

M.L. 2015 Project Abstract

For the Period Ending June 30, 2018

PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

PROJECT MANAGER: Steve Thomas

AFFILIATION: The NetWork for Better Futures

MAILING ADDRESS: 2620 Minnehaha Avenue

CITY/STATE/ZIP: Minneapolis, MN 55406

PHONE: 612-325-7856

E-MAIL: sthomas@betterfutures.net

WEBSITE: www.betterfuturesminnesota.com

FUNDING SOURCE: Environment and Natural Resources Trust Fund

LEGAL CITATION: M.L. 2015, Chp. 76, Sec. 2, Subd. 07c as extended M.L. 2017, Chapter 96, Section 2, Subdivision 18

APPROPRIATION AMOUNT: \$845,000

AMOUNT SPENT: \$836,123

AMOUNT REMAINING: \$8,877

Overall Project Outcome and Results

This project promoted building deconstruction as an alternative to demolition. The project also developed viable techniques for reducing greenhouse gas emissions and diverting significant amounts of reusable and recyclable building materials from landfills. Construction and demolition debris is the second largest component of our waste stream; only 20-30 percent is recycled. Deconstruction is the systematic disassembly of a building, with the purpose of recovering materials for reuse or manufacturing into new products. Overall, material reuse reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The partners exceeded nearly all the expectations related to this project:

1. 29 LCCMR-eligible properties were deconstructed.
2. 303 unemployed people were trained and/or employed. 18 FTE positions were created.
3. The partners compiled environmental impact data for the projects. Over 2,600 tons of building material was diverted from landfills. For projects in the Twin Cities, more than 85% of the waste was diverted and 5% of the materials were reused. It was difficult to achieve these diversion rates in Greater Minnesota due to the lack of building material recycling facilities.
4. The environmental benefits generated by deconstruction compared to traditional demolition are significant. The practice of dumping a building into a landfill emits, on average, 248 metric tons of CO₂ for each property demolished. Better Futures' deconstruction work emitted on average just 51 metric tons of CO₂.
5. This project averted the emission of 5,288 metric tons of CO₂. This decrease in CO₂ emissions is equivalent to taking 1,114 cars off the road for one year. The social cost of this carbon offset is \$190,548.

These activities and accomplishments confirmed the multiple benefits of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in

numerous industries. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction since the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying material in landfills. The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide.

Project Results Use and Dissemination

Throughout the grant period, the partners were consistently engaged in promoting the practice of deconstruction and material reuse. Over time, the visibility of workers taking a part a building generated the most publicity and heightened the level of interest among the public. The actual work helped to highlight the futility and wastefulness of demolition and showcased a practical way to significantly reduce trips to a landfill. Homeowners emerged as the prime drivers for deconstruction of privately owned buildings. Accordingly, the partner's revised its messages and materials to address a homeowners' demands and concerns about demolition. An added advantage is homeowners secure a tax deduction for the materials donated to the partners. This tax benefit helps with making the case for deconstruction.



Environment and Natural Resources Trust Fund (ENRTF) M.L. 2015 Work Plan Final Report

Date of Report: 8-10-18
Final Report
Date of Work Plan Approval: 6-11-15
Project Completion Date: 6-30-18

PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

Project Manager: Steve Thomas
Organization: The NetWork for Better Futures
Mailing Address: 2620 Minnehaha Avenue
City/State/Zip Code: Minneapolis, MN 55406
Telephone Number: 612-325-7856
Email Address: sthomas@betterfutures.net
Web Address: betterfuturesminnesota.com

Location: Twin Cities Metropolitan Area and North Central Minnesota

Total ENRTF Project Budget:	ENRTF Appropriation: \$845,000
	Amount Spent: \$836,123
	Balance: \$ 8,877

Legal Citation: M.L. 2015, Chp. 76, Sec. 2, Subd. 07c
M.L. 2017, Chapter 96, Section 2, Subdivision 18

Appropriation Language:

\$845,000 the first year is from the trust fund to the commissioner of natural resources for an agreement with Better Futures Minnesota in cooperation with the Northwest Indian Opportunities Industrialization Center and \$155,000 the first year is from the trust fund to the Board of Regents of the University of Minnesota - Duluth for the Natural Resources Research Institute to develop and test a model for implementing building deconstruction and material reuse as a competitive alternative to demolition for the purpose of reducing greenhouse gas emissions, reducing landfill waste, and providing job training.

Carryforward (a) The availability of the appropriations for the following projects are extended to June 30, 2018: (7) Laws 2015, chapter 76, section 2, subdivision 7, paragraph (c), Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste.

I. PROJECT TITLE: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste

II. PROJECT STATEMENT:

This project will establish deconstruction as an alternative to demolition and develop viable techniques for reducing greenhouse gas emissions and the amount of reusable building materials buried in landfills. The U.S. EPA estimates that construction and demolition debris is the second largest

component of our waste stream, just behind municipal solid waste. Only 20-30 percent of this waste is recycled. One goal for this project is to deconstruct at least 30 buildings over a two year period. We estimate that the environmental impact of this effort is projected to: reduce carbon dioxide (CO₂) emissions by 900 metric tons, reduce the emission of methane gas (CH₄) by 45 tons, conserve the equivalent of 6,400 MMBTUs of energy, and divert 2,600 tons of building material from landfills.

As summarized by The Institute for Local Self-Reliance, deconstruction is the systematic disassembly of a building, with the purpose of recovering valuable materials for reuse or manufacturing into new products. By reducing waste, deconstruction also reduces greenhouse gas emissions and abates the need for new landfills and incinerators. It helps to steer the construction and demolition industry towards sustainability and reuse. It reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The goals for this project are to: (1) Test and fully develop effective techniques and incentives for deconstructing buildings; (2) Develop and build value-added products and sustainable markets for the range of reusable materials recovered; and, (3) Document the environmental, social, and economic benefits of deconstruction, including reduced greenhouse gas emissions, reduced landfill use, and the reuse of natural resources. These goals will be achieved by: (1) Developing efficient techniques for deconstructing buildings safely; (2) Promoting deconstruction as alternative to demolition and establishing a marketplace for reclaimed materials; (3) Creating and manufacturing products made from reclaimed materials; (4) Calculating the environmental impact of this project and deconstruction work.

This endeavor is a partnership between Better Futures Minnesota (Minneapolis), the Northwest Indian OIC (Bemidji), and the Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth. To advance this project and achieve the outcomes outlined in the work plan, the partners intend to meet monthly via conference call and hold face to face meetings each quarter.

Better Futures will: serve as the project manager; take the lead on testing and refining efficient techniques for taking apart buildings; take the lead on educating Tribal, local, county and State government agencies about the practice and benefits of deconstruction and work with these entities to implement incentives, policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition; deconstruct up to 20 uninhabitable properties in various states of condition; and, work with the NRRI to develop and test products that can be manufactured from reclaimed materials. \$503,397 of the ENRTF appropriation is allocated to cover Better Futures' projected expenses.

The Northwest Indian OIC will: help test and inform the development of efficient techniques for taking apart buildings in North Central Minnesota; hire, train, and supervise NW OIC crew chief and workers; work with Tribal, State, county, and local agencies to implement incentives, policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition; and, deconstruct up to 10 uninhabitable properties in various states of condition. \$341,603 of the ENRTF appropriation is allocated to cover Northwest Indian OIC's projected expenses.

The Natural Resources Research Institute (NRRI) at the University of Minnesota Duluth will: inform the development of techniques that maximize the quality and quantity of materials harvested from

buildings that are in various states of condition and assess the value, quality, and quantity of materials harvested; identify or develop a tool for calculating the yield and environmental impact of materials harvested from buildings, including reduced greenhouse gas emissions, energy savings, reduced landfill use, and the reuse of natural resources; and build prototypes and test products that can be manufactured from reclaimed materials. \$155,000 of the ENRTF appropriation is being appropriated directly to NRRI to cover its projected expenses.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of December 31, 2015:

The partners meet monthly to advance all the activities outlined in this work plan. Since July 2015, Better Futures deconstructed 4 publically-owned buildings and 5 additional publically-owned buildings are in the process of being deconstructed. The NWIOIC deconstructed 3 mobile homes for tribal agencies. 36 different Better Futures employees worked 2,217 hours on the 4 buildings that were deconstructed. Twenty eight (28) Better Futures workers participated in 6 hours of training on deconstruction techniques and packaging of materials for reuse; 16 of these workers completed OSHA-10 safety training while 17 completed forklift training. Five (5) NWIOIC workers completed OSHA 10 safety training.

Better Futures and NWIOIC began testing various techniques for dismantling buildings in an effort to reduce the amount of materials sent to landfills. The diversion rates for an initial set of buildings deconstructed by Better Futures since July varies from 55% to 83%. The data and analysis being produced by NRRI will help the partners refine and improve on-site work processes to increase and maintain high diversion rates, with a priority on increasing the reclamation rate of materials.

Presentations regarding the benefits of deconstruction were made before a commission in Edina, at the State Fair, at the architect's State convention, and at the Recycling Association of MN convention. The major challenges to date are: demolition is an established, low cost option; deconstruction is an under-developed, under-valued practice; public policy and current practices hinder the development of deconstruction as a viable alternative; the true cost of demolition compared to the benefits of deconstruction needs to be assessed more fully.

Amendment Approved by LCCMR 5-19-2016:

On behalf of its partners, Better Futures is requesting three amendments to our work plan:

- 1) We would like to change the deadlines for submitting status reports from December 31 to January 31 and from June 30 to July 31. The reason is that Better Futures' accounting system is not able to produce accurate payroll, expense, and revenue data until the books are closed for the month. This typically occurs two to three weeks later in the following month. For example, June data will not be ready until the second or third week of July.
- 2) We would like to shift a portion of the Project Manager's time and funding to cover work related to Activity Four. The reason for this shift is that a portion of the Project Manager's time is being invested in helping gather and then analyze the environmental impact data being produced by NRRI. In addition, the Project Manager is helping to package the environmental data for education and outreach efforts described in Activity Two.
- 3) We would like to amend the work plan and budget to contract with Tim Roman of Ecotone Partners as a Sole Source Vendor. Better Futures will retain Roman to assist with completing these tasks outlined in our work plan:

- ✓ Assist with developing tools for estimating time and cost to complete a project and the projected value of materials.
- ✓ Create a spreadsheet that calculates labor hours and projected product values once the type and amount of materials from a project are entered into this tool.

Working with Better Futures' business manager and accountants, Mr. Roman will build the database needed to support the labor costs used for this spreadsheet. In addition, Mr. Roman is currently under contract with Better Futures to develop and launch a warehouse inventory system for used materials and an on-line store. His expertise with these new systems will enable him to integrate the list of materials and values from the inventory with the formulas to be used in this new calculation tool.

Moreover, (under a contract outlined in NRRI's companion Work Plan) Roman is currently the only person using the materials lists, recycling reports, and landfill reports from every project completed by Better Futures and NWIOIC to produce the environmental impact statements outlined in Activity Four. This experience developed by Roman over the past year is a valuable asset as the Partners move to create the estimating tool described above. Roman's knowledge of the value, weight, and type of materials being reused recycled, or land filled is essential for creating the estimating tool.

Overall, the Partners agree that Roman's firm is the only, one entity reasonably able to meet the objectives outlined in Activity One. He has been working with NRRI since the inception of this grant and he is the developer and producer of the environmental impact statements for this grant. To our knowledge, no other firm or individual has created or is producing the type of impact statements produced under this grant project. This distinctive skill, along with an intimate knowledge of the range of materials collected during the deconstruction process, makes Roman uniquely qualified to help the Partners develop the estimating tool cited in Activity One.

In addition, Roman's research and practical experience with deconstruction techniques and the sale of used materials enables him to apply this knowledge in developing a practical tool for estimating job hours and material values. His unique, practical understanding of the deconstruction work processes, his survey of the national marketplace for material sales, and his detailed understanding of the value and environmental impact of all the materials generated during the deconstruction process, positions him to be uniquely qualified for this assignment.

As noted, Roman has been working with Better Futures for several years and with NRRI more recently. The initial engagement between Better Futures and Roman was not established through a competitive bid process but was developed in consultation with staff at Hennepin County's Environmental Services agency. Back then, we were in the early stages of figuring out how to measure the environmental impact and benefits of recycling and reusing used building materials. Roman was an ideal candidate since he had served on the Board of the Green Institute's Reuse Store (now closed) and was beginning to tackle this issue. Roman's role, value and expertise emerged as we all learned and developed this line of work more fully.

As to rates, Roman proposes to charge the same rate he charged three years ago, \$62.50 an hour. From our research, this rate is well below market. By comparison, for other clients, Roman charges \$150 an hour. Our colleagues at NRRI estimate that a talent who performs the type of work offered by Roman typically charges \$200 an hour. Based on advice from NRRI and experience with consultants

from other fields, we are confident that the proposed rate is below market and of good value for the project.

Project Status as of July 31, 2016:

A range of key activities were completed during the first half of 2016. Better Futures work crews deconstructed four (4) eligible properties and partially deconstructed a fifth property. NWICDC deconstructed one property. Since the inception of this project, the two partners have deconstructed 13 eligible properties. Chronically unemployed people were trained and hired to work on these projects. They were employed for a total of 4,432 hours (3,830 for Better Futures workers and 602 hours for NWICDC workers). Thirty four (34) different men participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 8 different men).

Efforts to promote the innovative practice of deconstruction and promote the reuse of reclaimed materials intensified and blossomed during the first half of 2016. Better Futures drafted a “model” building deconstruction and material reuse policy and presented the policy to officials at Hennepin County and the City of Minneapolis. Both entities are considering adoption of this proposed policy. The goal under the new policy would be to reuse at least 5% of the materials from a building targeted for removal and to recycle an additional 70% of the materials. The partners estimate that, at these rates, the CO2 emissions from a project would be at least “net zero”; meaning that the net emissions of CO2 gas would be zero or less.

Significant progress was made in constructing higher value goods (park benches) from reclaimed materials. In addition, an environmental impact analysis of the LCCMR-eligible jobs completed by Better Futures under this grant is impressive: On average, 87% of all building material from 8 projects was diverted from the landfill. More important, deconstruction generated 70% less CO2 emissions than simply recycling some of the materials; and, deconstruction generated 91% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill.

Amendment Approved by LCCMR 11/3/2016:

On behalf of its partners, Better Futures is requesting two amendments to its work plan and budget:

- 1) Better Futures would like to shift \$12,416 in personnel funding from Activity One to Activity Three. This will enable Better Futures to train workers and build about 100 “Leopold” park benches. The benches will be made from lumber reclaimed from the buildings deconstructed under Activity One in this Work Plan. As mentioned in the July 31, 2016 Status Report, the NRRI helped the partner identify these benches as a viable option for manufacturing new products from reclaimed materials. The benches are relatively easy to build and just a few tools are needed. This manufacturing effort is also a great training opportunity for the partner’s workers. Along with safety training, this endeavor will train workers on how to use basic woodworking tools and reinforce core production habits related to consistency and quality control. The workers will also help develop a budget and production schedule for this effort reinforcing the need to be safe and efficient while staying within budget.

The plan is to use the benches to help promote the value and benefits of reuse. This effort also advances one of the objectives of creating higher value products from reclaimed materials. In addition, the benches will help build an additional line of work for the partners and create additional employment slots.

The NWICDC would like to shift \$43,056 from Activity One to Activity Two. This reallocation of funding will enable the NWICDC to hire a full time staff person to receive and inventory reclaimed materials, promote the reuse of reclaimed materials in the community, and operate a reuse warehouse. The need for this position is needed to help create a demand and marketplace for reclaimed materials in North Central Minnesota. In addition to promoting the value of reuse and building a customer base, the manager is needed to establish protocols and systems to manage inventory and customer fulfillment.

This position will advance a critical goal for this LCCMR grant; namely, promote deconstruction as alternative to demolition and establish a marketplace for reclaimed materials. This new position and the reuse warehouse are critical elements for promotion and for creating a marketplace for reclaimed materials. The intent is to establish this warehouse as a destination and source for reused building materials in North Central Minnesota. The one-time infusion of LCCMR funds for this staff position will help develop this strategy into a sustainable endeavor. The NWIOIC is funding the warehouse cost and other related overhead expenses. Projected revenue from sales of materials is expected to cover these operating costs in the future.

The partners do not expect this shift in funding to affect their ability to achieve the original goals for this grant. LCCMR funds coupled with other sources of revenue are expected to enable the partners to complete 30 deconstruction projects.

Project Status as of January 31, 2017:

Better Futures and its partners made steady progress in advancing this distinctive effort to reduce greenhouse gasses and solid waste. Better Futures work crews deconstructed an additional four (4) eligible properties and NWICDC deconstructed three (3) additional properties. Since the inception of this project, the two partners have deconstructed 19 eligible properties. Chronically unemployed people were trained and hired to work on these projects. They were employed for a total of 4,621 hours (822 for Better Futures workers and 3,799 hours for NWICDC workers). During this six month period, 40 different people participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 14 different men).

Efforts to establish alternative policies and practices at the county and municipal levels moved forward, but at a very slow pace. As noted in the last update, even though building material reuse and recycling reduces greenhouse gas emissions and landfill waste significantly, policy and practices must be reformed at all levels of government to establish deconstruction and reuse as an alternative to dumping. The impact data generated throughout this project documents that “net zero” emissions (meaning the net emissions of CO₂ gas would be zero or less) would occur if a requirement to reuse at least 5% of the materials from a building targeted for removal and to recycle an additional 70% of the materials was implemented. Along with achieving significant environmental and health benefits, a new policy will generate more jobs statewide.

Both Better Futures and NWICDC crews built dozens of benches and other types of seating with reclaimed wood. The NRRRI provided design ideas along with building patterns, work flow advice, and step by step building directions. On average, 86% of all building material from the four Better Futures projects during this six month period was diverted from the landfill. More important, as the partners collect more impact data, the dramatic environmental benefits are becoming more apparent: during this six month period, deconstruction generated 81% less CO₂ emissions than simply recycling some of the materials; and, deconstruction generated 150% less CO₂ emissions than the current, predominate

practice of throwing away the building and burying it in a landfill. This growing amount of impact data is helping to inform public education campaigns. For example, the data was used to produce a graphic/poster entitled “Why Throw Away A House?” (see Attachment B).

Amendment Approved by LCCMR (3-22-17):

On behalf of its partners, Better Futures Minnesota is requesting an amendment to its LCCMR work plan and budget to maximize the impact of the LCCMR grant and develop deconstruction into a sustainable line of work. This request focuses on realigning a portion of the existing funds while staying on track to meet all the goals outlined in the original work plan. With this amended work plan and budget, the partners will also achieve additional outcomes as noted below.

Funds are available for reallocation since the actual costs related to deconstructing properties are lower than originally projected. The partner’s techniques have improved and become more efficient thus requiring fewer days on a job site. In addition, the partners have experimented with the size of work crews and settled on an efficient level of staffing for a deconstruction crew.

The specific requested changes are as follows:

- 1) Decrease the Activity One “Personnel” budget by \$49,664 to a revised budget of \$488,266.
- 2) Increase the Activity Three “Personnel” budget by \$49,664 to a revised budget of \$128,517.
This shift of existing funds will support one Better Futures and one NWICDC furniture-building work crew for three months. We project the three months of funding will be expended by 9-30-17. This proposed use of funding will enable the partners to build and sell 75 more benches and other types of furniture. In addition, more workers than originally projected will be employed. The partners estimate that 8 FTE job slots will be funded during this three month period. Any net revenue from the sale of the furniture will be used to support the program activities sponsored by each partner.
- 3) Reallocate \$113,756 of Personnel funds within Activity One to cover a portion of the salary and benefit expenses for two existing Better Futures staff people. We are proposing to spend less on work crews for deconstruction work and reallocate some of those funds to cover these two additional positions for 8 months. The requested reallocation of LCCMR funds will cover 60% of the Deconstruction Managers’ position for eight months and 50% of the Business Coordinator’s position for eight months retroactive to 2-1-17. The amount of the retroactive funding requested is \$14,220. Better Futures’ deconstruction line of work has grown considerably over the past year (a measure of success for the LCCMR grant). Last February 2016, the partner’s work crews were idle; this February, Better Futures had three full crews working on deconstruction projects. This increased workload created the need to train and supervise more workers, assess prospective jobs and prepare bids, manage a greater number of customers and projects, and transport an increasing amount of reclaimed materials. Moreover, together with the LCCMR Program Manager, the Deconstruction Manager will assist with the final drafting of the deconstruction operations manual, the safety manual, and a cost estimating tool. These are deliverables for the LCCMR grant. The Deconstruction Manager is also attending a growing number of trade shows and community events to help promote the practice deconstruction. The Business Coordinator is focused on managing the logistics related to an increasing pipeline of deconstruction work, including customer relations, ordering equipment, managing subcontractors, invoicing, collecting cost and impact data, and transportation.
- 4) Extend funding for the NWICDC Project Manager, the NWICDC Warehouse Manager, and the Better Futures Project Manager for an additional three months (July, August, and September

2017). The expense related to the additional three months is \$125,681. We expect to spend less on work crews for deconstruction work thus creating an opportunity to reallocate some of these work crew funds to cover these three existing positions for an additional 3 months. This increase in time will enable these individuals to close out this project, continue adding projects to the deconstruction pipeline, continue promoting changes in policy and practice, (including making presentations at community meetings and the State Fair), and continue building momentum for material sales at the NWICDC sales warehouse.

- 5) Shift \$5,000 in Personnel Funds in Activity One to increase training funds in Activity One from \$10,000 to \$15,000. This increase in funding will cover the cost of Deconstruction certification training. The plan is to engage a certified trainer to train Better Futures and NWICDC crew chiefs and deconstruction managers. By completing this training, the partner's supervisory staff will earn a nationally-recognized certification in deconstruction project management and techniques. With this certification, the partners will be positioned to compete for more work. In addition, Hennepin County officials have indicated a desire to require that companies be certified to complete deconstruction projects in their jurisdiction.
- 6) Use a portion of the work crew personnel funds in Activity Two to support the employment of two existing Better Futures job slots for eight months focused on the promotion and sales of reclaimed materials. We also request that reimbursement for this expense be approved retroactive to 2-1-17. The expense related to retroactive funding is \$2,826. These are full time positions and the men receive training related to customer service and processing sales transactions. More men than originally projected will be employed by this shift in LCCMR funding. As noted earlier, the lower work crew cost for deconstruction permits us to dedicate a portion of the work crew personnel funding in Activity Two for this purpose.

Amendment Approved by LCCMR (July 31, 2017)

In light of the one-year extension to spend the funds appropriated for this project, the partners request that all project end dates be changed from June 30, 2017 to January 31, 2018.

Project Status as of July 31, 2017:

Better Futures and its partners continued to make important strides toward making deconstruction and building material reuse a sustainable alternative to demolition. Although Better Futures work crews deconstructed one LCCMR-eligible property during this reporting period, both Better Futures and the NWICDC crews were kept very busy by deconstructing properties for private and government customers. Better Futures completed the deconstruction of five, privately-owned properties during this reporting period and was in the process of completing two additional projects on July 31st (one for a private owner and one LCCMR-eligible project). In addition, the NWICDC deconstructed three private or government-owned properties during the first six months of 2017.

Since the inception of this project, the two partners have deconstructed 22 LCCMR- eligible properties. We have a sufficient number of potential LCCMR-eligible projects in the pipeline to meet the goal of 30 projects by the end of 2017. The main strategy for reaching this goal is a deconstruction pilot with St Louis County. The County planning staff are excited to demonstrate the multiple benefits of deconstruction and reuse in the Northeast part of Minnesota and they have initially identified seven properties that may be good candidates for deconstruction. Better Futures and the NWICDC are in the process of assessing each property. Deconstruction work on some of these sites is expected to begin in the early Fall 2017.

Chronically unemployed people were trained and hired to work on these projects. During this six month reporting period, 85 different people participated in trainings and worked on the projects (Better Futures employed 75 different men and NWICDC employed 10 different men). The non-LCCMR work created the highest number of people consistently employed since the inception of this project. Better Futures also earned a record level of revenue from the sale of reclaimed materials. Total sales revenue for this six month reporting period totaled \$140,325.

Better Futures and its partners increased its outreach and education efforts during the past six months. Multiple presentations at trade shows and conferences helped to increase the visibility of our work and promote its value. In May, Better Futures was honored with the Sustainable Business Award during Environmental Initiatives 25th Anniversary celebration.

Both Better Futures and NWICDC crews continued to build dozens of benches and other types of seating with reclaimed wood. In addition, the NRRRI worked with a supply of drywall gathered by the NWICDC to develop an array of possible alternate uses for this material. The possibilities include animal bedding, a soil supplement, and chalk for lining sports fields.

The environmental impact from this project remains impressive. On average, 87% of all building material from the partner's deconstruction projects was diverted from the landfill. To date, this project has collected over 2,500 tons of building material, 2000 tons of this material was recycled and more than 100 tons was reused. Overall, the project so far has averted the emission of 4,224 metric tons of CO₂. This amount of CO₂ reduction is equivalent to taking 106 cars off the road for a year.

Amendment Approved: (2/22/2018)

Given the delay in implementing the St Louis County Deconstruction Pilot, the partners request that all project end dates be changed from January 31, 2018 to June 30, 2018.

Project Status as of January 31, 2018:

Along with deconstructing a mix of LCCMR-eligible and privately-owned properties, Better Futures made significant progress in drafting and advancing policies to replace demolition with deconstruction in several local communities. In addition, both the State MPCA and Hennepin County highlighted the need to focus on and divert construction and demolition waste from landfills. This is the first time C and D waste has been elevated to this level of urgency in these public agency's solid waste plans.

Better Futures work crews completed the deconstruction of one LCCMR-eligible property in Ramsey County. This job received coverage in local newspapers and helped to increase Better Futures' presence in the County. The NWICDC deconstructed three more government-owned properties during the last six months of 2017. Since the inception of this project, the two partners have deconstructed 25 LCCMR- eligible properties. See Attachment B for a listing of all LCCMR-eligible properties fully deconstructed since July 2015.

Better Futures has negotiated a contract with St Louis County to implement a deconstruction pilot initiative funded in part with the remaining portion of the LCCMR funds. This project was expected to be completed last fall but the partner's workload prevented them from diverting labor and managers to the County. The plan now is to complete this Pilot as soon as weather permits in 2018.

Chronically unemployed people continued to be trained and hired to work on these projects. During this six-month reporting period, 93 different people participated in trainings and worked on the projects (Better Futures employed and trained 80 different men; NWICDC employed and trained 13 different workers). Better Futures more than doubled the amount of annual revenue earned from the sale of used materials. In 2016, Better Futures earned \$116,000; in 2017, the agency earned \$266,000. This dramatic growth in sales revenue indicates a growing demand for used building materials and progress in building a marketplace for these materials.

Per our agreement with the previous LCCMR Director, all net proceeds from generated revenue has been reinvested in this project.

The environmental impact from this project remains impressive. Moreover, the partners are generating data for each project that helps the customer and policymakers understand the benefits of deconstruction and the harmful effects of demolition. On average, 87% of all building material from the partner's deconstruction projects was diverted from the landfill. To date, this project has collected over 2,620 tons of building material, 2300 tons of this material was recycled or reused. Overall, the project so far has averted the emission of 5,172 metric tons of CO₂. The partners' deconstruction work is close to achieving "net zero" emissions of CO₂ gas.

Overall Project Outcomes and Results:

This project promoted building deconstruction as an alternative to demolition. The project also developed viable techniques for reducing greenhouse gas emissions and diverting significant amounts of reusable and recyclable building materials from landfills. Construction and demolition debris is the second largest component of our waste stream; only 20-30 percent is recycled. Deconstruction is the systematic disassembly of a building, with the purpose of recovering materials for reuse or manufacturing into new products. Overall, material reuse reduces the industry's consumption of virgin materials, helps preserve natural resources, and protects the environment from pollution related to extraction, processing, and disposal of raw materials.

The partners exceeded nearly all the expectations related to this project:

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4. The environmental benefits generated by deconstruction compared to traditional demolition are significant. The practice of dumping a building into a landfill emits, on average, 248 metric tons of CO₂ for each property demolished. Better Futures' deconstruction work emitted on average just 51 metric tons of CO₂.
5. This project averted the emission of 5,288 metric tons of CO₂. This decrease in CO₂ emissions is equivalent to taking 1,114 cars off the road for one year. The social cost of this carbon offset is \$190,548.

These activities and accomplishments confirmed the multiple benefits of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in

numerous industries. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction since the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying material in landfills. The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide.

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Develop efficient techniques for deconstructing tribal, publically-owned, or uninhabitable buildings safely

Description:

One key strategy for making deconstruction a cost-effective alternative to demolition is demonstrating viable, safe techniques for dismantling a building. In addition, as proponents of deconstruction, the partners must document the yield, value, and quality of the materials diverted. Accordingly, the tasks and outcomes in this area of activity are aimed at testing and refining techniques for maximizing the yield, quality, and value of material diverted from landfills either through recycling or reuse. The objective of maximizing yield and value of material diverted must be balanced with the cost of time and labor required to meet this objective.

Diverting the maximum amount of building materials from landfills generates significant environmental benefits. For example, the deconstruction of a 2000 square foot house in 2014 produced the following benefits: 82%, or 88 tons of the building was recycled or reused and this effort averted the emission of 33 metric tons of carbon dioxide and 1.5 metric tons of methane gas. This reduction in emissions is equivalent to conserving 211 MMBTUs of energy.

Better Futures and the NWIOIC will take apart in a methodical manner at least 30 Tribal, publically-owned, or uninhabitable buildings that are in various stages of condition (i.e. fully intact to partially damaged). These projects will be used to continuously refine deconstruction and material processing techniques during the course of this project. Better Futures and NWIOIC will also use the practical experience from these projects to develop and refine protocols that help workers maximize the yield, quality, and value of material harvested from each building. A related task is that partners will test a range of techniques for processing the material harvested to achieve the greatest value from recycling or reuse. NRRI (as outlined in their work plan) will be helping Better Futures and NWIOIC with assessing the value, quality and quantity of materials harvested.

This in-the-field, project experience will enable Better Futures and the NWIOIC to update and finalize an operating manual and safety protocols. In addition, all workers will receive training with credentialing related to safety, product identification, and harvesting techniques to maximize yield, value, and quality during the deconstruction process. As with the operating manual and safety protocols, this training regimen will be refined and finalized during the course of the project.

Summary Budget Information for Activity 1:

ENRTF Budget:	\$551,939
Amount Spent:	\$543,062

Balance: \$ 8,877

Outcome	Completion Date
1. At least 30 tribal, publically-owned, or uninhabitable buildings, in various stages of condition (i.e. fully intact to partially damaged) are deconstructed. Of the projected 30 buildings, 20 are expected to be located in the Twin Cities Area and 10 in North Central MN.	June 2018
2. At least 40 different at-risk adults and two supervisors are hired and trained for deconstruction work. LCCMR funding supports 29,000 hours of training and labor for the 30 projects.	June 2018
3. On average, 75% of the materials from each building (estimated total weight of 2,600 tons) are reused or recycled and diverted from landfills.	June 2018
4. A final report summarizing the following information is produced: the amount of material recycled or reused and diverted from each building; the type of materials recycled and reused from each building; and the quality and estimated value of the materials recycled and reused.	June 2018
5. A final operating manual and safety protocol for building deconstruction is produced. The manual will contain guidelines for maximizing the yield, value, and quality of material harvested from buildings. The manual will also offer guidelines for assessing the viability of deconstructing a building based on its age and condition.	June 2018

Activity Status as of December 31, 2015:

The partners are focused on developing and testing techniques for safely taking apart buildings while controlling costs. Offering a financially attractive alternative to demolition is one of this project’s objectives. Several approaches are being used to develop these safe and efficient techniques: Deconstruction companies and practitioners in other cities are being consulted; Training manuals and videos obtained from these practitioners and from a professor at Catholic University are being used; and, Practical experience gained from actual work on the job site is being documented and analyzed. The work on actual jobs provides the most valuable information. This on-site work also enables the partners to test, assess, regroup, and adjust. The information and experience gained from these sources is being used to routinely update the deconstruction and safety training regimen.

Along with testing various techniques, the partners are tackling a major operational issue related to the optimal number of workers required and the number of experienced workers needed on a crew. The partners are testing various scenarios while dealing with the tensions inherent in their workforce development model. Namely, a job can be completed in less time with higher paid, more experienced workers; yet, the partner’s mission is to create as many jobs as possible. Moreover, labor is the single biggest cost factor in deconstruction. More jobs over the year ahead will help the partners analyze staffing assumptions more thoroughly and come closer to establishing an efficient, sustainable staffing model.

A more thorough average project cost analysis will be presented in the next status report. From an initial review of expense data for the first set of projects for two private customers, it appears that earned revenue covered most of the direct cost of deconstruction. The rates earned to date from private customers have not, however, covered all overhead costs. In addition, the partners struggle with finding demolition companies (who are needed to remove the foundation and prepare the lot for

its new use) willing to provide their services at a significantly lower cost. We expect much lower final demolition costs since a good portion of the material has already been removed through the deconstruction process.

Of course, a steady pipeline of buildings is needed to advance this project and good amount of staff time and effort has been invested in securing tribal and publically-owned properties for deconstruction. NWIOIC has initially targeted its outreach to tribal agencies, counties, cities, MNDOT (Northern MN), the State DNR, and the National Forest Service. Better Futures has introduced this concept and its services to MNDOT, Hennepin and Ramsey counties, and several cities in Hennepin County.

The NWIOIC was able to complete work for a tribal agency (the deconstruction of 3 mobile homes). Better Futures deconstructed 4 houses owned by Hennepin County and the County offered 3 more houses which are in the process of being deconstructed. The City of Minneapolis adopted a deconstruction pilot and has initially offered 2 houses for deconstruction. All 9 of the properties were slated to be demolished. In addition, Better Futures completed full deconstruction work for two private customers.

Along with deconstructing these properties in a safe and efficient manner, the partner's objectives over the past six months has been to: reduce the amount of time spent working at a site; increase the amount and quality of materials harvested for reuse (as opposed to recycling and landfill); and, move closer to settling on the ideal staffing level and mix of staff experience.

Another development which advanced learning and kept at-risk men employed, occurred in November when Better Futures invited NWIOIC's Deconstruction Director to supervise a crew and work on two of the buildings offered by Hennepin County. The NWIOIC's workload slowed down in the fall and Better Futures needed an extra crew to meet the project timeline set by Hennepin County. This creative arrangement has the partners working side-by-side on a daily basis which expedites testing and the development of practical experience.

Here is a summary of the partner's efforts compared to the outcomes established for Activity 1:

1. A total of 12 tribal or publically-owned buildings were deconstructed or were in the process of being deconstructed during the first six months of this project. NWIOIC deconstructed 3 of the properties and Better Futures deconstructed 4 County-owned houses; 3 more County-owned houses are in the process of being deconstructed and 2 houses owned by the City of Minneapolis are being deconstructed.
2. 36 Better Futures workers, including three crew chiefs, worked a total of 2,217 hours deconstructing the four houses owned by Hennepin County.
3. Twenty eight (28) Better Futures workers participated in 6 hours of training on deconstruction techniques and packaging of materials for reuse; 16 of these workers completed OSHA-10 safety training while 17 completed forklift training. Five (5) NWIOIC workers completed OSHA 10 safety training. A total of 274 training hours were offered.
4. The diversion rates for an initial set of buildings deconstructed by Better Futures since July varies from 55% to 83%. The data and analysis being produced by NRRI will help the partners refine and improve on-site work processes to increase and maintain high diversion rates, with a priority on increasing the reclamation rate of materials.

Activity Status as of July 31, 2016:

During the first six months of 2016, the partners focused on refining deconstruction techniques and developing a sustainable cost model.

The diverse and steady flow of work has enabled the partners to learn a great deal about the main drivers of the deconstruction cost model. These include: staffing mix and size; the efficient deployment of staff and effective project management; final demolition expenses; and the age, quality, and size of building. The partners have been vigilant about testing operating assumptions, assessing performance after each job, and adjusting the operating model when necessary. This process of performing, learning, and adjusting is allowing Better Futures and the NWICDC improve continuously and progress toward establishing a sustainable business model.

Initially, the partners assumed the best staffing model was one crew chief, 4 full time workers, and 2 trainees. Based on the data and experience of working on the 13 LCCMR-funded projects since June 2015, the partners are now adjusting this model to consist of one crew chief (with a richer mix of supervisory and training skills plus a higher starting salary), 5 full time workers (with higher performance expectations and perhaps an increase in the hourly rate), and one FTE which will cover the deployment of two trainees at each job.

Overall, this adjustment in staffing is needed to ensure the partners provide a quality service at a competitive price. This includes increasing the skill set, performance expectations, and pay for the full-time staff. Turnover of the full-time staff undermines the enterprises' ability to provide a consistent, disciplined, and cost-effective service. And yet, many full-time workers leave for higher paying jobs in the private sector. This transition is an on-going tension and management challenge: stable, well-prepared workers are needed to ensure a high performing enterprise but the overall goal is to move workers into better paying jobs in the community.

A similar tension is related to the deployment of trainees on the work site. The deconstruction work for trainees advances the goal of creating work opportunities for chronically unemployed, at-risk people. But this strategy also burdens the crew chief with additional supervision responsibilities and distracts the chief from focusing on project management objectives.

The newest version of the full deconstruction staffing model will be tested and fine-tuned over the remaining months of 2016. Based on past experience and initial feedback from companies in other parts of the country, the one crew chief, 5 workers, and two trainees model appears to be best option.

Next to staffing, the ability to plan for and execute a full deconstruction project on time and within budget is mission-critical. LCCMR grant-funded work has helped the partners further develop this skill and the habits necessary for effective project management.

One insight is that more careful planning must be completed on the front end of a project, starting with the initial inspection. Staff are learning about the essential need to understand the age, quality, and condition of a building. This includes gaining deeper insights into how a structure was built. For example, a house at 6601-04 Girard in Richfield appeared to be a typical mid-century suburban home. Yet, the crew discovered the house took more time than planned to disassemble since the "bones" of the building were larger and better "connected" than usual. The type and application of insulation throughout a house also affects time and costs.

More time must also be invested in preparing for a project, including starting with daily production goals and then adjusting these goals after a day's work is completed. Also, a key task under this grant -- study performance and environmental data to prioritize the type and amount of materials to harvest from a house -- will help with the allocation of staff time. There is a point of diminishing returns and this analysis will help create decision rules and craft a labor deployment plan that yields the highest returns in terms of materials and environmental impact.

The age, quality, size, and composition of a building play a critical role in determining the schedule and cost of deconstruction. Again, more analysis is needed but it appears that a decision matrix (depicted below) needs to be created to help guide the planning and project management process.

High quality and high value Building built before 1950 3000 sq ft or larger An appraisal of \$30K or more is likely Old barns	Medium quality and value The older the home the better 1500-2000 sq ft Marginal need for an appraisal	Low quality, low value but high value for structural lumber if older building
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Although cost is a prime factor, customers have additional factors to consider and the partners must continue its efforts to address these factors in a compelling manner. For example, private owners have been willing to pay a higher cost for deconstruction since the tax deduction for the value of the materials donated to Better Futures and the NWICDC offsets some of this higher cost. A public owner, however, will value the positive return of creating jobs for chronically unemployed men. Public owners will also typically value the significant increases of recycling and reuse produced by the deconstruction process. Finally, a major goal for the last half of 2016 is to assemble more demolition partners in an effort to reduce the cost of their service, and thus the overall cost of full deconstruction.

Here is a summary of the partner's efforts to advance the outcomes established for Activity 1 during the first six months of 2016:

1. Better Futures work crews deconstructed four (4) eligible properties and partially deconstructed a fifth property. NWICDC deconstructed one property in the past six months. Since the inception of this project, the two partners have deconstructed 13 eligible properties.
2. Chronically unemployed people were trained and hired to work on the 5 deconstruction projects and the building of park benches during the first six months of 2016. They were employed for a total of 4,432 hours (3,830 for Better Futures workers and 602 hours for NWICDC workers) during this reporting period. This includes 79 hours of training for the workers. Thirty-four (34) different men participated in trainings and worked on the projects. Better Futures employed 26 different men and NWICDC employed 8 different men. Since the beginning of the LCCMR grant, 70 different men have been trained and/or employed and these men have worked a total of 6,649 hours.
3. The partners have compiled environmental impact data for 8 of the 13 LCCMR-funded projects completed since June 2015 (additional data is still being collected for the remaining projects). On average, 87% of all building material from the 8 projects was diverted from the landfill.

Activity Status as of January 31, 2017:

A summary of the partner's efforts to advance the outcomes established for Activity 1 during the last six months of 2016 are presented below.

1. Better Futures work crews deconstructed four (4) eligible properties and the NWICDC deconstructed three properties. Since the inception of this project, the two partners have deconstructed 19 eligible properties.
2. Along with working on LCCMR-eligible properties, Better Futures also deconstructed 6 private properties and partially deconstructed another 4 properties for private customers. The work for private customers is typically a profitable job and the growth in this type of work is a critical element for making deconstruction a financially sustainable enterprise.
3. Chronically unemployed people were trained and hired to work on the 7 deconstruction projects and the building of park benches during the last six months of 2016. They were employed for a total of 4,621 hours (822 for Better Futures workers and 3,799 hours for NWICDC workers). During this six month period, 40 different people participated in trainings and worked on the projects (Better Futures employed 26 different men and NWICDC employed 14 different men). Since the beginning of the LCCMR grant, 110 different people have been trained and/or employed and these individuals have worked a total of 11,270 hours.
4. The partners have compiled environmental impact data for 15 of the 19 LCCMR-funded projects completed since June 2015. A major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible. For Better Futures projects, however, an average of 86% of all building material for 11 of its 13 projects was diverted from the landfill; nearly 5% of this material was reused.

During the first six months of 2017, a final draft of a deconstruction and safety operating manual will be prepared. One version of this manual will be developed for the training of new workers. A second version will be crafted for use on the job site. The manuals will include coaching points and guidelines for: assessing the value of materials; estimating worker hours for a job; and, protocols outlining efficient methods for processing materials safely. These resources are needed to support a stable, predictable and cost-effective deconstruction operation over the long term.

Project Status as of July 31, 2017:

During the first six months of 2017, Better Futures and its partners accomplished the following tasks in relation to Activity One:

1. Better Futures work crews deconstructed one (1) LCCMR-eligible property. Since the inception of this project, the two partners have deconstructed 22 eligible properties.
2. Along with working on LCCMR-eligible properties, Better Futures also deconstructed 6 private properties. One private project (a 24,000-square foot house) employed about 16 men for three months. The NWICDC also deconstructed two properties owned by a private and a government customer. The growth in this type of work is a critical element for making deconstruction a financially sustainable enterprise.
3. Eighty-seven (87) different, chronically unemployed people were trained and hired to work on 9 deconstruction projects and the building of benches. Since the beginning of the LCCMR grant, 198 different people have been trained and/or employed.
4. The partners have compiled environmental impact data for 15 of the 22 LCCMR-funded projects completed since June 2015. As noted in the last update, a major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible.

5. Better Futures is now typically achieving net zero emissions of CO₂ with each project. The environmental benefits of this outcome are significant; the common practice of dumping a building into a landfill emits, on average, 228 metric tons of CO₂ per project.

Given the extension for this project's appropriation, the partners adjusted their work plan and now intend to produce a final draft of a deconstruction and safety operating manuals during the last part of 2017.

Project Status as of January 31, 2018:

During the last six months of 2017, Better Futures and its partners accomplished the following tasks in relation to Activity One:

1. Better Futures work crews completed the full deconstruction of one (1) LCCMR-eligible property. The NWICDC deconstructed 3 properties. Since the inception of this project, the two partners have deconstructed 25 eligible properties.
2. 93 different, chronically unemployed people were trained and hired to work on 4 deconstruction projects. Since the beginning of the LCCMR grant, 291 different people have been trained and/or employed.
3. The partners have compiled environmental impact data for 25 LCCMR-funded projects completed since June 2015. As noted in the last update, a major constraint for the NWICDC is the lack of building material recycling facilities in Greater Minnesota. Consequently, the CDC's ability to achieve high diversion rates is nearly impossible.
4. Better Futures is now typically achieving net zero emissions of CO₂ with each project. The environmental benefits of this outcome are significant; the common practice of dumping a building into a landfill emits, on average, 228 metric tons of CO₂ per project.

Given the delay in implementing the St Louis County Deconstruction Pilot, the partners adjusted their work plan and now intend to produce a final draft of a deconstruction and safety operating manuals by June 2018. This effort includes organizing a six-day deconstruction training program for managers, crew chiefs, workers, and building inspectors. This training will lead to some of the staff becoming certified as deconstruction experts.

Final Report Summary:

Better Futures and its partners exceeded nearly all the expectations and outcomes outlined in Activity One:

1. Better Futures work crews and NWICDC deconstructed 29 LCCMR-eligible property against a goal of 30 properties. We were not able to fully deconstruct 2 of the 29 properties due to budget and time restraints.
2. 303 different, chronically unemployed people were trained and/or employed for Better Futures and NWICDC deconstruction projects. Overall, 18 FTE positions for chronically unemployed people were supported during the LCCMR grant period. This exceeded the original goal of 15.2 FTE
3. The partners compiled environmental impact data for all 29 LCCMR-funded projects completed. Over 2,600 tons of building material was diverted from landfills. A major constraint for the NWICDC and our St Louis County Deconstruction Pilot was the lack of building material recycling facilities in Greater Minnesota. Consequently, the ability to achieve high diversion rates outside the Twin Cities is currently nearly impossible. In the Twin Cities, however, Better

Futures diverted more than 85% of the waste from LCCMR-funded projects. By the end of this project, Better Futures was reusing over 5% of the materials from each building deconstructed.

4. Better Futures will use a portion of its 2018 LCCMR grant award to develop and implement techniques to significantly increase reuse, recycling, and waste diversion in select Greater Minnesota counties.
5. Another key outcome is that 8 people (5 Better Futures employees, 2 NRRI employees and 1 NWICDC employee) successfully completed a four day, nationally recognized deconstruction skills training. The training was funded in part with LCCMR grant funds. Five of these individuals also passed a test for the certification of deconstruction technician. These trainings are sponsored by the Building Materials Reuse Association which offers the “gold standard” in deconstruction training.
6. Better Futures and its partner the NRRI, assembled handbooks and materials for training deconstruction workers on techniques, safety and protocols for preserving the value of harvested materials. To compile these materials, the partners discovered existing resources (manuals, study guides and videos) that served as sources for the final materials developed under this grant. Better Futures harvested from these sources and also prepared customized handouts and presentations for use during regular training sessions. Another valuable source was the training handbook published by the Building Materials Reuse Association. All project managers and crew chiefs used this handbook during a certification training session funded in part with LCCMR grant dollars.

These activities and accomplishments confirmed the multiple value of building deconstruction. This approach for building removal reduces the release of harmful toxins and gasses to our air, water and land. Deconstruction also creates meaningful employment with opportunities for advancement in numerous industries. In addition, the methodical process of taking apart a building preserves valuable natural resources such as lumber and wood flooring. This process also preserves a wide range of fixtures and other materials that are in demand for reuse or repurposing.

But significant challenges hinder the financial viability of deconstruction. Quite simply, the current cost of demolition is artificially low. The existing price for demolition does not reflect the true environmental, health, economic, and social cost of burying and holding waste in landfills; the current cost for demolition does not capture the negative effects of transporting waste to landfills, and the impact of manufacturing new products from virgin material.

Moreover, existing practices and infrastructure are designed to support demolition not deconstruction. The lack of sufficient C and D waste recycling facilities along with the lack of expertise, specialized equipment and tools, and training all affect the further development of deconstruction.

The solution, based on the testing, work, and research completed under this grant is to adopt building material stewardship policies statewide. Similar stewardship laws, i.e. for electronics, appliances, household waste, paint, etc. resulted in these toxic products being reused and/or recycled. Building material waste poses health and environment threats to the community; more than 85% of this waste can and should be diverted from landfills. And unlike many of the products currently regulated, buildings contain a significant amount of material that can be reused and repurposed into higher value goods.

ACTIVITY 2: Promote deconstruction as a sustainable alternative to demolition and establish a marketplace for reusing materials harvested from projects

Description:

Another key strategy for making deconstruction a viable alternative to demolition is to introduce the value and benefits of deconstruction to a range of people in the community: homeowners, contractors, demolition companies, architects, Tribal, local, county and state government officials, and consumers. This effort to educate the community and public officials will consist of two objectives: promote the practice of deconstruction as a viable, cost effective alternative to demolition; and, increase awareness about the value and uses for materials harvested from buildings. A combination of information, promotion, and practical demonstrations are expected to generate a trend toward making deconstruction a common practice. In addition, these efforts are expected to increase the amount and types of materials being recycled and reused by consumers, contractors, architects, and government agencies.

The key activities in this area will consist of studying strategies and incentives used by public agencies across the country to promote the practice of deconstruction. In addition, we will study the practices of deconstruction and reuse organizations nationwide to determine their methods for promoting deconstruction and fostering a demand for reclaimed building materials.

This scan of practices nationwide will help inform the partner's efforts in Minnesota. Specifically, Better Futures and the NWIOIC will develop briefing materials outlining the "why, what and how" of deconstruction, including a primer on the environmental benefits of this practice compared to demolition. A strategy for promoting deconstruction within key sectors (homeowners, contractors, architects, demolition companies, and public agency officials) will be developed and implemented. Briefing materials will be tailored for each of these audiences. Outreach tactics will include making presentations at home improvement shows and conventions sponsored by architects and builders. We will also host seminars and offer presentations for local, county, tribal, and State government officials, focusing on those officials with responsibility for issuing demolition permits and increasing waste recycling rates. The goal of this education and promotion effort is to increase the practice of building deconstruction statewide. In addition, we will work with local, county and State officials to adopt incentives for deconstruction such as reduced permit fees and/or diversion goals for projects.

Another set of activities will be focused on increasing Better Futures' and the NWIOIC's expertise for valuing and creating a demand for materials reclaimed during the deconstruction process. This effort to foster a demand and marketplace for reclaimed materials is critical since our preliminary data indicates that using reclaimed materials generates a dramatically higher environmental benefit than recycling. For example, in 2014 Better Futures diverted 175 tons of building material from the landfill. 74% of this material was recycled and 26% was reused. Material reuse, however, accounted for 80% of the carbon emissions averted. 180 metric tons of CO₂ emissions were avoided by reusing materials compared to only 46 metric tons of CO₂ prevented by recycling materials.

A set of activities to increase demand for and promote the reuse of materials will be advanced during this project. Information about the environmental benefits and range of potential uses for reclaimed materials will be prepared. This information will be promoted and accessible via each partner's website. We will also promote reuse ideas at trade shows and remodeling fairs which target homeowners and crafts people. Social media will also be used to promote ideas for reuse and the

range of materials available. A key tactic will consist of building and launching an on-line store to promote the availability and sale of reclaimed materials.

Summary Budget Information for Activity 2:

ENRTF Budget: \$150,485

Amount Spent: \$150,485

Balance: \$ 0

Outcome	Completion Date
1. The practice of deconstruction and information regarding its environmental benefits is widely promoted by: Meeting with Tribal, local, county, and State officials who issue demolition permits, demolish public buildings, and are responsible for increasing recycling rates; Hosting information booths and seminars at home improvement shows, and trade conventions for architects, contractors, and demolition companies.	June 2018
2. At least six continuing education sessions regarding the practice and benefits of deconstruction and the reuse of materials are hosted by the partners. Architects and contractors are the prime audience for these sessions.	June 2018
3. At least one Tribal government and three cities or counties or State agencies adopt incentives and/or material recycling and reuse goals for buildings targeted for demolition.	June 2018
4. Demand for reclaimed materials increases by 30% over the course of the project (as measured by Better Futures and NWIOIC revenue from the sale of material from January 2016 through December 2017)	June 2018
5. Tribal, local, county, and State agencies begin using reclaimed materials for tables and other types of basic office furniture.	June 2018

Activity Status as of December 31, 2015:

A major task and challenge for this project is changing the established practice for removing buildings. The partners are committed to making an effective case for replacing the wasteful practice of demolition but they are confronting some significant hurdles. These include:

- ✓ The cost of demolition is low compared to the initial cost of deconstruction. In addition, the deconstruction process takes more time. The challenge for the partners is to build a case for why the true cost of demolition is in fact higher when one accounts for the environmental and social impact of demolition compared to deconstruction.
- ✓ The partners are also learning how public policy hinders the development of deconstruction into a sustainable practice. For example, counties in Minnesota must report on their recycling rates for household waste and financial incentives are tied to these rates. In contrast, counties are not required to track or report on the recycling and diversion rates of construction and demolition waste.
- ✓ Deconstruction as a practice is a relatively unknown and underdeveloped service in Minnesota. Consequently, the partners must rely on “early adapters”, an initial group of customers (public and private) who are willing to help the partners learn and test their trade.

- ✓ The partners are working to build a steady of pipeline of year-round work. Deconstruction requires a core group of trained and experienced workers and these workers move on to other jobs if the work is intermittent and unpredictable.

Activity 2 is focused on dealing with these challenges. An initial set of briefing handouts were prepared and are being used to educate public officials and private customers. NWIOIC reached out to officials at tribal agencies throughout Northern MN, MNDOT, the State DNR, several counties and cities in Northern MN, and the National Forest Service. Better Futures advanced a deconstruction demonstration effort with Hennepin County and launched a deconstruction pilot with the City of Minneapolis. Better Futures also introduced the concept to cities in the metropolitan area along with architects, contractors, and homeowners. A marketing plan developed by the partners is guiding this education and outreach effort.

The partners also relied on several gatherings to promote the practice and benefits of deconstruction. Better Futures met with the City of Edina Recycling Solid Waste Working Group in August and presented at the MPCA's eco-booth at the State Fair. The partners also shared a booth with MN Green Star at the AIA (architects) State convention in November. The partners' work and services were also highlighted at the Recycling Association of MN convention in October. This included a tour of two deconstruction job sites for convention participants.

A related effort is the redesign of Better futures' website to promote the practice and benefits of deconstruction. The new website is expected to be operational in March 2016. Along with information about deconstruction, the website will include an on-line store for viewing and buying reclaimed building materials. This online store is expected to be an outlet for selling materials harvested by both Better Futures and NWIOIC.

A key element of Activity 2 is establishing a demand and outlets for the materials harvested from deconstruction sites. During the first six months of this project, the partners focused on increasing its sales efforts. This consisted of Better Futures hiring a new, full time sales manager and hosting several warehouse sales events which were promoted through various social media outlets. In addition, the Better Futures warehouse is open daily and has attracted an increasing number of steady customers. The demand for reused materials is expected to increase significantly when Better Futures opens its new warehouse in January 2016. This new site is conveniently and prominently located in South Minneapolis near a set of other retail outlets selling used goods.

The results of these efforts are beginning to yield good outcomes. Better Futures revenue from the sales of materials for the first 11 months of 2015 was \$49,000; \$13,000 of this revenue was earned from a large sale in July. Sales revenue is projected to total \$150,000 in 2016.

Activity Status as of July 31, 2016:

The partners made significant progress in promoting deconstruction as an alternative to demolition and to creating a marketplace for reclaimed materials.

Educational materials were updated to reflect customer feedback and to incorporate data about the significant environmental benefits of deconstruction. The partners are also refining a "side by side" analysis which compares the cost of traditional demolition to the net cost of deconstruction (factoring

in the cash value of a customer's tax deduction. The partners also discovered an additional appraiser with deep experience in valuing used building materials.

The sale of building materials is a proven strategy for creating a demand and marketplace for reclaimed materials. In addition, sale of materials can generate income to support of the overall mission of the partner's enterprises. Success in this marketplace is dependent, however, on consistent effort and exceptional sales management practices. To that end, the partners implemented the following improvements over the past six months:

1. Opened a new warehouse in South Minneapolis at the northern end of Minneapolis' "Reuse Mile" and in a prime location for shoppers.
2. Implemented a high-performing inventory management and point of sale system which will support the operation of an on-line store.
3. Launched an on-line store. And Better Futures is working with the NWICDC to develop a way to provide access to the on-line store for the sale of materials harvested by the NWICDC.
4. Both partners are using social media (primarily Craig's List and Face book) to generate interest in and demand for reclaimed materials.
5. Better Futures established a partnership agreement with the Twin Cities Builder's Association. This partnership is expected to increase significantly the amount of used building materials donated to Better Futures.
6. In an effort to create a marketplace in North Central Minnesota, the NWICDC has started selling used building materials at a warehouse near Bemidji.

Better Futures earned \$50,000 in revenue from the sale of used building materials in the first six months of 2016.

Efforts to promote the innovative practice of deconstruction as an alternative to demolition intensified and blossomed during the first half of 2016. Better Futures drafted a "model" building deconstruction and material reuse policy and presented the policy to officials at Hennepin County and the City of Minneapolis. Both entities are considering adoption of this proposed policy. For the County, this policy would apply to all County-funded renovation and demolition projects. The City may apply the policy to all renovation and demolition projects in Minneapolis, both public and private projects. The goal under the new policy would be to reuse at least 5% of the materials from a project and to recycle an additional 70% of the materials. The partners estimate that at these rates, the CO2 emissions from a project would be at least "net zero".

The partners were also invited to present the case for deconstruction to public works and recycling officials with St Louis Park. The model policy was discussed and ways to introduce deconstruction to private developers and incorporate deconstruction in City-funded projects were reviewed.

Activity Status as of January 31, 2017:

A major effort was made during this reporting period to develop a more robust marketplace for the sale of reused building materials. The results from this focused effort were significant and very promising. The NWICDC secured new warehouse space and hired a full time person to promote the sale of reused materials. Better Futures intensified its use of social media outlets and hired a new sales person in September. These two actions generated substantial results for Better Futures: Gross revenue from sales of materials was \$112,798 in 2016. More significant, the average monthly sales

revenue for the first 8 months of 2016 was \$5,390 but the average monthly total for the last four months was \$17,419; monthly sales revenue more than tripled during the last four months of 2016.

Better Futures and the NWICDC are becoming known more widely as a source for used building materials and a small but loyal group of repeat customers now exists. Many of these customers send pictures of their renovation jobs or furniture made with reclaimed material purchased at the Better Futures warehouse.

As noted earlier, Better Futures experienced an increase in the number deconstruction jobs completed for private customers. This type of work typically generates a greater amount of high value materials (compared to LCCMR-eligible uninhabitable sites) and this work creates a steady pipeline of work for employees. This increase in private customers is due in part to the hiring of a part time marketing agent. The partners still need, however, to improve their marketing materials, including offering an easy to understand explanation for how the tax benefits from donating materials to one of the partners typically makes deconstruction less expensive than demolition.

Modest progress was made in convincing county and municipal governments to reform existing demolition policies. The partners continue to promote a model policy for increasing the reuse and recycling of materials but public officials are slow to respond. As noted throughout this report, public policy and practices must change to help make deconstruction a sustainable alternative to demolition.

The partners continued to connect with trade and community groups to promote the value and practice of deconstruction. Better Futures hosted a booth at the AIA convention in November and Better Futures staff made a presentation at the annual meeting for Association of Recycling Managers and Counties and Cities Involved in Source Reduction and Recycling in December.

In October 2016, the partners submitted comments to Assistant Commissioner Kirk Koudelka at the MPCA in an effort to inform changes in the handling of building waste and the management of landfills statewide. Below is an excerpt from that letter:

“Thank you for inviting us to submit recommendations for reducing pollutants and for reducing the amount of building material thrown away and buried in landfills throughout the State.

As summarized in our last status report to the State’s Legislative-Citizen Commission on Minnesota Resources (LCCMR), the U.S. EPA estimates that construction and demolition debris is the second largest component of our waste stream, just behind municipal solid waste. The MPCA estimates that only 20-30 percent of this waste is recycled. Just as significant, our work to reuse and not throw away building material is highlighting the substantial amount of pollutants emitted by dumping building materials in landfills.

Our environmental impact analysis for 8 projects revealed the following: 87% of all building material from the 8 projects was diverted from the landfill. We are able to consistently achieve this rate of diversion by using proven, “deconstruction” methods, an approach that entails taking apart a building in a methodical manner and preserving the maximum amount of material for reuse. Our deconstruction work generated 70% less CO2 emissions than simply recycling some of the materials; and, deconstruction generated 91% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill. Over the next few months, we plan on providing

additional data on the amount and type of toxic chemicals that leech from buried building waste into the surrounding land and groundwater.

Overall, our work is documenting that current policies and practices for processing used building materials emits a significant level of greenhouse gasses along with pollutants that seep into our land and water. As our status report indicates, a substantial portion of these “waste” materials can be recycled and, most important, reused which creates jobs, new businesses, and helps improve the quality of our State’s air, land, and water.

Our evidence is compelling and our approach (which is growing and well-established in many communities throughout the country) is a much-preferred alternative to current building waste management practices in Minnesota. But as noted in our LCCMR status report, we are encountering significant barriers as we try to develop our building deconstruction and reuse endeavor into a sustainable enterprise. Quite simply, State solid waste policies and current management practices seriously undermine efforts to establish alternatives that generate significant environmental, social, and economic benefits. For example:

- ✓ The cost of demolition is *artificially* low compared to the cost of deconstruction. The real cost of demolition is much higher than what the market is currently paying because the impact associated with GHG emissions and other toxic effects of land filling are not accounted for. In contrast, deconstruction does indeed add costs as an alternative to landfill. But in doing so, we are closer to capturing the REAL COSTS of pollution in the price.
- ✓ Public policy in Minnesota hinders the development of deconstruction into a sustainable practice. For example, counties in Minnesota must report on their recycling rates for household waste and financial incentives are tied to these rates. In contrast, counties are not required to track or report on the reuse, recycling, and diversion rates of construction and demolition waste.

In light of these barriers, and given the substantial, emerging evidence of the multiple benefits of reusing and recycling building materials, we encourage the MPCA to consider and advance these recommendations:

- 1) The State must establish a comprehensive policy for reducing significantly the amount of building materials currently buried in landfills. There are an array of model policies nationwide. We suggest that the State promote a policy that requires a demolition project to achieve a recycling rate of 70% and a reuse of material rate of at least 5%. At a minimum, these reuse and recycling rates should be expected from all State-funded projects.
- 2) The price of throwing away building materials should be increased to reflect the true cost of burying the waste. The State’s low tip fees encourage a “throw away” mentality and, perhaps more significant, leaves the additional cost of pollution and future clean up to an entity other than the owner of the material. Deconstruction and material reuse is a flourishing practice in areas where the per ton cost of dumping is \$100 or higher.
- 3) The new policy for processing used building materials should also include grants and financial incentives for reusing or recycling building materials. As noted in our report, the reuse of materials generates by far the most significant environment and economic benefits. Funding tied to recycling and especially reuse rates will begin to change practices and behaviors.
- 4) The State’s new policy should outline specific goals and the overriding goal should be a net zero emissions goal for each “demolition” or major renovation project. As our data indicates, net zero emissions from processing used building materials can only be achieved when a portion of

the material is reused. Tracking diversion rates alone will not necessarily result in a net zero emissions from a project.

- 5) This new policy, its related goals and its financial incentives should be complemented by grants to help educate local officials, contractors, and the public.
- 6) Grant funds should also be offered to support the development of deconstruction and building material reuse services statewide.

Clearly, these are ambitious proposals but they are absolutely necessary. And our interaction with public officials and citizens throughout the State underscores the need and desire to adopt a new course of action. Just as important, the current policies and practices for managing used building materials are not sustainable. There is a growing and urgent need to adopt a much more enlightened and beneficial approach; an approach that can be supported by compelling environmental, economic, and social benefits data.

Thank you for the opportunity to help inform your policy agenda. We are committed to working with you as you advance efforts to improve and protect our State's land, water and air. Please let me know how we can help you and your colleagues work toward the goal of net zero emissions from processing used building materials."

Project Status as of July 31, 2107:

The main area of success within Activity Two has been the dramatic increase in the sale of materials reclaimed from deconstructed buildings. Better Futures' sales revenue totaled \$140,325. This amount for the first six months of 2017 is more than double total sales revenue for all of 2016.

No progress was made in implementing policy reforms at the county or local levels. But Better Futures and NRRI did have several opportunities to promote the benefits of deconstruction and reuse before several important audiences. In March, Better Futures presented before a gathering of solid waste officials from the seven-county metro area. This presentation led to a call from officials in the city of Roseville who contracted with Better Futures to deconstruct a foreclosed city-owned property. In addition, officials from Ramsey County initiated conversations with Better Futures about deconstructing some county-owned properties.

Another encouraging development is the commitment of officials in St Louis County to sponsor a deconstruction pilot in that county. Seven county-owned properties have been identified as candidates for deconstruction. Work on some of these sites is expected to begin sometime in September 2017.

Better Futures and the NRRI also made a presentation on deconstruction and material reuse at the Transportation Research Board's sustainability conference. This was a good networking opportunity. Finally, Environmental Initiatives honored Better Futures with its Sustainable Business Award at its annual dinner in May. The LCCMR was noted as one of Better Futures' key partners.

Project Status as of January 31, 2018:

As mentioned earlier, the St Louis Pilot was delayed until this Spring. In addition, the partners connected with officials in Clearwater and Otter Tail counties about potential deconstruction work later this year.

The two significant accomplishments in this area over the past six months were: 1) Better Futures sales revenue for 2017 more than doubled for a total of \$266,000. 2) City council members in Minneapolis are working with Better Futures to draft a model deconstruction ordinance. The goal is to adopt this ordinance by July 1, 2018. The new code will mandate the deconstruction of all residential properties instead of demolishing the buildings. Also, Hennepin County and the State MPCA are making the diversion of building material waste a priority in their newly drafted solid waste management plans. To support these policy reform efforts, Better Futures assembled model ordinances from around the country and prepared briefing sheets to support the adoption of these policies.

Final Report Summary:

The partners made presentations before a wide array of audiences about the benefits and impact of building material reuse and repurposing. These events included annual talks at the State Fair, meeting with elected officials across the State, serving as panelists at recycling conferences and gatherings sponsored by Twin Cities metro area counties. The partners also hosted booths at home improvement and builders' conventions, at architect conventions, and in one on one meetings with more than 100 contractors and homeowners.

The partner's websites were updated to promote building material reuse and deconstruction. Better Futures' sales warehouse was updated to include promotions about the multiple benefits of building material reuse. A copy of a poster from the warehouse is included with this final report. Sales of products at this warehouse totaled more than \$500,000 over the LCCMR grant period, further demonstrating the demand for reclaimed goods and materials. All net proceeds from these sales were reinvested into the project.

Efforts to promote material reuse included a deconstruction pilot initiative in St Louis County. This initiative, funded primarily with LCCMR grant dollars created 2 months of full time work for 9 local residents. Four tax forfeited properties were deconstructed (3 in Duluth and 1 in Chisholm). This work provide exposure to the value and benefits of deconstruction. A small press conference was held at one of the sites in Duluth. Flyers to neighbors were used to promote the practice of deconstruction and social media was used to promote the sale of materials. About \$3,000 of the harvested material was sold at the job sites; the remaining material (4 truckloads) was transported back to Better Futures' warehouse. This effort also generated a handful of calls from local contractors and homeowners interested in working with the partners' work crews.

One of the most significant accomplishments in this activity area is the introduction of building material reuse policies for Hennepin County and the City of Minneapolis. As of this report date, the County is in the process of reviewing a proposal to require material reuse and recycling in all projects sponsored by the County. The County is also paying Better Futures to deconstruct any County-owned property slated for demolition.

In addition, a Minneapolis City Council committee is about to approve a building material reuse ordinance. Specifically, the new law would require all buildings built before 1950 to achieve a reuse rate of at least 5% and a recycling rate of at least 75%. The committee is expected to recommend the ordinance for approval by the full City Council some time in October.

The activity related to sponsoring six continuing education sessions was not achieved. Over the grant period, the partners did make presentations before nearly a dozen trade and professional associations

(architects, contractors, public officials, environmental protection agencies, and recycling associations) but none of the presentations qualified as formal continuing education sessions.

ACTIVITY: 3 Create and test higher value uses for reclaimed materials; develop markets for products made from reclaimed building materials

Description:

The Natural Resources Research Institute at the University of Minnesota Duluth will identify and test potential products that can be manufactured from reclaimed materials. Please see their work plan for a project description and budget.

NRRI will also train Better Futures and Northwest OIC staff on manufacturing processes, standards, specifications, and equipment needed to build products. The NRRI will also offer advice to Better Futures and Northwest OIC staff as they prepare for and begin manufacturing products. As noted below, a small portion of the budget will be used to support this area of activity.

Summary Budget Information for Activity 3:	ENRTF Budget:	\$128,671
	Amount Spent:	\$128,671
	Balance:	\$ 0

Outcome	Completion Date
1. Better Futures and the NWIOIC use reclaimed materials to create at least three new products such as end tables, conference tables, and counter tops.	June 2018

Activity Status as of December 31, 2015:

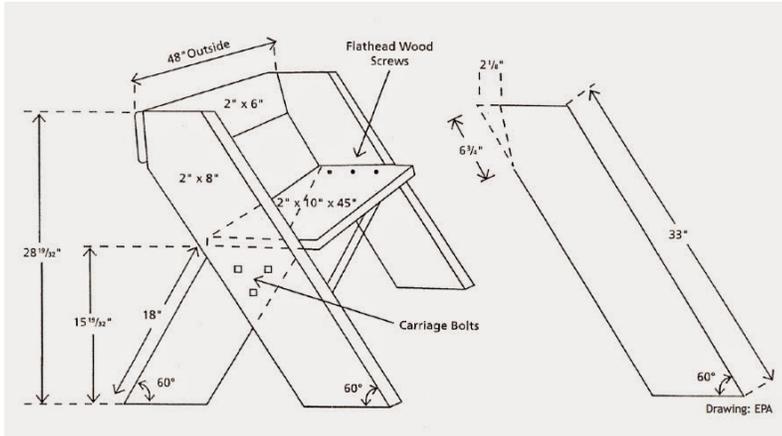
The NRRI is taking the lead on this Activity and Better Futures and NWIOIC are working closely with the agency to develop higher uses for some of the materials reclaimed during the deconstruction process. In May 2015, the NRRI produced three small tables from wood reclaimed from deconstruction projects. These prototype tables are being used to introduce potential customers to the idea of building furniture from reclaimed wood. For example, Hennepin County is assessing the cost and value of using tables made from reclaimed lumber in several renovated libraries. A business plan and financial model for developing the capacity, expertise, and demand for furniture will be developed during the first half of 2016.

In addition, the NRRI staff toured several deconstruction job sites in December and the partners in an effort to identify materials that could be reused or recycled rather than sent to the landfill. The partners decided to experiment with developing alternative uses for three materials in particular: porcelain, drywall, and insulation. The NRRI will test these materials and experiment with possible uses. The partners will also scan the country to determine if and how these materials are being reused and recycled elsewhere.

Activity Status as of July 31, 2016:

Workers for Better Futures and NWICDC completed a pilot initiative of building benches designed by Aldo Leopold. This is the first “higher use” product made from the wood harvested from LCCMR-funded deconstruction projects. The NRRI assisted with producing plans for building the benches and they constructed several prototypes to inform the training of workers and to develop building

instructions. The NRRI also provided training and advice for both NWICDC and Better Futures as their supervisors and workers built nearly a dozen benches. NRRI is also providing advice on marketing the benches.



The partners agree that this product is an ideal item to produce on a much larger scale. It's fairly simple to build and requires just three sizes of reclaimed wood. Only one type of saw is required and a minimal amount of hardware is used. Finally, the final touches such as sanding and staining are easy tasks to teach.

At present, Better Futures lacks the type and size of work space required for building and storing the benches. But over the next few months, the partners intend to develop a production schedule, including a plan to address Better Futures' production space needs. A marketing plan and quality control protocol will also be developed. The partners expect to build 100 or more benches during the upcoming winter months and have them ready for sale early next spring. The benches will be promoted through Better Futures' on-line store and Craig's List. Select garden centers may also be a potential sales outlet. Each bench will have the partner's logo branded on the back rail and a small card outlining the "transformation story" about the wood and the people who built the bench will be attached.

Activity Status as of January 31, 2017:

With design plans, prototypes and building instructions from the NRRI, Better Futures and the NWICDC assigned work crews to begin producing the "Aldo Leopold" benches mentioned in the past update. This project offers additional training for some workers and provides a higher value use for the much of the lumber reclaimed from job sites. An interior designer is serving as a volunteer and is offering advice on the finer points related to different types of finishes and stains and sales strategies. Another benefit of this emerging line of work is that is expected to create year-round work for at least one crew.

The bench project has ignited the workers' imaginations. They along with NRRI staff are developing more styles of benches, stools and tables.

Project Status as of July 31, 2017:

Bench building activities were limited during the first half of this year since most workers were needed to handle the high volume of deconstruction work.

Project Status as of January 31, 2018:

The NRRI will provide an update on activities in this area in their six-month report. The partners overall success and efforts in the is activity area will be summarized in the final report.

Final Report Summary:

The partners work in this area confirmed the value and potential of repurposing reclaimed material (especially lumber) into higher value goods. Several challenges were encountered in an attempt to develop repurposing into a consistent and sustainable enterprise.

First, proper space and appropriate tools are needed to build products, both the NWICDC and BFM lacked access to these assets. Second, workers must invest time in learning the finer skills related to using specialized tools and building quality products. The turnover in the workforce and the lack of steady work in this area prevented the partners from taking time to invest in this amount of training. Third, a steady level of year round work in this area must be available to support the investment of time and money into this line of business.

Nevertheless, the experience gained during this grant period established repurposing as a line business that should be developed. As the partner’s current enterprises mature and become healthier financially, building new products from reclaimed materials will likely become the next source of income and employment opportunities.

ACTIVITY 4: Calculate the environmental impact of this project and deconstruction work.

Description:

The Natural Resources Research Institute at the University of Minnesota Duluth will develop a formula for calculating the environmental impact of this project. Please see their work plan for a project description and budget.

In addition, Better Futures will help gather and then analyze the environmental impact data being produced by NRRI. Better Futures’ Project Manager will also package the environmental data for the education and outreach efforts described in Activity Two.

Summary Budget Information for Activity 4:

ENRTF Budget:	\$13,905
Amount Spent:	\$13,905
Balance:	\$ 0

Outcome	Completion Date
1. Better Futures and NWIOIC use impact data to inform efforts to promote the practice of deconstruction and to promote the reuse of reclaimed materials.	June 2018

Activity Status as of December 31, 2015:

Please see NRRI’s status report for a complete summary of the partner’s work in Activity 4. A major challenge for Better Futures is finding haulers, landfill operators, and building waste recyclers who understand and value the alternative practice we are trying to develop. The current systems do not routinely generate the data needed to complete quality impact statements, such as the composition of dumpster loads and weights for each type of material processed. These issues are solvable but it will take time to educate and help landfills and recyclers adopt processes that meet the partner’s data needs.

Activity Status as of July 31, 2016:

Another critical task related to education and marketing is documenting the environmental, social and economic benefits of building deconstruction. The environmental impact data generated by the partners to date is unprecedented. As far as the partners know, this project is the only deconstruction initiative in the nation attempting to provide an environmental and social impact statement for every job completed. This emerging data will help inform improvements in the management and completion of a job and support efforts to implement new policies and practices. The partners will continue to refine their impact model by consulting with County and State environmental staff and with experts nationwide. In addition, this impact data must be analyzed much more thoroughly to identify correlations and to refine the impact model.

There are several key findings. First, the State does not require counties or municipalities to track the amount of construction and demolition debris generated in their localities. Nor are there any financial incentives to divert this waste from landfills. State policy places emphasis on and directs financial incentives toward the recycling of household waste. The partners believe this policy and practice must change. At present, Minnesotans can throw away buildings (even though more than 85% of the buildings can be reused or recycled) with no consequences or incentive to change this practice.

Second, although most focus on the amount of Building material diverted from landfills, the key measurement is the amount of that waste reused and recycled. As noted in the path-breaking data produced under this grant, reuse of building materials generates a significant environmental benefit, a much greater benefit than simply recycling a portion of the material. The partners' data points to the need to begin tracking the portion of material reused and recycled from a project, not just the amount of material diverted.

Table One of the Attachment accompanying this Status Report presents environmental impact data for 8 of the 13 buildings deconstructed with LCCMR grant funds. The key results include:

- ✓ When compared to demolition, the deconstruction of these 8 buildings avoided the emissions of nearly 2,100 metric tons of CO₂, the largest component of greenhouse gasses.
- ✓ The average diversion rate was 87%.
- ✓ Three of the 8 projects resulted in no net emission of CO₂! This occurs when the reuse of materials rate typically equals or exceeds 5%. The impact from this project is revealing that the reuse of materials has a significant, positive benefit for the environment, much more beneficial than recycling.
- ✓ Overall, deconstruction generates 91% less CO₂ emissions than demolition, and 70% less CO₂ emissions than recycling some of the materials off-site.

Activity Status as of January 31, 2017:

Attachment A, accompanying this Status Report, presents environmental impact data for 3 of the 4 buildings deconstructed by Better Futures with LCCMR grant funds during this reporting period. This table also presents a summary of the environmental impact for 11 of the 13 LCCMR eligible projects deconstructed by Better Futures since the start of the LACCMR grant in July 2015. The key results include:

- ✓ When compared to demolition, the deconstruction 11 buildings to date avoided the emissions of 3,435 metric tons of CO₂, the largest component of greenhouse gasses.
- ✓ The average diversion rate was 86%.
- ✓ The average reuse of material rate for the 11 projects is nearly 5%. A 5% reuse rate combined with a recycling rate of 70% or higher typically results in "net zero" emissions.

- ✓ Overall, the growing amount of impact data from this project shows that deconstruction generates 81% less CO2 emissions than simply recycling some of the materials; and, deconstruction generates 150% less CO2 emissions than the current, predominate practice of throwing away the building and burying it in a landfill.

Project Status as of July 31, 2017:

Please review Attachment A which summarizes the environmental impact of 12 LCCMR-eligible projects deconstructed by Better Futures since the inception of this project.

Project Status as of January 31, 2018:

Please review Attachment A which summarizes the environmental impact of 15 LCCMR-eligible projects fully deconstructed by Better Futures since the inception of this project along with the 10 projects deconstructed by the NWICDC. In addition, Attachment B lists the address and location of every LCCMR-eligible project deconstructed by Better Futures and the NWICDC.

Final Report Summary:

By the end of the grant period, Better Futures was typically achieving net zero emissions of CO2 from each deconstruction project. The environmental benefits generated by deconstruction compared to traditional demolition are significant. The common practice of dumping a building into a landfill emits, on average, 248 metric tons of CO2 for each property demolished. In contrast, Better Futures' deconstruction work on LCCMR-funded projects generated on average just 51 metric tons of CO2.

Overall, the work under this LCCMR project averted the emission of 5,288 metric tons of CO2 (against an original goal of 900 metric tons). This decrease in CO2 emissions is equivalent to taking 1,114 cars off the road for one year and the social cost of this carbon offset is \$190,548.

V. DISSEMINATION:

Description:

As noted in the work plan, the partners intend to prepare marketing materials that promote the practice and multiple benefits of building deconstruction. These materials will focus on informing homeowners, architects, contractors, tribal governments, and government agencies (with a focus on North Central Minnesota and the Twin Cities). The partners also intend to identify key gatherings such as trade shows, industry conventions, and the State Fair to promote the practice of deconstruction and the reuse of used materials.

Better Futures will also provide regular updates about the purpose and status of this project through its Face book page and website (www.betterfuturesminnesota.com). Better Futures' newsletter is another outlet for providing updates and promoting deconstruction. This newsletter is distributed via e mail every other month. Finally, the partners intend to use an on-line store to promote the reuse of materials and products made from reclaimed materials. This store will provide an additional outlet for promoting the practice of deconstruction and the reuse of used building materials.

Status as of December 31, 2015:

As noted under Activity 2, the partners worked to promote the concept and practice of deconstruction through multiple venues. A presentation was developed and will be improved as additional cost/multiple benefits data is gathered from an increasing number of deconstruction projects. Updated

education and marketing handouts targeted to four key sectors--government, contractors, architects and homeowners—must still be drafted. These four new handouts will replace an existing handout.

The partners will continue to identify and attend trade shows and home improvement fairs. Better Futures joined the Builder's Association of the Twin Cities and the MN chapter of the National Remodelers Association. These memberships are intended to connect the partners with potential customers for both deconstruction services and used building materials. The partners' presence on social media is established and the use of these various outlets should increase significantly once the Better futures sales manager is settled in the new warehouse. And the launch of the online store in the spring of 2016 is expected to increase the demand for reused materials.

Status as of July 31, 2016:

The partners are routinely using various outlets to promote their work and the information being generated under this project. Newsletters and Blog posts are regular venues for sharing project updates and highlighting the environmental impact data. Better Futures' on-line store was launched and is serving as an outlet for promoting and selling reclaimed materials. Policy proposals being developed with both the City of Minneapolis and Hennepin County is helping to promote (and perhaps even mandate) deconstruction as an alternative to demolition.

Status as of January 31, 2017:

As noted earlier, social media and partner websites are routinely used to promote the practice of deconstruction and the reuse of reclaimed building materials. In the fall of 2016, Better Futures, its consultant Ecotone, and a team of graphic design students produced a compelling poster depicting the environmental benefits of taking a part and reusing or recycling pieces of a house. The poster is entitled "Why Throw Away A House" and a copy of the graphic is presented in Attachment B.

Project Status as of July 31, 2017:

Better Futures and its partners continued to attend conferences and home improvements shows in an effort to promote the practice and benefits of deconstruction. Better Futures also used social media to promote its award from Environmental Initiatives and related press coverage.

Project Status as of January 31, 2018:

Better Futures and its partners continued to attend conferences and home improvements shows. in an effort to promote the practice and benefits of deconstruction. Better Futures also hosted a design contest using reclaimed materials. Winners submitted their designs and work products; the most creative designers were awarded gift certificates for use at the Better Futures warehouse.

Final Report Summary:

Throughout the grant period, the partners were consistently engaged in promoting the practice of deconstruction and material reuse. Over time, the visibility of the partner's workers taking a part a building generated the most publicity and heightened the level of interest among the public. The actual work helped to highlight the futility and wastefulness of demolition and the work showcased a practical way to significantly reduce trips to a landfill.

Homeowners also emerged as the prime drivers for deconstruction of privately owned buildings. Accordingly, the partner's revised it's messages and materials to address a homeowners demands and

concerns about demolition. An added advantage is that homeowners secure a tax deduction for the materials donated to the partners. This tax benefit helps with making the case for deconstruction.

VI. Project Budget SUMMARY:

A. ENRTF Budget Overview:

Budget Category	\$ Amount	Overview Explanation
Personnel:	\$ 761,675	Better Futures Project Manager: NWIOIC Deconstruction Director: NWIOIC Work Crew: BFM Work Crew: BFM Crew Chief:
Professional/Technical/Service Contracts:	\$30,000	Tim Roman of Ecotone Partners to assist with developing tools for estimating time and cost to complete a project and the projected value of materials. Roman will help create a "spreadsheet" that lists all the types of materials targeted for harvest in a building and be programmed to calculate labor hours and projected product values once the type and amount of materials are entered into this tool. Roman will also gather data and build the database needed to support the costs and values used in this spreadsheet.
Equipment/Tools/Supplies:	\$ 18,245	
Travel Expenses in MN:	\$ 11,203	
Other:	\$15,000	Estimated cost of safety training and training related to proper use of tools;
TOTAL ENRTF BUDGET:	\$836,123	

Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: 18

Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: .25

B. Other Funds:

Source of Funds	\$ Amount Proposed	\$ Amount Spent	Use of Other Funds
Non-state			
To be determined	\$65,000	\$ 0	Box truck, pickup truck, trailer
To be determined	\$20,000	\$ 0	Out of state travel
Earned Revenue and Foundations	\$210,000	\$500,000	Administrative overhead and operating support for the LCCMR project
Hennepin County Environment and Energy	\$0	\$435,000	Marketing support and subsidies for deconstruction projects in the County

TOTAL OTHER FUNDS:	\$295,000	\$ 935,000	
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VII. PROJECT STRATEGY:

A. Project Partners:

This endeavor is a partnership between Better Futures Minnesota (Minneapolis) and the Northwest Indian OIC (Bemidji). Better Futures will serve as the project manager. Both agencies are committed to supporting at risk adults who are committed to changing their lives and lifestyles. Job creation and employment are core activities for both. For the past four years, Better Futures has been working with counties, contractors, and the MPCA to promote the practice of building deconstruction and develop markets and alternative uses for construction waste diverted from landfills. Their experience informs the proposal outlined in this work plan. Better Futures is partnering with the Northwest OIC to help build their capacity to provide this service in North Central Minnesota. The University of Minnesota Duluth's Natural Resources Research Institute (NRRI) recently began working with Better Futures to identify, prototype and assess uses for reclaimed materials. This grant will enable NRRI to increase their level of research and assistance for both Better Futures and the Northwest Indian OIC.

The following is a summary of each partner's role and responsibilities during this project. To advance this plan and achieve the outcomes outlined in the plan, the partners intend to meet monthly via conference call and hold face to face meetings each quarter.

Better Futures Minnesota:

1. Serve as Project Manager with overall responsibility for:
 - A. Preparing LCCMR work plan and budget and submitting status and final reports to the LCCMR
 - B. Organizing and shepherding the partnership, including managing contracts, establishing and monitoring work plans with each partner, and hosting monthly video meetings and quarterly face-to-face meetings with partners.
2. Take the lead on testing and refining efficient techniques for taking apart buildings
3. Develop, disseminate and update as needed operating manuals and protocols to maximize the amount of material recovered from deconstruction properties and diverted from landfills;
4. Develop, disseminate, and update as needed a training regimen related to safety, product identification, and harvesting techniques to maximize the yield, value and quality of materials from deconstruction properties
5. Hire, train, and supervise Better Futures crew chiefs and workers
6. Assist NRRI with assessing the quality, quantity, and value of materials harvested during the deconstruction process
7. Assist NRRI with developing strategies that maximize quality and quantity of materials harvested from buildings in various states of condition
8. With advice and assistance from NRRI and the Northwest Indian OIC, develop marketing handouts and implement a statewide promotion strategy targeting homeowners, architects, contractors and government agencies
9. With advice and assistance from NRRI and the Northwest Indian OIC, develop expertise for valuing and selling materials using on-line stores and auctions
10. Take the lead on recommending strategies for sustaining the practice of deconstruction statewide
11. With the NRRI and the Northwest Indian OIC, promote deconstruction services and materials, and the environmental benefits of this approach through relations with trade groups, trade shows, social media, and web pages

12. Assist NRRI with studying model deconstruction/diversion policies from across the country; take the lead on drafting model policy and practice options for Tribal, local, county and State government agencies to consider
13. Work with Tribal, State, county, and local agencies to implement public policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition
14. Deconstruct up to 20 properties in various states of condition
15. Work with the NRRI to develop and test products that can be manufactured from reclaimed materials
16. Prepare an operating and financial plan to launch the manufacture of at least three products from deconstruction reclaimed materials. This plan may result in products being made by Better Futures or NW OIC independently or in cooperation with each other.

Natural Resources Research Institute at the University of Minnesota Duluth:

1. Assess the quality, quantity, type, and value of materials harvested during the deconstruction process
2. Develop strategies that maximize the quality and quantity of materials harvested from buildings that are in various states of condition and assess the value, quality, and quantity of materials harvested
3. Identify or develop a tool for calculating the yield and environmental impact of materials harvested from buildings, including reduced greenhouse gas emissions, energy savings, reduced landfill use, and the reuse of natural resources
4. Study and benchmark this venture against similar endeavors across the nation (i.e. their techniques, products, and the policies that support these techniques and products) with an emphasis on integrating the values and traditions of the Native American and African American cultures
5. Build prototypes and test products that can be manufactured from reclaimed materials
6. Review and test prototypes with potential customers; identify viable products
7. Develop manufacturing plan, identify equipment, and provide technical support, product specifications and quality assurance for each viable product in cooperation with Better Futures MN and NW Indian OIC

Northwest Indian OIC

1. Help test and inform the development of efficient techniques for taking apart buildings
2. Contribute to the drafting and updates of operating manuals and protocols related to material recovery and waste diversion;
3. Assist with drafting and training regimens related to safety, product identification, and harvesting techniques
4. Hire, train, and supervise NW OIC crew chief and workers
5. Assist NRRI with assessing the quality, quantity, and value of materials harvested during the deconstruction process
6. Assist NRRI with developing techniques that maximize quality and quantity of materials harvested from buildings in various states of condition
7. Assist with drafting a business and financial plan for sustaining this enterprise when start up funding, including the LCCMR funding ends
8. Assist NRRI with studying model deconstruction/diversion policies from across the country; take the lead on drafting model policy and practice options for Tribal, local, county and State government agencies to consider

9. Work with Tribal, State, county, and local agencies to implement public policies and practices that promote deconstruction as an environmentally beneficial alternative to demolition
10. Deconstruct up to 10 properties in various states of condition
11. Work with the Natural Resources Research Institute to develop and test products that can be manufactured from reclaimed materials
12. Assist Better Futures with preparing an operating and financial plan to launch the manufacture of at least three products from deconstruction reclaimed materials. This plan may result in products being made by Better Futures or NW OIC independently or in cooperation with each other.

B. Project Impact and Long-term Strategy:

By adopting deconstruction on a broad-scale, Minnesota can achieve significant reductions in greenhouse gas emissions, reduce the amount of waste buried in landfills, and increase the amount of materials reused. There are, however, a set of challenges that hinder the development of deconstruction into a standard practice statewide. These include:

1. At present, there is no economic model to support this line of work. The cost of dumping in Minnesota is much cheaper than recycling and reuse and there are no established marketplaces for selling reclaimed materials. A new economic model must be developed and changes in public policy and practice are the main drivers for helping to foster this new model.
2. Local and State government is presently focused on the lowest bid to remove buildings and there is no current policy or incentives to take into account the additional jobs and environmental benefits that would be achieved from deconstruction.
3. Launching a new line of business and reaching a level of stability takes time (at least five years) and sufficient startup capital.
4. The State is an under-developed market for deconstruction, meaning that no one is offering this service, there is no prominent marketplace for selling used or reclaimed materials, and current public policy undermines attempts to develop the market more fully. This is both a challenge and an opportunity.
5. At present, there is only one appraiser who is willing to provide private owners with an appraisal for the goods donated to Better Futures. And this appraiser has very limited experience with the method for appraising harvested materials and complying with IRS policies.

This project is focused on addressing these challenges. The four activities being funded over the two year grant period: (1) Developing efficient techniques for deconstructing buildings safely; (2) Marketing deconstruction and establishing a marketplace for selling reclaimed materials; (3) Creating, manufacturing, and marketing products made from reclaimed materials; (4) Calculating the environmental impact of this project and deconstruction work; are formulated to demonstrate the economic, social and economic value of deconstruction. In addition, the partner’s experience gained and data generated will help inform the development of policies and practices to support deconstruction as an alternative to demolition. These new policies and practices will also help foster a marketplace for the reuse and reclamation of used building reused materials. And the experience and data will help inform strategies to support deconstruction as a financially viable practice statewide. Long term, deconstruction can become a financially sustainable line of business once the level of work generates adequate revenue from dismantling buildings, selling used materials, and selling products manufactured from reclaimed materials.

C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	\$ Amount
---------------------------------	-------------------	-----------

MN Pollution Control Agency	11/15/12-6/30/14	\$18,833
MN Department of Employment and Economic Development	7/1/14-6/30/15	\$237,500

IX. VISUAL COMPONENT or MAP(S):

Please see attached poster, "Why Throwaway a House?"

X. RESEARCH ADDENDUM:

XI. REPORTING REQUIREMENTS:

Periodic work plan status update reports will be submitted no later than: December 31, 2015; July 31, 2016; January 31, 2017; July 31, 2017, and January 31, 2018. A final report and associated products will be submitted no later than August 31, 2018.

Environment and Natural Resources Trust Fund															
															
Project Title: Building Deconstruction to Reduce Greenhouse Gas Emissions and Solid Waste															
Legal Citation: M. L. 2015, Chp 76, Sec. 2, Subd. 07c and M.L. 2017, Chapter 96, Section 2, Subd. 07c															
Project Manager: Steve Thomas															
Organization: The NetWork for Better Futures															
M.L. 2015 ENRTF Appropriation: \$845,000															
Project Length and Completion Date: 3 Years, June 30, 2018															
Date of Final Report 08-10-2018															
ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget	Amount Spent	Activity 1 Balance	Activity 2 Budget	Amount Spent	Activity 2 Balance	Activity 3 Budget	Amount Spent	Activity 3 Balance	Activity 4 Budget	Amount Spent	Activity 4 Balance	CURRENT BUDGET	Amount Spent	TOTAL BALANCE
Personnel (Wages and Benefits)	\$484,354	\$484,267	\$87	\$134,986	\$134,986	\$0	\$128,517	\$128,517	\$0	\$13,905	\$13,905	\$0	\$761,762	\$761,675	\$87
Project Manager: (77% wages, 23% benefits); .6 FTE each year for 2.50 years at \$182,023															
BFM Work Crew: \$188,950 (62% wages, 38% benefits); 2.7 FTE each year for 2 years															
BFM Crew Chief: \$115,661 (69% wages, 31% benefits); 1 FTE each year for 2 years															
BFM Business and Marketing Coordinator \$19,425 (50% Wages, 23% benefits) 1 FTE															
BFM Business and Deconstruction Manager \$48,300 (60% Wages, 38% benefits) 1 FTE															
NWIOIC Deconstruction Director: \$162,021 (71% wages, 29% benefits); 1 FTE each year for 2 years															
NWIOIC Sales of Materials Coordinator \$43,056 (62% Wages, 38% benefits) 1 FTE															
NWIOIC Work Crew: \$120,703 \$163,579 (62% wages, 38% benefits); 2.3 FTE each year for 2 years															
Professional/Technical/Service Contracts	\$15,000	\$15,000	\$0	\$15,000	\$15,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$30,000	\$30,000	\$0
Tim Roman, Ecotone Analytics: Consultant to develop template and formula for cost estimating and assist with identifying and valuing materials. The consultant(s) will help create a "spreadsheet" that lists all the types of materials targeted for harvest in a building and be programmed to calculate labor hours and projected product values once the type and amount of materials are entered into this tool. The consultant(s) will also gather data and build the database needed to support the costs and values used in this spreadsheet.															
Equipment/Tools/Supplies	\$20,794	\$18,245	\$2,549	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$20,794	\$18,245	\$2,549
Rental of containers to collect and temporarily store recyclable and reusable materials at up to 6 sites; 3 containers @ \$400 per container for a total of \$1200 per job (\$7,200) Rental of a JLG Lift for up to 3 days to remove high pitched roof on building in Chisholm (\$1500) Purchase of plastic safety fencing for perimeter of job sites and purchase of replacement blades for saws, and safety equipment for workers (\$400) Rental of chemi jons for six jobs x \$150 a site (as required by code)=(\$900). Total \$10,000															
Hand and power tools and personnel safety equipment: tool belts for workers, starter supply of power and hand tools for NW OIC workers, replacement small tools for both agencies; hard hats, vests, eye protection, gloves, and steel inserts for boots. Specific costs and exact items to be determined.															
General woodworking supplies, saw blades, adhesives, wood finishes, cutting bits, stains, hardware,															
Travel expenses in Minnesota	\$16,791	\$11,203	\$6,241	\$499	\$499	\$0	\$154	\$154	\$0	\$0	\$0	\$0	\$17,444	\$11,203	\$6,241
Up to 40 days of actual costs for food and lodging for one crew chief and one on-site supervisor (DNR grant guidelines regarding reimbursement for these costs will be followed) = \$8,800. Reimbursement for mileage related to St Louis County Pilot: crew chief and Pilot supervisor travel back and forth to home on weekends, 2 people x 7 weekends x 250 miles roundtrip = \$3,500 + 6 trips to Duluth by BFM staff, 250 x 6 = \$1,500. Total costs \$13,800															
Travel to Duluth, Minneapolis and Bemidji areas for project activities associated with deconstruction of buildings. Mileage: \$4,492 (10 trips to MSP, 5 to Duluth, 5 to Bemidji); Lodging: \$1,860 (30 nights); and Meals: \$1,440 (30 days)															
Other	\$15,000	\$15,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$15,000	\$15,000	\$0
Estimated cost of safety training and training related to proper use of tools; exact cost and provider(s) of training to be determined															
Shipping of samples and prototypes															
Laboratory testing of energy content of wood samples															
Grinding of wood materials that are not usable in sold form by a commercial wood grinding company															
COLUMN TOTAL	\$551,939	\$543,062	\$8,877	\$150,485	\$150,485	\$0	\$128,671	\$128,671	\$0	\$13,905	\$13,905	\$0	\$845,000	\$836,123	\$8,877



A GUIDE TO DECONSTRUCTION

January 2003

Prepared by:

Bradley Guy, Associate Director
University of Florida Center for Construction and Environment
M. E. Rinker, Sr., School of Building Construction
College of Design, Construction and Planning
101 FAC
PO Box 115703
Gainesville, FL 32611-5703
minou@grove.ufl.edu

And

Eleanor M. Gibeau, Environmental Specialist
Resource Management Group, Inc.
1143 Central Avenue
Sarasota, FL 34236
ellie@rmg.us



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The information in this deconstruction guide is superseded by all Local, State and Federal regulations related to construction and demolition activities and the creation, handling, transport and disposal of construction and demolition salvage and debris, including hazardous materials.

Some Facts

- US EPA has estimated that U.S. companies generate 136 million tons of building-related construction and demolition (C&D) waste per year.
- 92% of building-related C&D waste is from renovation and demolition.
- C&D waste is approximately 30% of all solid waste produced in this country excluding road and bridge debris.
- US EPA has estimated that only 20-30% of C&D waste is presently recycled.
- Excluding food and fuel, construction activities consume 60% of the total materials used in the U.S. economy.
- About 245,000 residential structures and 44,000 commercial structures are demolished each year in the US.
- Many older buildings contain asbestos and lead-based paint both hazardous to human health in renovation and demolition processes.
- Heavily leaded paint was used in about 1/3 of homes constructed before 1940, about 1/2 of homes constructed between 1940 and 1960, and then to a lesser extent until it was limited to 0.06% in any product in 1978.
- Landfills and incinerators are increasingly more expensive and problematic to open, operate and close.
- In order to sustain human society into the next century, resource efficiency will have to increase by a factor of 10.

Log on to www.deconstructioninstitute.com for an interactive benefits calculator with more facts.



Dumpster full of C&D waste

Introduction

This deconstruction guide will work best if read through first to get an overview and then it can be used as a reference guide or series of checklists during a deconstruction project.

■ Safety and administrative tips are highlighted with a wide bar in the left margin.

Purpose of this deconstruction guide

The purpose of this deconstruction guide is to provide guidance to deconstruction managers, supervisors and workers who are planning or who are already conducting deconstructions. It is also appropriate for anyone who resells or redistributes salvaged materials from buildings. This guide is designed to be used in conjunction with the website which includes a Feasibility Tool, Benefits Calculator, Links for additional information and Case Studies. Log onto: www.deconstructioninstitute.com

What is deconstruction?

Deconstruction is a process of building disassembly in order to recover the maximum amount of materials for their highest and best re-use. Re-use is the preferred outcome because it requires less energy, raw materials, and pollution than recycling does in order to continue the life of the material. As a consequence of deconstruction, there are also many opportunities for recycling other materials along the way.

Why do we want to deconstruct?

Deconstruction combines the recovery of both quality and quantity of reusable and recyclable materials. The re-use of materials can serve a broad set of goals including the provision of low-cost building materials to a community, and the avoidance of demolition debris going to landfills.

The benefits of reuse and recycling building materials include:

- Reduces the overall costs of building removals.
- Provides lower cost building materials to the community.
- Extends the life of landfills.
- Protects the natural environment by reducing the need for the extraction of new resources.
- Job creation and economic development.

Goals of Deconstruction

- Safety: All construction and environmental health and safety regulations and processes are followed and no injuries result during the process.
- Materials: The recovery of the maximum amount of reusable materials in a cost-effective manner.
- Site: Remove the building from the site.

Deconstruction Overview

Below is an overview for preparing and carrying-out a deconstruction project. This checklist provides a quick overview of the basic steps. This is a general list only. Please refer to each section for more details.

Safety First

You will see the word **safety** throughout this deconstruction guide. Important safety points are noted with an orange bar.



Before considering a deconstruction program, the person who will manage the program must create a Deconstruction Safety Plan. For each new project, a Project Safety Plan will be created to handle any additional requirements to maintain safety at that specific project site. Elements of the Safety Plan will include worker orientation, hazard identification and training, guidelines for the use of tools, respiratory protection, fall protection, etc. The Safety Plan will contain procedures to handle emergencies, the proper OSHA forms, a job-site daily log, Personal Protective Equipment (PPE) use, and procedures for correcting unsafe behavior.

The Safety Plan is an accident prevention plan. Safety is a daily activity, and should be incorporated through DAILY safety talks at the beginning of the workday.

Survey

The first step in a potential deconstruction is a site visit to examine the building. This consists of visually surveying the building (inside and out) to estimate the basic material types and the overall condition of the structure. The next step is a building materials estimate that is comprised of inventorying the building material types and quantities, by number of items and by measuring the building.

It is also helpful to note basic conditions such as fire damage, water damage, rot, obvious leaks, and possible biological hazards such as bird or rat droppings.

Environmental Health and Compliance

Environmental surveys for lead and asbestos must be completed for any building built before 1978. The US EPA, OSHA and HUD all have regulations for dealing with asbestos containing materials (ACM) and lead-based paint materials (LBP). Although the EPA NESHAPS regulations exempt demolitions from the removal of non-friable ACM, deconstruction and salvage necessitate the removal of ALL asbestos before work begins. The deconstruction costs and processes will be heavily influenced by the presence of ACM and LBP materials. (Refer to www.epa.gov or www.osha.gov for detailed information on regulations or contact your local agency representative)

Workers should receive asbestos awareness training in order to be able to recognize “suspect” ACM both before and during the deconstruction. The presence of LBP will require worker protection and care in the handling of these materials.

Asbestos Abatement

Follow the law! All asbestos containing materials (ACM) must be removed before work begins. Be aware of all health and safety regulations for asbestos handling and disposal and handling of lead-based materials if they are in the building. Be sure that the abatement contractor makes proper notifications and permit applications to the state environmental protection department and that the abatement receives a proper clearance certifying that the building is safe to work in before starting the deconstruction. It is important to coordinate with the abatement contractor if their activities might damage salvageable materials. Plan for the time required for notification and abatement within the overall project schedule. (Refer to www.epa.gov/region4/air/asbestos for local regulations and contacts)

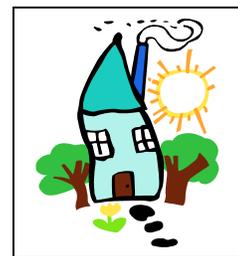
Contracts and Specifications

Estimating costs and finalizing a contract are the final pre-planning steps before agreeing to the deconstruction. There are many considerations in figuring out the project costs - starting with who is responsible for which costs. For example, if the Owner pays directly for necessary lead and asbestos surveys and asbestos abatement, then this does not need to be figured into the deconstruction costs. If the deconstruction is done by a non-profit, and the recovered materials are going to be a tax-deductible donation by the building Owner, this is also a major determining factor in how to price the deconstruction.

The contract also determines the scope of work for the deconstructor. It should be determined who is responsible for the complete removal of all building-related debris such as foundations, septic tanks, site cleaning, etc. as well as who will get any recovered materials. The costs of the deconstruction itself will be determined by the answers to these questions.

Historic Preservation

If a building is in an older part of the town or looks older than 50 years it may have historic preservation oversight by the local municipality. After determining the address, the municipal planning department or historic preservation organization should be contacted to research any historic building or district designations and the local demolition or deconstruction permits processes associated with historic buildings.



Permitting and Utilities

Disconnection of all utilities must take place before any work can begin. This includes - electricity, natural gas, water, wastewater, telephone and cable. Check with local utilities to determine the requirements and to have the work completed. Often the completion of the disconnection of the utilities is included in the demolition permit approval process. If activities such as on-site sales of materials are planned, there may be a required permit to carry out this activity as well.

Engineering Survey

According to OSHA, a demolition must have a building engineering survey and dismantling plan completed before work starts. The engineering survey and plan is completed and signed off on by a competent person who will oversee the deconstruction itself. This plan indicates known hazards at the time of the inspection, the structural make-up of the building and the general schedule, tasks, techniques and tools to be used to conduct the deconstruction.

The most critical aspect of the engineering plan is the identification of anything that is part of the building's structure and how these structural elements will be removed so as to not cause any unplanned collapses. The survey and plan are updated as the project progresses.

Organizational Plan

The organizational plan is the plan for dealing with all the management and worker issues and the specifics of how the deconstruction will take place. Taking the time to plan ahead can prevent many hardships later on. This plan is divided into several components that are described in the detailed section. Specific topics include Schedule, Labor and Responsibilities, Tools and Equipment, Sub-Contractors, Training, and Safety.

Site Plan

The Site Plan will determine the locations of everything that will happen on the site. The Site Plan can begin when the Building Survey is completed. The Site Plan has to work within the physical constraints of the project site and should be sensitive to neighboring properties and roads. The location of the site in the community will determine a lot about the site plan as well. For example, a highly visible site can facilitate on-site sales but increases opportunities for pilferage. It is not a bad idea to sketch out the site ahead of time and label it in order to communicate the site plan to others involved in the project.

Site Security

Planning for the site is the time to consider Site Security. Site Security includes preventing the theft of equipment and tools, as well as the safety of anyone trespassing onto the site. A partially dismantled house can be a temptation to vandals. Before any deconstruction begins, the decision about whether salvaged materials will remain

overnight will determine the needs for fencing, and lockable containers for storage or the time that it will take each day to remove materials from the site. Signage and warning tape should be used as due diligence to protect the public from the hazards of a deconstruction site.



Posting Signs



Warning tape for hazardous area

Materials Management Plan

Recovered materials have three places to go: Reuse, Recycle or Disposal. The steps in the detailed section describe ways to efficiently manage the materials, allocation of persons responsible for managing the materials, and the methods for planning and communicating efficient materials “flow” on the site. The materials management is the key to a successful and safe project. Remember that deconstruction is creating materials for reuse in the most cost-effective manner. Removing materials without damaging them and keeping them in good condition when handling them will insure that your effort is not wasted.

Always ask before any deconstruction: how will materials be distributed for reuse?

Plan ahead so that materials are not handled any more than three times !!

- First time: take it off the building.
- Second time: de-nail, trim and clean at the same time, and/or put it on the trailer, or stack on the site sale for reuse.
- Third time: take it off the transport for reuse or for storing at the reuse store. This type of efficiency will happen only by planning ahead.



Removal



De-nailing



Transport for reuse

Deconstruction Process

Once all of the planning has been completed, the actual deconstruction can begin. Each deconstruction project is different. For resources, case studies, links and online tools to help in the deconstruction process, log onto www.deconstructioninstitute.com.

Pete Hendrick's Seven Samurai Principles of Deconstruction

1. **Accumulation technique** - As you take down the building you will get different types of materials. Store materials according to dimension and from each project or part of the same project, keep adding that type of material until you have a critical mass large enough to use or sell as a large unit, i.e. pallet, forklift, square of roofing, room's worth. A critical mass is equivalent to what is found in a retail store, 1,000 BF for example.

2. **Personality phenomenon** - Apply your labor to the job that suits them. There are two parts; people who have to be pulling stuff off of the building are Type A. Those who can do the more mundane task like de-nailing are Type B. Third type carries the materials, cleans up, always moving from task to task and that is Type C.

3. **Excitement code** - Clean up as you go. Don't become so involved in doing the whole roof for example that you end up with large backlog of dangerous, and dirty and in the way stuff. Do not allow materials to be piled up between the Type A and the Type B people/ tasks.

4. **Monday morning conceptual and organizational lecture** - Periodically stop and talk about the next phase of the deconstruction; why it's next, so everybody understands not to go off on their own. How the crews are organized for each phase of the materials is very important and should be communicated so that everyone understands.

5. **Fatigue factor** - There are certain things you do not do when you are tired: Such as working on a roof or a ladder. Pace the hard stuff by switching off between jobs. For instance if you have three Type A's, instead of them all doing the hard tasks together, switch them around so that they can relieve each other over time and one is always fresher. Be aware of the heat factor get out of the sun whenever possible, put the de-nailing station in the shade or on the porch if you have one.

6. **Daily briefing of theories** - Every morning check out everyone for general health, sore body parts, and coordinate what is coming off the building and how much space is left for that phase. Decide the materials flow, when and where de-nailing stations are needed. Arrange how the crew is arranged between areas of the buildings. Everybody needs to know what everybody else is doing for that day. If one person or group gets caught up, they will know how to go to the next phase or help somebody else.

7. **Doing the right one** - Walk around and get a general view of the building you are considering deconstructing to determine age, species of wood and types. Look at the whole building. Look at the practicality of taking the building apart. Figure out the number of people and how long it will take. If two houses are the same size and both made of pine for instance, look at the amount of time they have been exposed, the older the house is, the better it is, it will have higher quality materials so if you get less, it will be worth more of your time if considering two similar buildings in size and type of construction.

Section 1: Safety

When dismantling a building element, it is helpful to know how it was put together and what tools were used. This means that in general the deconstruction will follow the rule of “last on - first off” (LOFO) sometimes including the additions to the building.



Remember - It rains in Florida! The roof should be left in place as long as possible during the process, and all salvageable interior finishes should be removed before the roof is taken off.

Pre-Planning

Deconstruction is considered demolition and is covered by the OSHA Code of Federal Regulations (CFR) 29 Part 1926 for Labor. See OSHA for more details.
<http://www.osha.gov/>



Safety starts with planning for the worst and taking every measure to prevent even the most minor incidents. It is reasonable to expect small minor cuts, scrapes, bruises, etc. but it is not reasonable to expect falls, electrical shocks, any major cuts or impact injuries. One aspect of deconstruction that differentiates it from more traditional and mechanized demolition is the use of predominantly hand labor. In the case of an integrated hand labor and mechanical labor process, the greatest care must be taken to insure the separation of people activities from the operation of mechanical equipment.

A competent person must always be on site to assess any potential safety hazard and have the authority to take corrective action.

A **competent person** “means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.” (OSHA29 CFR 1926.32)

The location of the nearest medical emergency treatment and telephone numbers for emergency services should be known by all workers, or if one is not available, a person who has a valid certificate in first aid training must be on the site.

The deconstruction process begins with protecting worker health in the removal and handling of lead-based painted materials (buildings built before 1978), exposure to possible biological hazards, and any asbestos containing materials that were missed by the asbestos survey.

At the beginning of the deconstruction process, the entire site should be checked for miscellaneous hazards such as holes, roots and uneven ground, biting animals and insect nests, tree limbs that might be in the way, overhead wires, fences, etc. that might cause accidents and inhibit equipment movement.

How the building will be taken apart, the movement of people and materials, and the use of tools and equipment all create potential on-going hazards during the deconstruction.

Safety starts with the site and ends with each worker. Think of safety as a series of concentric rings from the outer ring of site and building conditions, to the inner ring of the actions of workers and their personal protective equipment. Refer to Appendix I “General Organizational and Safety Plan”.

The following table was adapted from the top 100 Causes of Injuries published by OSHA. It shows the most frequently cited OSHA construction standards related to physical hazards in 1991.

Rank	Description of Standard	
1	Fall Protection	Guarding open sided floors/platforms
2	PPE	Head protection from impact, falling objects
3	Electrical	Ground fault protection
4	Electrical	Path to ground missing or discontinuous
5	Trench/Excavation	Protective systems for trenching/excavating
6	Scaffolding	Guardrail specs for tubular welded frame scaffolds
7	PPE	Appropriate PPE used for specific operation
8	Ladders/Stairways	Stair rails required
9	Fire Protection	Approved containers or tanks for storing combustible liquids
10	General Provisions	General Housekeeping

Safety - First Line of Defense

The Building

The first aspect of preventative safety is that the building has been abated of all asbestos (see photo) and that any possible and accessible biological hazards have been dealt with.



The building elements should be physically sound and able to support the weight of workers, and not present a danger of collapse wherever workers might be present. Any shoring or stabilizing should be completed prior to the deconstruction and as needed during the process.

No worker should contribute to the instability of the building by (for example) removing load-bearing walls when they are still supporting a floor or roof above. Do not remove vertical or horizontal structural elements “before their time.”

The Environment

Rain and wet conditions pose immediate hazards and work should not take place in the rain or in excessively wet conditions. Wet conditions can cause slips and electrical shocks.



Extremely hot and or humid conditions and lack of ventilation are sources of heat exhaustion and stroke, and care should always be taken to insure adequate water consumption, as much shade as possible, and not overtaxing workers to the point that they might make serious mistakes.

Tools

The tools to be used should be adequate to the tasks, in proper working condition and used properly. Power tools must have proper insulation and grounding. The proper tools also include safety systems such as grounding for electrical generators, harnesses for fall protection, lock-out tags, warning tape, medical first aid kit, and fire extinguishers. (See Appendix II for “Basic Tools Necessary”).



Supervision and Training

The persons supervising the work (competent person) must know how to spot hazards and what to do about them, the proper order and techniques for the deconstruction, and how to communicate tasks to the workers. Training should always be given and acknowledged for any new worker and then again for each new task and piece of equipment.

Safety is the result of communicating to workers how to do things in a safe manner. Safety is also the result of communication between workers. Everyone on a deconstruction site needs a constant “heads up” attitude about what and where people are in relation to the building, the ground, the materials, pieces of equipment, and to each other.

Clean Site

A clean job site is a safe one. The simplest cause of nail punctures and tripping is when salvaged wood members with nails still in them are allowed to pile up or are allowed to sit in areas where people are walking. Tripping and slipping comes from allowing debris to pile up in the work areas. **Always remove nails from wood at the earliest opportunity and stack materials for denailing away from where people are working or walking.**

Clean up salvage and debris as you go!!

Safety - Last Line of Defense

When all else is considered, from the weather to the building itself, Personal Protective Equipment (PPE) is the last line of defense. Lumber with nails sticking up in a pathway or a piece of flying debris should not be present in the first place, BUT if an accident happens, PPE will help prevent injuries. Basic PPE for every worker are:



Ready to work

- **Hardhat** - for any work where objects are overhead, debris might fall, or even someone might be carrying a piece of lumber nearby for example. Hardhats should be put on whenever entering the work zone and kept on!!
- **Gloves** - leather palm gloves provide some impact resistant; help prevent blisters and splinters, and cuts from sharp objects.
- **Safety Glasses** - safety glasses prevent impacts to the eyes from small flying objects, and dust, debris, and fibers that might fall from above, and sparks or splinters from cutting or chiseling metals or masonry. It is extremely important to use safety glasses whenever using power tools that might cause debris to fly about or in case of a broken blade.
- **Steel-Toed Boots** - steel-toed boots and preferably also steel soles provide protection from objects that might impact the foot from above and from the side, and provide protection from stepping on nails. Boots with steel soles are the only real protection from stepping on nails. Boots also provide ankle support for uneven footing.
- **Long Pants** - long pants may be hotter than short pants, but provide an invaluable layer of protection from sharp edges or nails.



- **Ear Plugs** - ear-plugs are used when power tools and generators are creating a lot of noise. OSHA provides a guideline for the levels of noise when ear-plugs should be used.
- **Particle Filter Masks and Half Mask Respirators** - respiratory protection is an important aspect of worker health and safety whenever there is potential for respiratory hazards such as dust, fibers, and lead-based paint. A particle filter mask is only good for dust and is not sufficient for protection against lead-based paint. A properly fitted-tested half mask respirator with proper filter is required for working in an environment containing lead-based paint.



Hard Hat with Ear protection



Particle filter mask and ear plugs

Safety - Bottom Line

Two of the most dangerous aspects of deconstruction are being caught or struck by - materials, tools, and especially by nails, and falls - from ladders, by tripping, slipping, and from positions on roofs or the roof structure

Being hit by materials often comes from lack of communication between workers so that one worker hits another with a piece of material. Another cause of being caught or struck by is from hitting materials or trying to muscle something apart and having it suddenly give. When a tool involved, this also often results in workers hitting themselves with a tool such as a crowbar. **“Sorry” doesn’t count after someone is hurt!**

Refer to “Job Site Daily Checklist” in Section 6.

Fall Prevention



It is not the fall that hurts - it's what you land on at the end of the fall!!

Do not leave dangerous things for yourself or others to be tripped by, or to fall on!!

OSHA requires fall protection for heights starting at 6 feet above the surface below.

Many people are uncomfortable with heights. No workers should be asked to work at heights, unless they are comfortable doing so. Care should be taken when workers are tired, or exposed to high heat and humidity, which can reduce alertness and balance. The best fall protection strategy to begin with is a healthy and alert worker.

Fall protection comes in several forms - from personal body harnesses to railings, to controlled access zones and monitoring. Personal body harnesses must be properly anchored to be effective.



Fall protection gear



Side view on



Back view on

Deconstruction is unique in that it involves removing the building elements from around the worker. This means creating a “leading edge” - reducing the places to secure a body harness or place a railing and to stand safely - all at the same time!!

In the case of removing a roof structure or second floor, the worker is actually creating more openings through which to fall!! At some point during the removal of roofs and upper floors, it will be necessary to start working from below on scaffold or ladders, thereby reducing the fall hazard.

***Follow OSHA regulations for using ladders and fall protection.
Do not use ladders that are broken or too short for the task.
Minimize dragging and banging ladders around.***

When using extension ladders always tie the ladder off to the edge that it is leaning against. Use buddies to help hold the extension ladder from the backside, hold a regular ladder, and to hand up tools. Holding a ladder from the backside, the opposite side from the person on the ladder will insure that if the person on the ladder does fall, they do not fall on the person holding the ladder. (Refer to Appendix III “Sample Fall Protection Plan” for how to set up a fall protection plan for the deconstruction project).

OSHA provides guidelines for the placement and angle, and extension of extension ladders - the angle should be 70 degrees, feet placed on firm ground, and the top of the rail should extend 36 inches above the level where stepping off of the ladder.

Ladder Use

Rules of Thumb:

- Keep passageways clear and clean-up debris. This prevents slips and also allows for placing ladders on a flat clear surface.
- Know where you are stepping, know where edges and steps are, mark them and use rails.
- Check floors and roofs for holes and rotted wood or weaknesses before using them for support. Take the time to reinforce, stabilize, and cover holes with plywood, etc.
- Always work facing into a ladder, if something gives, you will fall into the ladder, which is the strongest position. Never assume that a ladder is latched properly, set on the ground properly. Always check it yourself.
- Standing at the base and extending your arms straight in front of you can approximate the proper angle of an extension ladder. Your fingers should comfortably touch the ladder. If you do not reach the ladder, the angle is too low. If you reach past the ladder it is too steep.



Proper use of step ladder



Proper angle of extension ladder

Safety Training

A safe deconstruction project requires that all those present on the site know the Safety Plan and know how to accomplish the work. It is also necessary to assign clear roles and responsibilities so that each worker knows who is responsible for specific tasks such as Supervision, Safety, Medical and First Aid, Tools, Materials Management, Deconstruction - and knows where information is and what to do in special circumstances. **This deconstruction guide is part of the training process.**

Specialized training may be required for such things as Fall Protection and Respiratory Protection.

Do not allow untrained persons to work at the site, even for a moment. If an untrained person is hurt the deconstruction contractor is responsible for not properly preparing the worker. Train all workers and make sure that they acknowledge this training in writing.

Job site safety includes not only the actual process of being safe but also the formalities of training and record keeping that serve for legal requirements. These formal structures serve an invaluable purpose of giving structure to job site safety training and consequently the process of the deconstruction itself.

Emergency Planning

The American National Standards Institute (ANSI) in its ANSI A10.6-1983 - Safety Requirements For Demolition Operations states: "No employee shall be permitted in any area that can be adversely affected when demolition operations are being performed. Only those employees necessary for the performance of the operations shall be permitted in these areas."

Medical Services and First Aid

Prior to starting work, provisions should be made for prompt medical attention in case of serious injury.

- The nearest hospital, infirmary, clinic, or physician
- Instructions for the most direct route to these facilities.
- Proper equipment for prompt transportation of an injured worker, as well as a communication system to contact any necessary ambulance service, must be available at the job site.
- Post the telephone numbers of the hospitals, physicians, or ambulances in a conspicuous spot.
- A properly stocked first aid kit must be available at the job site. The first aid kit should contain approved supplies in a weatherproof container with individually sealed packages for each type of item. It should also include rubber gloves to prevent the transfer of infectious diseases.



- Provisions should be made to provide for quick drenching or flushing of the eyes should any person be working around corrosive materials. Eye flushing must be done with water containing no additives.

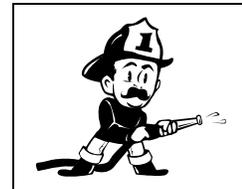
Check the contents of the first aid kit on each job and at least weekly to ensure that expended items are replaced.

Police and Fire

- The telephone numbers of the local police, ambulance, and fire departments should be available at each job site.
- Notify police in the event of any traffic problems, such as the movement of equipment to the job, uncontrolled fires, or other police/fire matters.
- Notify police to report any vandalism, unlawful entry to the job site, or accidents requiring police assistance.

Fire Prevention and Protection

A "fire plan" should be set up prior to beginning a deconstruction job. This plan should outline the assignments of key personnel in the event of a fire and provide an evacuation plan for workers on the site. Common sense should be the general rule in all fire prevention planning.



- All potential sources of ignition should be evaluated and the necessary corrective measures taken.
- Electrical wiring and equipment for providing light, heat, or power should be installed by a competent person and inspected regularly.
- Equipment powered by an internal combustion engine should be located so that the exhausts discharge well away from combustible materials and away from workers.
- All internal combustion equipment should be shut down prior to refueling.
- Fuel for this equipment should be stored in a safe location.
- Sufficient firefighting equipment should be located near any flammable or combustible liquid storage area.
- Only approved containers and portable tanks should be used for the storage and handling of flammable and combustible liquids.
- Heating devices should be situated so that they are not likely to overturn and shall be installed in accordance with their listing, including clearance to combustible material or equipment.
- Competent personnel should maintain temporary heating equipment, when utilized.
- Smoking should be prohibited at or in the vicinity of hazardous operations or materials.
- Roadways between and around combustible storage piles should be at least 15 feet wide and maintained free from accumulation of rubbish, equipment, or other materials.
- When storing debris or combustible material inside a structure, such storage shall not obstruct or adversely affect the means of exit.
- A suitable location at the job site should be designated and provided with plans, emergency information, and equipment, as needed.

- Access for heavy fire-fighting equipment should be provided on the immediate job site at the start of the job and maintained until the job is completed.
- An ample number of fully charged portable fire extinguishers should be provided throughout the operation.
- All motor-driven mobile equipment should be equipped with an approved fire extinguisher.

OSHA Coverage

One very important consideration for a non-profit organization is the use of the term “employee” for the requirement to follow OSHA regulations. If the deconstruction is carried out by an organization with at least one employed person and/or one or more employed persons are supervising or working at the deconstruction project, OSHA regulations apply to the deconstruction project, no matter how many volunteers may be engaged in the work, and regardless of whether the organization is a non-profit or a for-profit.

Safety Rules of Thumb:

COMMUNICATION

Knowing where you are in relation to others, walls, roof edges, steps, or changes in level, overhangs, any building element on the ground, OTHER workers and their activities, is probably the most important concept of all.

- Workers must be alert and invested in the work they are performing.
- Cleanup of debris on all work surfaces will occur after each phase of deconstruction.
- Piles of debris will not be allowed to accumulate in work areas where they could generate a hazard or impediment to the workers.
- One person will be appointed Job Safety Officer and will have overall responsibility for job safety.
- Every person on the site must act responsibly.
- Understanding of the Deconstruction process and Goals.
- Stabilizing weakened sections of buildings, and working in such a way as to keep the structures as stable as possible via the order of the deconstruction.
- Taking care in handling windows (glass), long items, heavy items, and objects with the nails still in them.
- Understanding how components are connected and the best method and tool to use in removing it to minimize force that in turn can result in sudden movements, creating projectiles, slipping, etc.
- Importance of cleaning debris and removing materials from areas where they can be hazards either off or on the ground.
- Understanding load bearing components and stresses produced by gravity, including awareness of damaged components and weak points caused by termite, water damage, etc.
- Use of safety harnesses, scaffolding, ladders, guardrails, and 2x4s nailed horizontally for footholds when working on roofs.

- Using a two-person system for the majority of materials removal so that long wood members, for example, can be handled at both ends to protect both workers and materials from any sudden movements.



Proper tool use



Correct hand placement



Scissors Technique



Proper use of tool



Proper use of tool

Section 2: Survey



Is it worth it? Evaluate the building to decide whether or not it makes sense to deconstruct and salvage. Does the value of the materials exceed the cost of recovering them and the amount that the Owner will pay to have the building removed?

The Estimating Survey

Before any deconstruction can begin, an estimating survey of the building should take place. This is an overall survey and can be done in stages to minimize the upfront effort to decide whether the deconstruction is a feasible alternative. If the general characteristics of the building indicate its viability for deconstruction, then more effort can be put into a detailed estimate for the purposes of calculating the cost of deconstruction, a time schedule and workforce and equipment requirements, and expected amount and types of salvage.

The costs of the deconstruction and the estimated salvage can be used to prepare a bid to the Owner, as well as provide the Owner with the estimated tax-deductible donation if the deconstructor is a non-profit entity. An estimated time of the work is also important for preparing a scope of work for the Owner, especially when new construction will take place on the site.

Things to look for:

- Note if the structure is obviously older than 1978.
- Visual survey of possible lead-based paint and asbestos containing materials and other hazardous materials.
- Look for water, fire, or insect damage.
- Look for signs of structural instability.
- Look for specific salvage materials you know will sell or have a potential market.
- Examine attic space for type of roof materials and construction, working room, direction of structure and the bearing points, (in order to distinguish load-bearing from non-load bearing walls) insulation, possible rodent, bird, bat, and insect detritus, possible fire damage, extent of wiring and ductwork.
- Examine roof (outside and inside for preliminary determination of bearing walls)
- Examine roof structure for salvage value (often older wood roof sheathing can be dry and brittle and low salvage value).
- Examine walls for type of framing and finishes (appearance of multiple layers on floor or walls).

Many older buildings can have newer layers of drywall installed over wood bead board or other historic components that have high value. Another

situation might be visible large structural timbers in a raised floor that at first glance are high value, but upon further exploration have internal rot or termite damage, making them not worth recovering. Both cases illustrate where first appearances do not tell the whole story!!

First Walk Through

Identify the best reusable materials in order of importance for whole house deconstruction. (See Appendix V for sample Initial Survey completed after First Walk Through).

When doing a walk through of an older, damaged, or abandoned building, be extremely careful of damaged flooring and support structures that may give way, causing a fall or dropping something onto you.

- Flooring – re-milled or reused as is.
- Tongue & Groove wall and ceiling finish
- Roofing material: terra cotta tiles, metal shingles, 5 v-crimp metal roofing, or slate. Anything else not reusable.
- Brick yes or no. Stone, Concrete/masonry. How easy will it be to remove and clean?
- Rafters and joist condition and dressed or rough, grade mark, no grade mark - if it has a grade, more likely you will be able to re-grade it or is good enough to be reused in light construction. How good is the condition - termite damage and water damage?
- Wall studs (same for grade mark)
- Windows, doors and trim – sashes and muntins condition and age, stair rails, chair rails, mantles, porch posts.
- Ceiling light fixtures, toilets, sinks, tubs various electrical and plumbing equipment, electrical

For 1" thick lumber, save a minimum of 3' length and if 2" thick lumber save 4' lengths. Save siding at a minimum of 3' lengths. 10-15% of perfect salvage of very good floors is not reusable.

Common problems that are difficult to see before the deconstruction:

- Water damage causing rot
- Termite damage
- Fire damage

It is rare to find an older building that does not have some moisture-induced rot, particularly around bathrooms, kitchens, window and doors.



Water Damage

Second Walk Through

An inventory form such as the one following this section is helpful to record the salvageable materials in the building. If there are also recyclables, you can note those as well. By using this form you can estimate the total salvage value in this building. Recyclable materials may or may not be a net value but the cost of pick-up or delivery will be less than disposal. Use another set of forms (also shown) to track the actual revenues or costs from selling salvageables, recyclables and the disposal of waste from the project. These forms are a guide and can be varied for your particular needs.

In order to estimate the possible salvage value in the building, you will want to make an inventory. For each item, a description and the amount of that material can be created in the form of a table.

Different units quantify different materials. For example, a window has a size (width x height), the type of material (ex. aluminum or wood) and each window is one unit (each).



Kitchen cabinets



Windows



Recyclable aluminum



Solid wood doors

The following table highlights the materials that are most likely to be worth salvaging relative to their resale value and salability. Every community is different and you might develop your own list of the most easy to sell items with the lowest cost to benefit effort.

Item	Cost/Benefit Ratio
Doors	0.46
Cabinetry	0.35
2 x 6 lumber	0.29
Windows	0.29
Wood stair (as one piece)	0.16
6 x 8 lumber	0.07
3x10 floor beam	0.03
Ceiling and attic fans	0.03-0.04
Claw foot tub	0.08-0.10
2 x 8 lumber	0.27-0.32
1 x? Novelty siding	0.37-0.45
1 x 12 planking	0.15-0.24
4 x? lumber	0.13-0.24
1 x 3 bead board	0.32-0.71
Brick	0.33-0.72
1x3 T&G flooring	0.11-0.58

The detailed walk through and estimates are important in order to help estimate the total value of the project for the purpose of estimating the cost and bid to the Owner. A non-profit organization can use the deconstruction salvage estimate to provide a building Owner with the value of the materials if they are going to be a tax-deductible donation to the non-profit. The materials value estimate is also important to decide between two projects and when the organization has limited resources and needs to be sure it gets the most value for the expenditure of these resources.



Section 3: Environmental Issues

Environmental issues related to hazardous materials can be quite complex, with regulations at the Federal, State and local levels. Deconstruction practitioners should contact their State and local environmental agencies to check and follow all applicable regulations.

The following protocols highlight the two most relevant hazardous materials to be found in deconstruction, asbestos and lead base paint. These checklists are meant to be a general guide to addressing these concerns. The checklists are superseded by any Federal, State or local regulations as they pertain to demolition and the creation, handling, storage, transport, and disposal of hazardous materials.

Asbestos Safety Protocol

- Buildings will be assessed for both friable and non-friable asbestos by a certified environmental consultant as needed (older than 1981)
- If building has friable or non-friable asbestos it will be abated by a licensed asbestos abatement contractor
- After asbestos abatement, the abatement contractor will be required to indicate that all asbestos has been removed. Inspections by the Florida Department of Environmental
- Any deficiencies found by the FDEP will be corrected before deconstruction can commence.
- If Safety Officer, FDEP, or any other competent or responsible party suspects that asbestos containing material (ACM) is present, or uncovered at any time during the deconstruction all work will be halted.
- An environmental consultant will be requested to test suspect ACM, and further abatement will be required if ACM is found at regulated levels.
- Upon completion of additional asbestos abatement, deconstruction work will be allowed to continue *Note: Sometimes workers uncover ACM under layers of non-ACM material*
- A certified asbestos abatement contractor will be used for any asbestos abatement required during the project.
- At no time is any sanding, grinding, abrading, cutting, burning or heating of the LBP wood materials permitted.
- The primary threat of worker exposure to LBP is through ingestion - inhaling, eating, drinking and smoking while in proximity to the LBP.
- A hand washing station is established on the job-site and personal protective equipment (gloves) and filter masks are required of all workers.

Lead Safety Protocol

Methods to insure the removal of LBP and worker protection are primarily building engineering and mitigation techniques. OSHA and EPA recognize that deconstruction is a less destructive process than mechanical demolition, but conversely has the potential for greater worker exposure.

Because of the limited exposure and turnover of workers, the following protocol is recommended:

- All workers receive ACM and LBP awareness training.
- All exterior windows and doors are opened or removed to allow ventilation and prevent accumulation and concentrations of LBP particulate matter during deconstruction activities.
- All workers in the LBP environment are provided personal fit-tested and approved respirators and protective clothing until personal air samples are analyzed and record lead levels below the acceptable threshold for worker exposure.
- A HEPA vacuum is utilized throughout the building interior to remove all dust and particulate matter to the maximum extent feasible.
- Indoor air quality analysis is completed using approved personal air sampling devices to determine TWA-PEL of lead within the work environment.
- At such time as air sampling is recorded which shows airborne lead levels below OSHA thresholds, respirators and protective clothing will be removed.
- In all cases, workers will be rotated out of LBP environments on a short-cycle and regular basis.
- Job-site hand washing station will be provided.
- Smoking is prohibited inside the structure and near any salvaged materials. Workers are required to wash hands before breaks and lunch breaks.
- Sanding, cutting, grinding, abraded, burning and heat-gun stripping of LBP surfaces is not permitted.
- Workers are provided with uniform T-shirts and required to change them at the completion of the work shift and before leaving the job-site.

In the event of known Lead based paint (LBP) in an interior environment, (See OSHA Lead Regulations 29 FCR 1926.26), workers are assumed to be exposed to LBP above acceptable levels until proven otherwise through personal air sampling.

Other hazardous materials that can be found include PCBs, mercury in thermostats and switches, refrigerants, and various corrosive or flammable liquids. Biological hazards can also be common in older buildings.

Section 4: Contracts

Any deconstruction project will require a contract between the Owner of the building and the company that removes the building. For the deconstructor this might mean a contract directly with the Owner or it may operate under a sub-contract to a larger construction or demolition company.



Since the deconstruction will be predominantly the hand labor removal of salvageable materials and a deconstruction entity such as Habitat for Humanity will not carry heavy equipment as part of their normal tools, it is necessary to be clear with the building Owner or prime contractor who will be responsible for such parts of the building as masonry walls, slabs-on-grade, driveways, etc.

The deconstructor can provide a project contract and price for only the hand labor component with clear language of what they are not responsible for. Sample language includes “all building related materials up to five 5’ feet from the building perimeter, and above first floor elevation level.” This would prevent a misunderstanding that the deconstruction includes removing slabs, driveways, utility piping below grade, septic tanks, trees, etc. Any tree within 5 feet of the building would likely have to be removed in order to carry out the deconstruction.

When the deconstruction is being carried out by a non-profit organization, placing a value on the recoverable materials upfront is an important part of the contract negotiations with the Owner. The value of this donation of materials by the Owner to the non-profit organization is an important tool for convincing the Owner to consider deconstruction at a cost equal to or even greater than traditional demolition. Since the donation of the salvage is a tax-deduction, even a price for deconstruction that is higher than demolition can result in a net lower cost to the Owner after accounting for the tax-deduction. In some cases the non-profit will provide a receipt for the materials and in another case may ask the Owner to fill out a form or letter for the amount of the donation.

Any contract will have basic elements including but not limited to:

- The price of the contract.
- The amounts and schedule of payments tied to the percentage of work that is completed.
- A time frame for the beginning and end of the project.
- Who owns what materials in the building and what materials will be recovered by the Owner and the deconstruction contractor.
- The physical boundaries of the work that the deconstructor is responsible for such as 5’ from the building perimeter and above-grade. (If the deconstructor is a sub-contractor, they may wish to exclude masonry and concrete or other sitework that requires heavy equipment).

- If there are targets or required diversions rates that are either legally mandated or a requirement of the Owner (such as to meet regulatory diversion rates by a local government).
- Any other goals or requirements such as meeting regulatory purchasing guidelines or policies.
- The terms for termination of the contract.
- The terms for licensing, insurance, liability and bonding if necessary.
- The persons who are responsible for the contract.

(See Appendix VII for a Sample Agreement).

Section 5: Permitting and Utilities

Check with your local building departments and agencies for all permits and regulations.

Demolition Permit

Some demolition permits require that all utilities have been disconnected and signed-off on by the appropriate utility authority before they are approved.

A deconstruction permit might require that a minimum amount of materials be diverted from the landfill or an indication of how much will be salvaged. In this case, an estimating survey (See Survey section of this Guide) will have provided this information.

Additional permits beyond the demolition permit will be required if there is the presence of asbestos in the building. Asbestos abatement will require a 10-day pre-notification to the Florida Department of Environmental Protection. Being aware of this possibility can help in planning the schedule for the project. Additionally, if there is any possibility that the site is or was a commercial entity and may have created any environmental contamination, the permitting process may require a Phase One environmental survey. A phase one environmental survey is an analysis of historic property records and a visual observation or walk-through of the site to determine if the site was used for something that would produce possible environmental contaminants. Examples might be a gas station, a dry cleaning business, a manufacturing business. Check with the local environmental or building regulatory agency to determine if any additional environmental review is required before commencing deconstruction. If a Phase One survey has to be completed, contact a licensed and certified environmental engineering firm.

Historic Preservation

As a deconstruction enterprise, it is probably a good idea to be sensitive to historic preservation issues. Deconstruction is not as good as preservation or adaptive reuse of an entire structure from an environmental perspective, yet preservation and adaptive reuse or relocation can be an expensive proposition.

Many municipalities have designated historic buildings or historic districts. In these cases, the local government may place restrictions on demolition or deconstruction and incentives for renovation or relocation of a building.

Utility Location

Obviously you would not wish to endanger the health of workers or anyone else in the process of removing a building from its site. As buildings are serviced by electrical, telephone, television cable, water, natural gas and wastewater connections, it will require diligence on the part of the deconstructor to insure that all of these connections are properly removed and capped at the point of connection to the distribution system to avoid a problem for other property owners or workers. It goes without saying that live electrical wires, and

natural gas lines can be sources of very serious injuries or even death. Electrical and natural gas disconnects should only be performed by the utility company. If temporary power is desired, a separate temporary power pole can be installed by the utility company to provide power to the job site. The utility company will permit and install temporary power.

Before any deconstruction commences contact the local utility to locate and remove all utility services from the building.

Utility Disconnect Rules of Thumb

- All electric, gas, water, steam, sewer, and other services lines should be shut off, capped, or otherwise controlled, at or outside the building before demolition work is started.
- In each case, any utility company that is involved should be notified in advance.
- If it is necessary to maintain any power, water, or other utilities during demolition, such lines shall be temporarily relocated as necessary and/or protected.
- The location of all overhead power sources should also be determined, as they can prove especially hazardous during any machine demolition.
- All workers should be informed of the location of any existing or relocated utility service.
- Use a licensed contractor to pump/ crush & fill the septic tank if one is present.
- Leave old site of septic tank with a location flag.
- Call building inspector to approve and close septic system permit
- Cut sewer pipe flush to grade
- Fill the end of the sewer pipe with concrete or call utility company to cap the sewer line
- Leave pipe with location flag in its location to prevent accidental damage
- Call building inspector to approve and close permit for sewer connection.

Engineering Survey

Prior to starting all demolition operations, OSHA Standard 1926.850(a) requires that a competent person conduct an engineering survey of the structure.

The purpose of this survey is to determine the condition of the framing, floors, and walls so that measures can be taken, if necessary, to prevent the premature collapse of any portion of the structure.

- The engineering survey provides the demolition contractor with the opportunity to evaluate the job in its entirety.
- Any adjacent structure(s) or improvements should be checked.
- The demolition contractor must maintain a written copy of this survey.
- Photographing existing damage in neighboring structures is also advisable.
- The contractor should plan for the wrecking of the structure, the equipment to do the work, manpower requirements, and the protection of the public.
- The safety of all workers on the job site should be a prime consideration.
- During the preparation of the engineering survey, the contractor should plan for potential hazards such as fires, cave-ins, and injuries.
- Determine if any type of hazardous chemicals, gases, explosives, flammable material, or similar dangerous substances have been used or stored on the site.
- If the nature of any substance cannot be easily determined, samples should be taken and analyzed by a qualified person prior to demolition.
- The required number and type of respirators, lifelines, warning signs, safety nets, special face and eye protection, hearing protection, and other worker protection devices outlined in this manual should be determined during the preparation of the engineering survey.
- A comprehensive plan is necessary for any confined space entry.

See Appendix VI for an example of an engineering survey

Section 6: Organizational Plan

Planning is as important as actually doing the work!

Before beginning any job, the contractor should take a number of steps in the overall planning of the deconstruction/demolition job.

Steps to consider:

- The methods to be used to bring the structure down
- The equipment necessary to do the job
- The measures necessary to perform the work safely



Deconstruction is considered construction with regard to regulatory approvals, environmental health and safety, contracts, estimating, resource planning, and scheduling planning.

The Organizational Plan starts with a checklist of internal and external resources needed to do the work.

- Insure a plan for the storage, transport, sale of recovered materials
- Consider training needs based on the experience and knowledge of your workers.
- Conduct worker training including environmental health training.
- Confirm insurance, worker's compensation, waivers of liability, licenses, regulatory approvals are all in place before commences. (as appropriate)
- Plan for and order heavy equipment, disposal roll-offs, generator, forklift, rentals, etc.
- Determine access to landfill including for hazardous materials
- Determine nearest medical care facility, fire services.
- Complete tool inventory and purchase of any known additional tools needed (See list of recommended tools at the end of this section)
- Complete generic and job specific safety plan - includes respiratory protection, fall protection (See appendix for more details)
- Assign personnel roles and responsibilities.
- Determine schedule and time-line for project.

Competent Person

A competent person experienced in all phases of the work to be performed should conduct all organizational planning. The competent person on the project is the ultimate responsible person for recognizing and taking any actions necessary to correct hazards.

A Competent Person must be on-site at all times during the project. The other most important roles on the site are the Safety Officer and the Tool Person.

Safety Person

Every project should have an assigned Safety Officer who is responsible for overall safety on the project. EVERY PERSON is RESPONSIBLE for THEMSELVES and EVERYONE ELSE. The Safety Officer insures that every person on the project has their basic Personal Protective Equipment (PPE) at the beginning of every day and uses it as appropriate throughout each workday.

The Safety Officer must also inspect the site with materials areas and roll-offs, each individual's activities, and the building itself on a continuous basis to prevent unsafe conditions from arising. In the case of unsafe behavior by workers either for themselves or those around them, a procedure should be developed for warnings, providing instruction in corrective actions, and documentation.

Tool Person

In a situation involving volunteers or any larger number of people, tools can readily get misplaced and consistent communication can be difficult. One management strategy is to assign a Tool Person who is responsible for inventorying all of the tools at the beginning of the project, checking for wear and damage, taking responsibility for either removing or repairing tools, and keeping track of all tools, their condition and additional needs on a daily basis.

Site Plan

Conceptualize a site plan that works for the order and types of salvage and equipment for this particular deconstruction project. Remember that deconstruction is the creation of quantities of reusable materials. In order to avoid chaos, the materials stock must be planned for at the deconstruction site.

- Determine locations for all recyclables such as wood, metals, and concrete.
- Determine which trees and plants will be salvaged.
- Consider and plan for the weight of roll-off trucks, overhead space for drop-off and removal, room for backing, room for the directional placement of the door of the roll-off.
- Plan for and establish de-nailing stations that can be in the shade if possible and work well for minimizing the distance from the point of removal to the point at which nails are removed.
- Pre-plan for everything that will be removed from the building.
- Minimize the difficulty or distance materials have to move.
- Think ahead to insure that salvage does not have to be moved because it is in the way.
- Proceed in a methodical and pre-planned way.
- Let everyone on the deconstruction crew know the whole process so that they can use their own initiative to know what needs to be done next.
- Consider and plan for the fact that salvage for reuse requires different tools and procedures than salvage for recycling.
- Consider the order, how and what equipment and tools might have been used in the construction process.
- Consider and plan for where salvage will go, consider where recycle will go, consider where disposal will go.
- Plan for all employee needs such as drinking water, water for cleaning up, a shaded area and toilet facilities.

Separating the general work site into special zones can help to make the site safer for workers. The first zone is the posting of the job-site sign that will often include the demolition permit. The demolition permit can also be stored in the job-site trailer on the job-site safety book. The job-site sign informs the general public that a deconstruction project is taking place.

A quick checklist for what to include in a site plan:

- Entrance and exit to site for people and equipment, including loading materials
- Worker and visitor parking that does not conflict with other vehicles such as roll-off hauler
- Tool location for a central storage facility overnight
- Hauling material from site should be convenient to the generation of materials and flexible as the materials will be coming from different locations in the building
- Deconstruction activity must be safely demarcated and workers should not be in conflict with machinery
- Processing location will be flexible depending upon where and what activities are taking place. Take into account providing shade and areas to capture nails and off-cuts - convenient to both waste disposal and the removal of processed materials from the site
- Temporary storage location for materials left on the site should be secure from pilferage, protected from weather and the ground
- Metal recycling location should be able to remain in one location throughout the project and easily accessible for removal when enough metals have been accumulated to make a sufficient load
- Hazardous material location should be in approved containers, safe from damage from other activities and aware from workers rest areas, etc. Hazardous materials should be removed for disposal as quickly as possible.
- Site security may or not include fencing but will include signage, warning tape and barricades as necessary. Signage and security must be maintained on a daily basis with a walk-through and check at the end of every workday.
- Tree protection should be considered for significant or heritage trees on the site. Roll-offs and heavy equipment can damage tree roots. It may happen that trees must be removed to insure the safety of workers for instance when tree branches overhang a roof where workers are present.
- Temporary toilet should be within a close enough distance to be readily accessible but provide some relief from odors.

The next layer of job site safety and protection is the posting of signs that say **CAUTION** around the perimeter of the job-site to warn of potential hazards and to discourage unsafe practices. These signs should be placed in such a way as to not have any blind spots. For example they should be posted at driveway entrances, door entrances, and on all four sides of a building, at a minimum.

Yellow caution tape or danger tape should be used when there is an imminent hazard such as to prevent someone from walking where roof materials are being dropped to the ground below, or where heavy equipment is in use to carry out mechanical demolition or removal activities.

Materials Management Plan

Deconstruction is not the end in itself; recovering materials for reuse is the end goal.

Deconstruction is a process of building disassembly for the purpose of recovering the maximum amount of materials for their highest and best re-use. As a by-product of deconstruction, materials may also be recovered for recycling. Re-use is the preferred outcome.

Reuse requires less energy, raw materials, and pollution in order to continue the life of the material than recycling. The materials follow a hierarchy of possible options – reuse, recycling, use for fuel, biodegradation, non-hazardous materials disposal, and hazardous materials disposal. A hierarchical approach to managing the materials from a building deconstruction is inherent in the process of site separation.

The US EPA and Florida Department of Environmental Protection regulate the management of both hazardous and non-hazardous wastes.

Separating Materials on Site

- Everyone on the site should know where the reusable, recyclable, hazardous disposal, C&D disposal, and solid waste disposal will go on the site and the means to get it there.
- Understand and prepare specific outlets (contacts), general markets (advertisement) and methods (equipment, labor, sub-contracts) for removal of all materials from site.
- Pre-selling materials help reduce the risk of committing to the deconstruction and can save time and energy in processing, transporting and storing materials.
- The use of recovered lumber for structural purposes will involve regulatory oversight.
- There is no established standard for the re-grading of salvaged lumber or re-certification of a recovered engineered wood product.

- Some building departments are willing to accept signed and sealed documents from the structural engineer of the new building to approve the reuse of lumber for structural purposes. (Check with your building department).
- Anything made of wood should be protected from moisture and termites
- Consider all materials and the possible market for them, even plants, landscape pavers, etc.

We do not recommend the reuse of non-code compliant and inefficient windows, plumbing and electrical fixtures that may pose hazards and cause the waste of resources through continued use. This includes lead-based painted windows and older single-glazed wood windows, unless the lead-based paint is abated and the glazing can be augmented through storm windows.

Household Waste Disposal

A separate disposal container and daily clean-up should be arranged for household waste such as lunch wrappers, plastic bags, cardboard, cups, paper towels, etc. Do not place household waste into construction and demolition debris containers, as this will contaminate the C&D materials. Contaminated C&D debris becomes household waste and the waste hauler will take it to a municipal solid waste landfill at a much higher disposal rate than C&D debris.

(Refer to Appendix X for a link to “Recommended Management Practices for the Removal of Hazardous Materials from Buildings Prior to Demolition”).

All workers should be constantly reminded to keep all C&D debris, recycling (in separate containers by materials), hazardous waste, and household waste SEPARATE.

Contact Waste Hauler

To insure that there are no surprises, the hauler and the processor or landfill should be contacted before the project begins:

- What materials do they handle
- What condition or purity must it be in,
- How must it be contained,
- What times of day and hours they operate,
- How much lead time is required to arrange a container pick-up or drop-off,
- Do they require the materials to be dropped off at their location?

Free Wood

Although a general rule of thumb is not to recover dimensional lumber less than 4 feet long, (a 4 foot piece can take as much effort as an 8 foot piece), a kind of waste and cost avoidance strategy might be to place the short lumber pieces into a bin with a sign FREE WOOD at a safe and visible location at the site. This may take some effort and should be weighed against the fact that if it is not taken away for free, it would still cost something to be removed for disposal or mulching.

Hazardous Materials

The Consumer Product Safety Commission is responsible for oversight regarding the reuse of materials that might pose a hazard to the general public. The CPSC and US EPA recommend the abatement of lead-based paint from any reusable material, not to exceed 0.06% LBP content, or the complete encapsulation of the material.



A rule of thumb is for known hazardous materials to be removed from the building before work begins, including asbestos containing materials, mercury switches, PCB ballasts, pesticides and herbicides, solvents, fuels, paints, etc.

Be prepared- this means putting on a mask or respirator before you generate dusty conditions, putting on gloves before exposure to hazards, putting in ear protection before making loud noises, and supporting the other end of that joist before it falls on you.

Job Site Daily Checklist

Job Site Safety

- ❑ A pre-start site meeting will be held every day to review procedures and the day's activities / responsibilities.
- ❑ Deconstruction hazards shall be identified and appropriate actions taken to prevent any possible injuries from these hazards, including proper equipment, signage, and barriers.
- ❑ Medical emergency information and cell phone location will be noted.
- ❑ First aid kit will be placed in visible / accessible location.
- ❑ Fire extinguisher will be placed in a visible / accessible location.
- ❑ Hand washing station and drinking water station will be set up. Reusable cups will not be used.
- ❑ Smoking is prohibited in or near any building under deconstruction and is prohibited on any site where lead-based paint has been identified.
- ❑ Work in lead environment will require lead and asbestos awareness training, use of half-mask respirator, blood lead level test before and after project (short term less than 6 months).
- ❑ Other lead environment engineering control protocols and procedures will be followed including providing maximum ventilation, use of HEPA vacuum and wetting as needed, smoking prohibition, hand washing and glove use protocol, change of clothing at end of work day.
- ❑ Basic job site cleanliness, removal techniques, and materials /tools storage practices will be followed including:
 - ❑ Do not leave tools underfoot or in a door or passageway.
 - ❑ Do not place a board or material with nails pointing up and do not place these materials where someone is working (unless pulling nails), near or sticking into a doorway or passageway.
 - ❑ All workers are responsible for their own and others safety and shall inform the supervisor of any conditions that they deem unsafe for themselves or for any other.
 - ❑ Safety and health violations will be noted. Repeated violations or failure to take corrective action as instructed by supervisor will be grounds for dismissal.

Personal Safety and Protection

- ❑ Check and distribute - hardhat, gloves, ear plugs, safety glasses, steel-toed boots, and absence of personal jewelry that may pose a hazard.
- ❑ Hard hats are to be worn at all times within 10 feet of the building perimeter and whenever working under or near objects overhead, such as ladders, scaffolding, heavy equipment that may be present at the site.
- ❑ Long sleeves shirts should be worn when there is exposure to fibrous materials.
- ❑ Fall protection will be used for any surface 6 feet above the surface below.
- ❑ Fall protection will be used by those properly trained in its use.
- ❑ Half-mask respirators rated at least N-95 as per NIOSH standards for particulate filter efficiency shall be worn whenever there is possible exposure to dust, fibers, particulates, microbial agents, oils, etc.

- ❑ Use of half-mask respirator will require physical check-up, training in care and use, fit testing.
- ❑ Hands shall be washed before taking a break or eating food, and at the end of the workday.

Tools and Equipment

- ❑ Tools will only be used by those trained and competent in their use.
- ❑ Instruction on proper use of hand tools will be conducted in accordance with manufacturer's instructions.
- ❑ Instruction and proper use of ladders and scaffolding will be conducted in accordance with manufacturer's instructions.
- ❑ Ladders with broken parts will not be used.
- ❑ Instruction and proper use of power tools, including but not limited to power saws, drills, and generator.
- ❑ Tools with damaged or broken parts will not be used.
- ❑ Power tools and cords that are damaged or broken will not be used.
- ❑ Damaged or broken tools, ladders and power tools will be taken out of service, tagged and locked as needed to warn against and prevent further use and removed for repair or replacement.
- ❑ Generator will be provided with a ground fault interrupter.

Site and Building

- ❑ Remove the first layer of materials that you can see before removing anything behind it, for example, remove ALL trim and electrical socket or switch plate covers before removing drywall.
- ❑ Treat any salvage as though it is yours and you are using it in your own house.
- ❑ Keep the structure as stable as possible via the order of the deconstruction.
- ❑ Do not throw away materials to be salvaged.
- ❑ Do not throw away any materials unless throwing directly into the dumpster.
- ❑ Remove nails as soon as possible, either from materials still in place or after taking directly to a de-nailing area.
- ❑ Do not hit materials or have a material in a position that horizontal projectiles can be created.
- ❑ Always control both ends of the material as it is being removed, either by someone holding on to it at the other end or with one end already resting on the ground.
- ❑ Do not remove structural walls or any walls or materials which are supporting something else until they are no longer acting in this structural capacity.
- ❑ Cleanup debris on all work surfaces CONSTANTLY.
- ❑ If you are walking on top of debris and cannot see the ground below, it is past time to clean up!!
- ❑ After materials have been removed either waste or salvage they should be removed in a timely fashion from the work area, either to 1) a dumpster, 2) a de-nailing station, or 3) a storage location for reusable materials.
- ❑ A material is not reusable until it has had all nails removed.

- ❑ When removing components that have parts such as screws or a light fixture with a glass lamp and separate fixture, keep the parts together by taping them, wrapping them in plastic or paper, or placing into a plastic bag, box, etc.
- ❑ Crowbar, flat bars, pry bar, shovel are to be used for removing materials. A sledgehammer is to be used for limited purposes and primarily to remove non-reusable items.

Section 7: The Deconstruction Process

The definition of deconstruction is the “un-construction” of a building from “in to out” and from “top to bottom,” down to basic materials of the building such as dimensional lumber and components such as a piece of mechanical equipment or a window, maintaining the integrity of the materials to the greatest extent possible. It is essentially “the opposite of construction”.

The non-structural aspects of a deconstruction project can occur simultaneously, while the structural aspects of the building must be removed in a careful and sequential manner to maintain the integrity of the building.



Before Deconstruction



Sheetrock and Windows removed



Outer siding removed



Clean workspace



Down to the sheathing and rafters



Roof has been removed



Walls secured against collapse



Clean and secure work area



Walls and siding removed



The last wall comes down



Preparing to remove decking



Decking removed - insulation



Down to the supports



Salvaged lumber

In some cases bracing must be created while the process is underway to temporarily replace structural elements until the component itself can be removed. Because a building slated for demolition will likely have a combination of alterations, additions, age, and deterioration it can be weaker than it appears as certain elements are removed.

In order to insure a smooth deconstruction process, it is important to completely disentangle each element or system from the building at each stage. This facilitates the use of the same tools and sorting similar materials in a more efficient manner. (See Appendix IX for Deconstruction Checklist).



a one story building all cleaned up

An assembly line is an appropriate analogy for the deconstruction process, whereby tasks are grouped by tool, location, and materials types, and arranged in a sequence of steps.

Basic Principals in Deconstruction

- Use of personal protection equipment (PPE) and any basic tools
- Concept of “last on is first off” (LOFO)
- Concept of the same tool and minimal to no force to take any element apart.
- Concept of tool selection, let tool do the work, not any more than what anyone should be able to do, does not require excessive force.
- Concept of body control and position
- Concept of clear access to building elements and passageways in and out
- Fall protection (See appendix)
- Delineation of passageways for people and materials
- Do not work into the location for materials collection and de-nailing/processing
- Do not overlap worker areas horizontally and vertically with overhead work

Plan for the unexpected and worst case!!! Build in a factor for weather and unknown conditions of the building that might be discovered while the deconstruction takes

Deconstruction Process for One-Story Wood Framed Building

DAY 1 - Abatement

Asbestos Tile and Mastic - Abatement by certified abatement contractor

DAY 2 - General Clean-up inside and out

Site Cleanup and House Cleaning - The location was scattered with debris since the house was abandoned. The yard was cleaned allowing adequate space for the dumpsters and the denailing/processing station to be established. In addition, No Trespassing signs and job-site signs were posted.

DAY 3 - Doors and Windows

Doors, Windows, Trim, Ext. Awnings - Remove all doors and windows with frame and associated trim. Doors and windows will be maintained as a complete package

DAY 4 - Interior Fixtures and Finishes

Oak floor, Doors, Windows, Ceiling Fans, Baseboards, Crown molding - The oak floor was laid on top of original pine floor. Baseboards were removed before plaster and lathe.

DAY 5 - Interior Finishes

Plaster, Floor felt, lathe - Wall plaster removal with lathe left in place as best as possible. Lathe is easiest to push out from behind rather than rip out and away from the stud nailing surface. Floor felt under oak floor must be peeled up as it is adhered with a water based glue.

DAY 6 - Roof Finish and insulation

Lathe, sheet metal roofing, batt insulation, beadboard walls - Sheet metal roofing is difficult to remove due to the 10:12 pitch of the original structure.

DAY 7 - Roof Finishes, Sheathing and Structure

1 x 8 roof deck, double layer of asphalt shingles, lathe, transfer plaster debris - 1 x 8 roof deck on the 10:12 original roof is punched out from below by crews of 3 to 4 standing on plywood decking. The plywood is positioned to make a continuous work surface on top of the ceiling joists. A secondary roof of two layers of asphalt shingles was left on the 1 x 8's as they easily shattered when punched out.

DAY 8 - Roof Structure

2 x 4 rafters, 1 x 8 roof deck - 2 x 4 roof rafters are removed from 10:12 roof. Rest of 1 x 8 roof deck is removed. After removal of the roof structure, the stud walls can be dropped to the ground level for disassembly.

DAY 9 - Roof Structure, upper chimney

1 x 4 roof deck, top of chimney, transport materials to storage - Small amounts of 1 x 4 roof deck removed from 10:12 original roof, top of the chimney deconstructed.

DAY 10 - Ceiling Finish

Ceiling plaster and lathe, 2 x 4 rafters - Ceiling plaster is removed by standing on plywood deck on top of the ceiling joists and pushing down between joists with a sledge hammer

DAY 11 - Additions - roof, ceiling, and walls

Remove Kitchen addition to the floor deck - Take kitchen addition down. Roof, Ceiling, Walls removed

DAY 12 - Additions - roof

Porch roof tin, asphalt shingles, mixed type wood roof deck, transport materials to storage - West porch addition metal roof is removed. Asphalt shingles are removed using shingle shovels. 1 x 6's and 1 x 3's roof deck is removed

DAY 14 - Additions, roofs, walls and siding

Porch rafters, 2 x 4 studs, 1 x 6 novelty siding - Deconstruct West Porch rafters and walls. Sections of the original exterior wall is laid down.

DAY 15 - Additions, rafters, walls, siding

2 x 4 studs, porch rafters, 1 x 6 novelty siding, front porch canopy - Continue deconstructing porch additions down to floor deck.

DAY 16 - Additions - floor structure

Floor deck, 2 x 8 floor joists, foundation block and concrete - 1 x 3 porch floor deck is removed.

DAY 17 - Ceiling Structure and Walls

2 x 4 studs, 2 x 4 ceiling joists - Removal of original structure ceiling 2 x 4 rafters then 2 x 4 studs. The original house is divided in four equal quadrants by the stud walls. The 2 x 4 ceiling joists were removed in one quadrant leaving the next to brace the exterior wall. Next the surrounding exterior stud wall in the quadrant was cut with a skill saw. The stud wall could then be easily pushed over for deconstruction on the ground.

DAY 18 - Floor Structure

1 x 3 floor deck, 2 x 6 floor joists, 4 x 6 floor beams, transport materials to storage - Removal of 1 x 3 floor deck of porch and support joists continues. Brick foundation pillars left in place.

DAY 19 - Floor Structure

1 x 3 floor deck, 2 x 8 floor joists, 3 x 10 and 6 x 8 floor beams - 1 x 3 floor deck of original structure removed along with floor support beams. 1 x 3 decking appears to cup more when there is less resin in the wood. Every other board of 1 x 3 is cupped due to water damage from rain

DAY 20 - Foundation and Chimney

Foundation and chimney brick, garage demo of roof and walls - Pull remaining chimney over following OSHA guidelines. Pick up as many brick's from chimney and foundation as possible. The rest of the brick are left to the community to harvest. Final unload at the storage facility.

Deconstruction Process for Concrete Masonry Unit (CMU) House with Pool Cage

Always remove the item that is over, in front of, in the way of, supported by, any other material or component.

- Remove pool cage, gutters and downspouts and placement into a metals roll-off.
- Remove aluminum roof soffits and place into metals roll-off.
- Remove exterior doors and windows
- Remove interior fixtures such as diffusers, lights, ceiling fans, interior doors, bathroom fixtures: lights, mirrors, medicine cabinets, toilets, sinks, vanities, shelving, and miscellaneous hardware.
- Remove carpet and placement into the swimming pool, except for pieces of carpet to use as ground clothes for catching nails during the de-nailing activities and for padding for windows or other breakable, scratchable components in transport.
- Remove ceiling drywall to the slab below and pile in middle of rooms for disposal.
- Remove batt ceiling insulation (to the inside) cutting out first any wires or conduit that are in the way, and cutting whatever else is found along the way.
- Remove any ductwork that is feasible for recycling.
- Remove clay roofing tile for reuse
- Remove roofing tile mortar
- Remove asphalt and roofing felt (over one piece of plywood, try to center over the center of a room) to make a drop area for the roof tile mortar and the asphalt and roofing felt to the floor below.
- Drop mortar and roofing felt to floor below. Keep this debris away from any side wall and insure that no other work is being performed in this area, nor will the areas where debris is dropped impede anyone else. ***Be sure to use yellow caution tape to close off this drop area.***
- Remove plywood roof sheathing.
- Remove blocking and bracing for trusses.
- Remove wiring, ductwork, piping, and vents in attic space.
- Remove trusses.
- Remove gable end last, and remember to work towards the work processing areas, not way from them, unless you have more than one way to get there.
- Use rubber tired Bobcat to demolish interior walls and “sweep” studs, drywall, roofing mortar and felt, all other miscellaneous debris with bucket into roll-offs for disposal.
- Use heavy equipment to demolish remaining masonry walls and concrete slab for recycling as mixed concrete and masonry rubble.

Pete Hendrick's Rules for Deconstruction

Every conceivable type of material to be found in a residential structure has some trick relative to its removal and handling that has to do with using the right tool, for removing and cleaning it for reuse, or preparing it for disposal.

1. There is one best way to handle each material and the job is to learn how to handle each material in the best way.
2. If you are struggling, you are not doing it right. Use lever, wheels, incline plane, fulcrums to reduce the brute force needed.
3. Two bar method is to place the first pry bar and make a gap and hold it, then slip the other pry bar one in the gap further down, then work hand over hand down the line. (need pictures)
4. Using the edge of a stud or rafter and angle the bar next to it and under the attached piece, levering against the stud as close as possible to the nail but not digging between the board and the stud. Pulling nails from the studs and joist in place is easier than removing it and pulling the nails on a sawhorse. And nails falling on the floor inside are easier to deal with than out on the ground and/or over the piece of carpet.
5. Pull carpet out and turn it upside down to use it under de-nailing station to catch nails. Or anything to catch nails, do not want to leave them or have to throw each one into a bucket.
6. Use lathe strips from plaster and lathe walls as spacers for stacking lumber.
7. Have four different bars with four different types of prying end and angle for different situations.
8. Always work from the tongue side with any T&G material.
9. Always pull the nail in the direction that it went into the material.
10. Apply the building technique and tools to the deconstruction.
11. The material should come off in your hand as though "unlaying" it as it was put up.
12. For drywall, get an edge and try to pull off as big a sheet as possible that can be handled. Don't punch it.
13. Use the same tool that was used to place it - use a screwdriver if a screw, use a pry device if hammered, use a pipe wrench if a pipe fitting, use cutters for wire, etc.
14. When you are going to do a section of throwaway like asphalt shingles, stage a separate dumpster as close to building as possible.
15. Take off the middle rafter and leave the gable end, then push over the gable end as a unit and take apart on the ground.
16. Schedule the de-nailing and deconstruction so that the last nail come out as the last building material is removed. Everything ends at the same time, panelizing makes a mess.
17. Don't let the materials pile up waiting for de-nailing.
18. Take off roof joist with person at each end on a ladder inside the house. Loosen the connection and where bird's mouth is. Slide over to free one end and walk down the ladder with it, as opposed to knocking it off and letting it fall to the ground.
19. Remove siding from inside; place bar parallel to the ground pry the bottom of the board on top, away from the board below. Lever down the wall and loosen it up then come back and lever the top off and pull it out and to the inside.
20. Stud wall: take the top plate off, leave the bottom plate on. Can try to remove the bottom plate down the wall and remove the studs as you go, angling the plate. If interior walls, then break out bottom and pull from the top.
21. A longer movement arm provides more levering force. Pull attachment out at same angle it went into the attachment point.

Safe Work Practices When Demolishing a Chimney

When preparing to demolish any chimney, the first step must be a careful, detailed inspection of the structure by an experienced person.

- Particular attention should be paid to the condition of the chimney.
- Workers should be on the lookout for any structural defects such as weak or acid-laden mortar joints, and any cracks or openings.
- The interior brickwork in some sections of chimney shafts can be extremely weak.
- If chimney has been banded with steel straps, these bands should be removed only as the work progresses from the top down.
- The area around the chimney should be roped off or barricaded and secured with appropriate warning signs posted.
- No unauthorized entry should be permitted to this area.
- It is also good practice to keep a worker, i.e., a supervisor, operating engineer, another worker, or a "safety person," on the ground with a form of communication to the workers above.
- Special attention should be paid to weather conditions when working on a chimney.
- No work should be done during inclement weather such as during lightning or high wind situations.
- The work site should be wetted down, as needed, to control dust.
- If debris is dropped inside the shaft, it can be removed through an opening in the chimney at grade level.
- The opening at grade must be kept relatively small in order not to weaken the structure.
- If machines are used for removal of debris, proper overhead protection for the operator should be used.
- Excessive debris should not be allowed to accumulate inside or outside the shaft of the chimney as the excess weight of the debris can impose pressure on the wall of the structure and might cause the shaft to collapse.
- The foreman should determine when debris is to be removed, halt all demolition during debris removal, and make sure the area is clear of cleanup workers before continuing demolition.

Appendix I: General Organizational and Safety Plan

Personnel Policy

Minimum responsibilities for each worker are to provide proper personal clothing as stated in this document. The deconstruction site is a drug-free environment. Any presence of illegal or intoxicating substances will be cause for immediate removal from the deconstruction site.

Grievance procedure - any issues of concern shall be brought to the Job Supervisor immediately.

Areas of Job Responsibility

Every crew member will be assigned at least one area of responsibility, and over the first few months crew members will be encouraged to cross train each other so there is always at least one back-up person. A crew of “supervisors in training” is very different from a crew of “employees.”

The supervisor will review each person’s area of responsibility at the morning meetings. The following seven areas of site responsibility offer one way to divide up tasks:

Site Supervisor Responsibilities

- Do pre-work site review and write up list of prerequisite work for supervisor to give to owner.
- Develop contact with neighbors. This includes explaining the project and reporting problems or potential problems to supervisor.
- Review work order on-site before a job starts to confirm all special-ordered materials are on hand and all specs are clear.
- Set up job site – containment, isolation, dust room, rubbish area, etc.
- Assure someone is taking responsibility for all other job assignments.
- Establish and maintain production schedule. When a production goal is not met the supervisor will, in consultation with the crew, write up a memo on what needs to be done to improve production or change the schedule.

Supply/Inventory Responsibilities

- Review supply list with supervisor to be clear on quantity, specifications, source, order time, etc., of each supply item held in inventory.
- Maintain a supply of materials on truck or trailer for at least two days. Make sure storage area has a supply for a month.
- Make additions, deletions, changes on inventory form as crew requests. If possible, work with administration to computerize a working system that may include inventory software.
- Maintain on-site storage areas.

Tool & Equipment Inventory and Maintenance Responsibility

- Train people on use of equipment, particularly ladders, power tools and electrical cords. If equipment is damaged, tag and have it repaired before use.

- Keep an inventory of all crew tools and materials. Be sure there is a replacement for critical tools in the warehouse. Check inventory of major tools daily.
- Keep tools clean and sharp. Keep a full supply of new blades.
- Evaluate tools and make recommendations for replacement or additional tools.
- This person may also be responsible for vehicle maintenance (checking air, gas, oil, etc.) on a regular basis.

Health and Safety Responsibility

- Inspect site for any health and safety problems before and during job. This person may do the pre-work site review rather than the supervisor.
- Responsible for implementing weekly safety meetings and maintaining injury/accident reports.
- Maintaining first aid kit, drinking water supply, a safe, clean, well-lit break area and clean toilets.
- Implement respirator maintenance program as required by OSHA.
- Inspect use of ladders, scaffolding, power equipment, etc.

Quality Control Responsibility

This position would be circulated throughout the crew on a job-by-job basis. The crew will produce a “punch list” of items and monitor the list’s completion at each phase of work.

Site Data Collection and Salvaged Material Inventory Responsibility

- Maintain site log.
- Record time spent as compared to estimated time. To the degree possible, break work into components such as set-up, windows, clean up, etc. using data collection form provided
- Record materials used out of inventory or special purchase.
- Based on a distribution schedule, what material gets sold on-site, warehoused, processed, etc. Material will be bundled, palletized or placed in racks.
- Where materials will be processed on-site (de-nailed, ends cut, mortar removed, etc.), quality control and inventory will be kept.

Worker, Safety, Health & Comfort

- Clean up Area - The clean up area is to be located at the entrance/exit area of the job site. It contains:
- Wash up supplies - rinse buckets, soap, a pump sprayer for final rinse, paper towels, a 2-bottle eye wash station and a first aid kit.
- Worker protection - spare goggles, painter’s caps, respirators, tyvec suits and cleaning pads.
- Clothes rack - a place to leave tyvec suits, dusk masks, respirators, and shoe covers. Work clothing can be vacuumed until it can be changed.
- Emergency numbers - local hospital, property owners, utilities, etc.

- Workers will leave and enter the job site through the door at the clean up area. Workers must wash their hands before eating, drinking, or smoking and clean up thoroughly before going home.
- Break Area - Where this is located depends on the site, the size of the job and the weather. It could be under a tree or in a heated construction trailer. It should include at least
 - Good air circulation and shade in hot weather
 - Safe heat when it's cold
 - Comfortable places to sit
 - A place to store food, preferably refrigerated
 - Easy access to clean toilets
 - A private area for men and a private area for women to change clothes
 - A secure place to park - this might include negotiations with neighbors or a contract with a parking facility.
 - Good lighting, preferably natural light.

Safety Rules for All Employees

It is the policy of Center for Construction & Environment (University of Florida) that everything possible will be done to protect you from accidents, injuries and/or occupational disease while on the job. Safety is a cooperative undertaking requiring an ever-present safety consciousness on the part of every employee. If an employee is injured, positive action must be taken promptly to see that the employee receives adequate treatment. No one likes to see a fellow employee injured by an accident. Therefore, all operations must be planned to prevent accidents. To carry out this policy, the following rules will apply:

- ❑ All employees shall follow the safe practices and rules contained in this manual and such other rules and practices communicated on the job. All employees shall report all unsafe conditions or practices to the proper authority, including the supervision on the project, and, if corrective action is not taken immediately, a governmental authority with proper jurisdiction over such practices.
- ❑ The job-site supervisor shall be responsible for implementing these policies by insisting that employees observe and obey all rules and regulations necessary to maintain a safe work place and safe work habits and practices.
- ❑ Good housekeeping must be practiced at all times in the work area. Clean up all waste and eliminate any dangers in the work area.
- ❑ Suitable clothing and footwear must be worn at all times. Personal protection equipment (hardhats, respirators, eye protection) will be worn whenever needed.
- ❑ All employees will participate in a safety meeting conducted by their supervisor once every week.
- ❑ Anyone under the influence of intoxicating liquor or drugs, including prescription drugs which might impair motor skills and judgment, shall not be allowed on the job.
- ❑ Horseplay, scuffling, and other acts which tend to have an adverse influence on safety or well-being of other employees are prohibited.
- ❑ Work shall be well planned and supervised to avoid injuries in the handling of heavy materials and while using equipment.
- ❑ No one shall be permitted to work while the employee's ability or alertness is so impaired by fatigue, illness, or other causes that it might expose the employee or others to injury.
- ❑ There will be no consumption of liquor or beer on the job.
- ❑ Employees should be alert to see that all guards and other protective devices are in proper places and adjusted, and shall report deficiencies promptly to the job-site supervisor.
- ❑ Employees shall not handle or tamper with any electrical equipment, machinery, or air or water lines in a manner not within the scope of their duties, unless they have received specific instructions.
- ❑ All injuries should be reported to the job-site supervisor so that arrangements can be made for medical or first aid treatment.
- ❑ When lifting heavy objects, use the large muscles of the leg instead of the smaller muscles of the back.
- ❑ Do not throw things, especially material and equipment. Dispose of all waste properly and carefully. Bend/pull all exposed nails so they do not hurt anyone removing the waste.
- ❑ Do not wear shoes with thin or torn soles.

Periodic Safety Training Meetings

Center for Construction & Environment (University of Florida) has safety meetings every week. The purpose of the meeting is to convey safety information and answer employee questions. The format of most meetings will be to review, in language understandable to every employee, the content of the injury prevention program, special work site hazards, serious concealed dangers, and material safety data sheets. Each week, the job-site supervisor will review a portion of the company's safe work practices contained in this booklet, or other safety related information. Whenever a new practice or procedure is introduced into the workplace, it will be thoroughly reviewed for safety. A sign-up sheet will be passed around each meeting, and notes of the meeting will be distributed afterwards.

Employee Responsibility for Training

Teaching safety is a two-way street. Remember, the following general rules apply in all situations:

No employee should undertake a job that appears to be unsafe.

No employee is expected to undertake a job until he/she has received adequate safety instructions, and is authorized to perform the task.

No employee should use chemicals without fully understanding their toxic properties and without the knowledge required to work with these chemicals safely.

Mechanical safeguards must be kept in place.

Employees must report any unsafe conditions to the job site supervisor and the Responsible Safety Officer.

Any work-related injury or illness must be reported to management at once.

Personal protective equipment must be used when and where required. All such equipment must be properly maintained.

Communication

Employers should communicate to employees their commitment to safety and to make sure that employees are familiar with the elements of the safety program. Center for Construction & Environment (University of Florida) communicates with its employees orally, in the form of directions and statements from your supervisor, written, in the form of directives and this manual, and by example. If you see a supervisor or management do something unsafe, please tell that person. We sometimes forget actions speak louder than words.

Accident Prevention Policy Posting

- ❑ Each employee has a personal responsibility to prevent accidents. You have a responsibility to your family, to your fellow workers and to the Company. You will be expected to observe safe practice rules and instructions relating to the efficient handling of your work. Your responsibilities include the following:
- ❑ Incorporate safety into every job procedure. No job is done efficiently unless it has been done safely.
- ❑ Know and obey safe practice rules.
- ❑ Know that disciplinary action may result from a violation of the safety rules.
- ❑ Report all injuries immediately, no matter how slight the injury may be.
- ❑ Caution fellow workers when they perform unsafe acts.

- ❑ Don't take chances.
- ❑ Ask questions when there is any doubt concerning safety.
- ❑ Don't tamper with anything you do not understand.
- ❑ Report all unsafe conditions or equipment to your supervisor immediately.

Accident Prevention Policy Posting

A copy of this manual will be posted in the work area. It is the policy of _____ to provide a safe and clean workplace and to maintain sound operating practices. Concentrated efforts shall produce safe working conditions and result in efficient, productive operations. Safeguarding the health and welfare of our employees cannot be stressed too strongly. Accident prevention is the responsibility of all of us. Department heads and supervisors at all levels shall be responsible for continuous efforts directed toward the prevention of accidents. Employees are responsible for performing their jobs in a safe manner. The observance of safe and clean work practices, coupled with ongoing compliance of all established safety standards and codes, will reduce accidents and make our Company a better place to work.

Hazard Identification & Abatement

This written safety and health plan sets out a system for identifying workplace hazards and correcting them in a timely fashion. Please review it carefully with your supervisor. Remember, safety is everyone's responsibility. Since many of the buildings to be demolished/deconstructed have not been cleaned out, many unmarked abandoned jars, cans, bottles and more are still located on site for us to dispose of properly. Any chemicals, solvents and gases must be put to the side for the job site supervisor to review and decide how it should be handled and removed from the job site. All asbestos abatements will be complete before workers will come on the site and work on problem areas. If asbestos is found on the site while work is underway the job will be stopped and a consultant will verify it is safe to proceed.

Workplace Inspections

In addition to the examination of records, work place safety inspections will occur periodically every week, when conditions change, or when a new process or procedure is implemented. During these inspections, there will be a review of the injury and illness prevention policy and Center for Construction & Environment (University of Florida) code of safe work practices.

OSHA Records Required

Copies of required accident investigations and certification of employee safety training should be maintained by the Responsible Safety Officer. A written report will be maintained on each accident, injury or on-the-job illness requiring medical treatment. A record of each such injury or illness is recorded on OSHA Log and Summary of Occupational Injuries Form 200 according to its instructions. Supplemental records of each injury are maintained on OSHA Form 101, or Employers Report of Injury or Illness Form 5020. Every year, a summary of all reported injuries or illnesses is posted no later than February 1, for one

month, until March 1, on OSHA Form 200. These records are maintained for five years from the date of preparation.

Smoking & Fire Safety

Fire is one of the worst enemies of any facility. Learn the location of the fire extinguishers. Learn how to use them. You can help prevent fires by observing the smoking rules:

Smoking is not allowed on the site.

Smoking is not permitted in toilets.

Reporting

All serious accidents must be reported to OSHA. In cases of hospitalization or death, a full investigation with copies to governmental authorities will be required. In less serious cases, the investigation report must be presented to the company for disclosure to its insurance carrier and for remedial action at the work site.

Ladders

Check ladders each and every time before you climb. Ladders should be maintained in good condition: joints between steps and side rails should be tight; hardware and fittings securely attached; and movable parts operating freely without binding or undue play. Non-slip safety feet are provided on each ladder. Ladder rungs and steps should be free of grease and oil. Employees are prohibited from using ladders that are broken, missing steps, rungs, or cleats, or that have broken side rails or other faulty equipment. **It is prohibited to place a ladder in front of doors opening toward the ladder except when the door is blocked open, locked or guarded. It is prohibited to place ladders on boxes, barrels, or other unstable bases to obtain additional height. Face the ladder when ascending or descending. Be careful when you climb a ladder. Do not use the top step of ordinary stepladders as a step. When portable rung ladders are used to gain access to elevated platforms, roofs, etc., the ladder must always extend at least 3 feet above the elevated surface.** It is required that when portable rung or cleat type ladders are used, the base must be so placed that slipping will not occur, unless it is lashed or otherwise held in place. All portable metal ladders must be legibly marked with signs reading "CAUTION" - "Do Not Use Around Electrical Equipment." Employees are prohibited from using ladders as guys, braces, skids, gin poles, or for other than their intended purposes. Only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder). Metal ladders should be inspected for tears and signs of corrosion. Rungs of ladders should be uniformly spaced at 12 inches, center to center.

Appendix II: Basic Tools Necessary

A complete tool inventory should be done prior to deconstruction. Purchase any additional tools that might be needed.

Safety

- ❑ Fire extinguisher
- ❑ First-aid kit
- ❑ Job contact telephone numbers and job site cell phone
- ❑ Personal protective equipment (PPE)- each worker has hard hat, safety glasses, steel-toed boots, long pants, filter masks or 1/2 mask respirators (fit-tested) as needed, gloves, tool-belt and basic personal tools (preferred)
- ❑ Roof anchors w/16 d nails, tie straps, safety harnesses, lanyards, life-lines, rope grabs, carabiners

Organization and Security

- ❑ Warning signs - Hard Hat area, Construction Site, etc
- ❑ Yellow caution tape
- ❑ Garbage bags (heavy duty contractors)
- ❑ Garbage can for miscellaneous solid waste
- ❑ Generator, grounding rod, and GFCI plug
- ❑ Water container for drinking water
- ❑ Water: for hand washing
- ❑ Disposable cups and paper towels
- ❑ Hand soap (construction grade)
- ❑ Hudson sprayers and germicidal bleach
- ❑ Polyethylene plastic sheet
- ❑ Rope
- ❑ Sawhorses
- ❑ Storage for equipment, either on-site or removal each day (if required to remove, then optimally a lockable vehicle).
- ❑ Tarps,
- ❑ Electric current detector
- ❑ Electrical cords

Deconstruction Tools – Power and Manual

- ❑ Axe (small and large), Pick axe
- ❑ Cats paw
- ❑ Chain saw
- ❑ Crow bars short and long (prefer “Gorilla Bar” type crow bar)
- ❑ De-nailing gun and air compressor (optional)
- ❑ Drill, cordless with batteries, and battery charger
- ❑ Hammers
- ❑ Ladders: 6 and 8 foot, 20’ extension ladders (fiberglass preferred)
- ❑ Measuring tape
- ❑ Nails and screws

- ❑ Pliers
- ❑ Saws: bow saw, hand saw, hack saw rotary saw, Skil saw with grinder and wood cutting blades
- ❑ Sawz-alls with bi-metal blades
- ❑ Screw drivers regular and phillips head
- ❑ Shovels: regular and specialty Snow shovels Roofing shovels
- ❑ Sledgehammers (small and large)
- ❑ Post-hole digger
- ❑ Pry bars
- ❑ Rakes
- ❑ Tamping bar or “Grizzly Bar”
- ❑ Tin snips
- ❑ Vise grips
- ❑ Wheelbarrows
- ❑ Wire and bolt cutters
- ❑ Wrenches adjustable

Equipment Rental as needed

- ❑ 20 C.Y. to 40 C.Y. roll-off
- ❑ Covered truck to remove salvage
- ❑ Debris chutes
- ❑ Man-lift, Hi-lift, Fork Lift
- ❑ Pneumatic or electric hammer with chisels
- ❑ Rolling scaffold
- ❑ Fall protection safety equipment
- ❑ Respiratory protection safety suits and equipment

Appendix III: Sample Fall Protection Plan

Name of Project:

Location of Job:

Deconstruction Company:

Date Plan Prepared or Modified:

Plan Prepared By:

Plan Approved By:

Plan Supervised By:

The following Fall Protection Plan is prepared for the prevention of injuries associated with falls. A Fall Protection Plan must be developed and evaluated on a site-by-site basis.

Statement of company policy

(Name of demolition/deconstruction company) is dedicated to the protection of its employees from on-the-job injuries. All employees of the _____ have the responsibility to work safely on the job. The purpose of this plan is:

(a) To supplement our standard safety policy by providing safety standards specifically designed to cover fall protection on this job and;

(b) To ensure that each employee is trained and made aware of the safety provisions which are to be implemented by this plan prior to the start of deconstruction.

This Fall Protection Plan addresses the use of conventional and non-conventional fall protection at a number of areas on the project, as well as, identifying specific activities that require non-conventional means of fall protection. These areas include:

- a. Removal of high wall and ceiling interior finish materials and components
- b. Leading edge work.
- c. Unprotected sides or edge.
- d. Dismantling of roof finish materials and structures.
- e. Use of ladders or scaffolding for removal of exterior high wall components.

This plan is designed to enable employers and employees to recognize the fall hazards on this job and to establish the procedures that are to be followed in order to prevent falls to lower levels or through holes and openings in walking/working surfaces. Each employee will be trained in these procedures and strictly adhere to them except when doing so would expose the employee to a greater hazard. If, in the employee's opinion, this is the case, the employee is to notify the foreman of the concern and the concern addressed before proceeding.

Safety policy and procedure on any one project cannot be administered, implemented, monitored and enforced by any one individual. The total objective of a safe, accident free work environment can only be accomplished by a dedicated, concerted effort by every individual involved with the project from management down to the last employee. **Each employee must understand** their value to the company; the costs of accidents, both monetary, physical, and emotional;

- The objective of the safety policy and procedures;
- The safety rules that apply to the safety policy and procedures;
- And what their individual role is in administering, implementing, monitoring, and compliance of their safety policy and procedures.

This allows for a more personal approach to compliance through planning, training, understanding and cooperative effort, rather than by strict enforcement. If for any reason an unsafe act persists, strict enforcement will be implemented.

It is the responsibility of _____ to implement this Fall Protection Plan. _____ is responsible for continual observational safety checks of their work operations and to enforce the safety policy and procedures. The foreman also is responsible to correct any unsafe acts or conditions immediately.

It is the responsibility of the employee to understand and adhere to the procedures of this plan and to follow the instructions of the foreman. It is also the responsibility of the employee to bring to management's attention any unsafe or hazardous conditions or acts that may cause injury to either themselves or any other employees. Any changes to this Fall Protection Plan must be approved by:

Fall protection systems to be used on this project

The following fall hazards are present in the deconstruction process:

- Removal of window trim, ceiling and high wall fixtures and appurtenances using ladders or rolling scaffolding.
- Removal high wall and ceiling plaster or drywall, ceiling insulation, attic wiring and ductwork by use of ladders or rolling scaffolding.
- Removal of roof finish, sheathing and rafters from either a platform created by roof joists or beams and planking.
- Removal of roof finish and sheathing materials from a working platform of the roof itself.

- Removal of roof fascia, soffits, rakes, high-level exterior trim, high-level exterior siding by use of ladders.
- Removal of roof structural members using rolling scaffolding or an adjacent structural roof, supported independently from the roof being removed.
- Use of extension ladders for access to working heights 6 feet above the level below.
- Removal of second floor windows and exterior siding where openings in the wall surface are created, from adjacent roof surfaces or the second floor interior surface.

Where conventional fall protection is infeasible or creates a greater hazard at the leading edge and during structural dismantling activity, we plan to do this work using a safety monitoring system and expose only a minimum number of employees for the time necessary to actually accomplish the job. The maximum number of workers to be monitored by one safety monitor is two (2). We are designating the following trained employees as designated deconstructors for heights above at 6 feet or higher than the level below and they are permitted to enter the controlled access zones and work without the use of conventional fall protection.

Safety monitor:

Designated high-level deconstructor:

Designated high-level deconstructor:

***high-level** indicates any work performed at or above 6 feet above the level below or when using scaffolds at 10 feet or more above the level below.

The safety monitor shall be identified by _____. Only individuals with the appropriate experience, skills, and training will be authorized as designated high-level deconstructors. All employees that will be working as designated high-level dismantlers under the safety monitoring system shall have been trained and instructed in the following areas:

1. Recognition of the fall hazards in the work area (at the leading edge and when making initial connections-point for tie-off).
2. Avoidance of fall hazards using established work practices which have been made known to the employees.
3. Recognition of unsafe practices or working conditions that could lead to a fall, such as windy conditions.
4. The function, use, and operation of safety monitoring systems, guardrail systems, body belt/harness systems, control zones and other protection to be used.
5. The correct procedure for erecting, maintaining, disassembling and inspecting the system(s) to be used.
6. Knowledge of deconstruction sequence or the deconstruction plan.

A conference will take place prior to starting work involving all members of the high-level deconstruction crew, supervisors of any other concerned contractors. This conference will be conducted by the Supervisor in charge of the project. During the pre-work conference, deconstruction procedures and sequences pertinent to this job will be thoroughly discussed and safety practices to be used throughout the project will be specified. Further, all personnel will be informed that the controlled access zones are off limits to all personnel other than those designated deconstructors specifically trained to work in that area.

Safety Monitoring System

A safety monitoring system means a fall protection system in which a competent person is responsible for recognizing and warning employees of fall hazards. **This system will be employed when using rolling tower scaffolding at heights less than 10 feet above the level below. The duties of the safety monitor are to:**

7. Warn by voice when approaching the open edge in an unsafe manner.
8. Warn by voice if there is a dangerous situation developing which cannot be seen by another person involved with product removal, such as a member getting out of control.
9. Make the designated deconstructors aware they are in a dangerous area.
10. Be competent in recognizing fall hazards.
11. Warn employees when they appear to be unaware of a fall hazard or are acting in an unsafe manner.
12. Be on the same walking/working surface as the monitored employees or within visual sighting distance of the monitored employees and able to see both the deconstructor and any openings or leading edges that pose a hazard to the deconstructor.
13. Be close enough to communicate orally with the employees.
14. Not allow other responsibilities to encumber monitoring. If the safety monitor becomes too encumbered with other responsibilities, the monitor shall (1) stop the erection process; and (2) turn over other responsibilities to a designated safety monitor; or (3) turn over the safety monitoring function to another designated, competent person.

The safety monitoring system shall not be used when the wind is strong enough to cause loads with large surface areas to swing out of radius, or result in loss of control of the load, or when weather conditions cause the walking-working surfaces to become icy or slippery.

Control Zone System

A controlled access zone means an area designated and clearly marked, in which leading edge work may take place without the use of guardrail, safety net or personal fall arrest systems to protect the employees in the area. Control zone systems shall comply with the following provisions:

1. When used to control access to areas where leading edge and other operations are taking place the controlled access zone shall be defined by a control line or by any other means that restricts access.
2. When control lines are used, they shall be erected not less than 6 feet (1.8 m) nor more than 60 feet (18 m) or half the length of the member being erected, whichever is less, from the leading edge.
3. The control line shall extend along the entire length of the unprotected or leading edge and shall be approximately parallel to the unprotected or leading edge.
4. The control line shall be connected on each side to a guardrail system or wall.
5. Control lines shall consist of ropes, wires, tapes, or equivalent materials, and supporting stanchions as follows:
6. Each line shall be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.
7. Each line shall be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) from the walking/working surface.
8. Each line shall have a minimum breaking strength of 200 pounds (.88 kN).

Holes

All openings greater than 12 in. x 12 in. will have perimeter guarding or covering. All predetermined holes will have the plywood covers made in the precasters' yard and shipped with the member to the jobsite. Prior to cutting holes on the job, proper protection for the hole must be provided to protect the workers. Perimeter guarding or covers will not be removed without the approval of the erection foreman.

Precast concrete column erection through the existing deck requires that many holes be provided through this deck. These are to be covered and protected. Except for the opening being currently used to erect a column, all opening protection is to be left undisturbed. The opening being uncovered to erect a column will become part of the point of erection and will be addressed as part of this Fall Protection Plan. This uncovering is to be done at the erection foreman's direction and will only occur immediately prior to "feeding" the column through the opening. Once the end of the column is through the slab opening, there will no longer exist a fall hazard at this location.

Implementation of fall protection plan

The structure being erected is a multistory total precast concrete building consisting of columns, beams, wall panels and hollow core slabs and double tee floor and roof members. The following is a list of the products and erection situations on this job:

Columns

For columns 10 ft to 36 ft long, employees disconnecting crane hooks from columns will work from a ladder and wear a body belt/harness with lanyard and be tied off when both hands are needed to disconnect. For tying off, a vertical lifeline will be connected to the lifting eye at the top of the column, prior to lifting, to be used with a manually operated or mobile rope grab. For columns too high for the use of a ladder, 36 ft and higher, an added cable will be used to reduce the height of the disconnecting point so that a ladder can be used. This cable will be left in place until a point in erection that it can be removed safely. In some cases, columns will be unhooked from the crane by using an erection tube or shackle with a pull pin which is released from the ground after the column is stabilized.

The column will be adequately connected and/or braced to safely support the weight of a ladder with an employee on it.

Inverted Tee Beams

Employees erecting inverted tee beams, at a height of 6 to 40 ft, will erect the beam, make initial connections, and final alignment from a ladder. If the employee needs to reach over the side of the beam to bar or make an adjustment to the alignment of the beam, they will mount the beam and be tied off to the lifting device in the beam after ensuring the load has been stabilized on its bearing. To disconnect the crane from the beam an employee will stand a ladder against the beam. Because the use of ladders is not practical at heights above 40 ft, beams will be initially placed with use of tag lines and their final alignment made by a person on a manlift or similar employee positioning systems.

Appendix IV: OSHA and Nonprofit Organizations**Coverage of Employees under the Williams-Steiger OSHA 1970**

Regulations (Standards - 29 CFR) Coverage. - 1975.4 1975.4(a)

General. Any employer employing one or more employees would be an "employer engaged in a business affecting commerce who has employees" and, therefore, he is covered by the Act as such.

Nonprofit and charitable organizations. The basic purpose of the Williams-Steiger Act is to improve working environments in the sense that they impair, or could impair, the lives and health of employees. Therefore, certain economic tests such as whether the employer's business is operated for the purpose of making a profit or has other economic ends may not properly be used as tests for coverage of an employer's activity under the Williams-Steiger Act. To permit such economic tests to serve as criteria for excluding certain employers, such as nonprofit and charitable organizations which employ one or more employees, would result in thousands of employees being left outside the protections of the Williams-Steiger Act in disregard of the clear mandate of Congress to assure "every working man and woman in the Nation safe and healthful working conditions . . .". Therefore, any charitable or non-profit organization that employs one or more employees is covered under the Williams-Steiger Act and is required to comply with its provisions and the regulations issued thereunder. (Some examples of covered charitable or non-profit organizations would be disaster relief organizations, philanthropic organizations, trade associations, private educational institutions, labor organizations, and private hospitals.)

Appendix V: Sample Survey after First Walk Through

Project Name	Veterans Highway House
Address	22261 Veterans Hwy (corner of Veterans Hwy and Presque Isle) Port Charlotte, Florida
Building Owner	Charlotte county
Contact Information	Mike Sosadeeter Resource Management Group, Inc. 941-358-7730
Building Type	L-shaped ranch style residential Concrete block exterior on concrete slab Wood framing with drywall interior Carpet/tile floors In-ground swimming pool Red barrel tile roof Large pool cage
Age of Building	Built in 1989
Building Size (square feet, number of stories, etc.)	Approx. 5,400 square feet One story
Landscape Type	Grass lawn Foundation plants including lilies, other perennials
Deconstruction Timeline	Hold 2-day deconstruction workshop on July 26-27 Habitat for Humanity will complete the deconstruction July 28-Aug. 3 County to perform: <ul style="list-style-type: none"> • Site clean up • Pool removal/filling in • Grading and seeding, as needed • Disposal of non-recyclable/reusable materials/components
Habitat for Humanity will be responsible for all Reusable/Recyclable Materials/Components	<ul style="list-style-type: none"> • Carpet (IF too wet and stained County responsibility) • Bath fixtures/cabinets (reuse) • Kitchen fixtures/cabinets/appliances (reuse) • Large mirrors (reuse) • Lighting (reuse) • Doors – interior, exterior, sliding glass doors (reuse) • Shutter bifold closet doors (reuse) • Windows (reuse) • Wood framing (reuse) • Wood trusses (reuse) • Clay tile roofing (reuse) • Electrical (reuse electrical panel and boxes)

	<ul style="list-style-type: none"> • Plumbing (reuse/recycle) • Pool cage (recycle the frame) • Tile roof (reuse) • Insulation (reuse) • Plywood sheathing on roof (reuse) • Plants, shrubs, flowers, trees (reuse) • Pool pump/filter (to Demolition company) • Water filter/pump (to Demolition company)
<p>Charlotte County Responsibilities</p>	<p>Arrange for all necessary permits</p> <p>Disconnect all utilities:</p> <ul style="list-style-type: none"> • Sewer/septic • Electrical • Water • Cable • Phone <p>Dispose of all hazardous materials/components on site that could include (no hazardous materials were identified during the initial site visit):</p> <p>Paint</p> <ul style="list-style-type: none"> • Oils, Refrigerants, Solvents <p>Supply a 30 yard dumpster at start of project (additional pulls necessary depending on amount of material) to dispose of all materials that cannot be reused/recycled to include but not limited to:</p> <ul style="list-style-type: none"> • Carpet (if it is too wet or stained) • HVAC (AC unit doesn't work) • Pool cage (screen material) • Electrical (wiring) • Plumbing (valves, connections, other non-reusable/recyclable parts) • Tile flooring • Swimming pool tile • Swimming pool (remove or fill in) • Concrete block • Concrete slab & driveway • Stone fireplace • Miscellaneous materials left at the site that cannot be reused/recycled <p>Project Close Out:</p> <ul style="list-style-type: none"> • Site clean up • Pool removal/filling in • Grading and seeding, as needed • Disposal of non-recyclable/reusable materials/components\

Appendix VI: Sample Building Engineering Survey**Deconstruction Building Engineering Survey – 15 SW 2nd Place, Gainesville, Florida**

Before any work commences, a competent person will perform a building engineering survey. Due to the nature of deconstruction, i.e. the building may be old and have had building additions and layers of materials added over time, some factors may not be determined until work has commenced. After work has begun an engineering survey will take place daily, and additional procedure and safety requirements will be determined as the need arises. The process of reviewing the 3 houses for deconstruction from November 7, 2001 to December 15, 2001 is comprised of:

- A lead and asbestos survey completed by the Owner
- Visual inspection including access to attics and crawlspaces
- General and building element-specific photographs
- Measurements and creation of “as-built” floor plan(s), and elevations
- Written record of hazards and potential hazards, including damage to the building
- Identification of load-bearing and non-load-bearing structure.
- Identification of the chronological process for each building
- Identification of primary disposal and salvage components
- Identification of site conditions, access, and disposal, storage and processing areas
- Identification of site constraints

The purpose of the building engineering survey is to insure an adequate understanding of all major conditions and potential conditions that may pose a hazard and to assist in the determination of the process and techniques of the deconstruction. It is used to identify potential hazards (occupational health hazards, premature collapse, fall hazards, fire or electrical hazards, etc.) and develop control to prevent accidents. A written engineering survey must be prepared before work is begun, maintained on site, and updated as work progresses. The building engineering survey must be signed and dated by the person(s) performing the survey. A walk-through will be conducted at the end of every work day and a worker tool talk will take place at the beginning of every shift.

Construction type and structure size:

The location of the building is: 15 SW 2nd Place, Gainesville, Florida 32601

Ground Floor = 2,904 SF

Second Floor = 1,052 SF

Covered Entrance porch = 37 SF

Wood Access Ramps/Deck = 630 SF

Inspection November 2, 2001

The structure is comprised of light-wood framing walls (2x4) and raised wood floor system (2x6, 2x8 joists) approximately 18” to 24” above grade on brick piers. The original portion of

the structure is 2 stories and several later additions are all 1 story. All second floor windows are below 20' above the grade below.

This building was occupied until very recently before it was slated for demolition and therefore is in excellent condition. There was no observable fire damage and minimal water damage was isolated to a few locations.

Second Floor Conditions

The southwest room has a jalousie type door (opening with glass panes) with several panes missing and no landing outside the door. The vertical glass opening sill is below 18" above the floor. There was apparent water damage in the ceiling where a portion of the wood lathe and plaster was sagging. This area did not appear to be in eminent danger of collapse and an inspection of the attic did not reveal any structural damage of the roof beams at this location.

There was considerable debris in the front room on the north side immediately over the downstairs stair entry vestibule.

Vandals had removed the second floor landing railing creating an unprotected edge over the stair. This edge is about 8' long and runs parallel to the direction of the stairs starting at the top of the landing.

Several windows in the southeast room had sills below 12" above the floor presenting a potential fall hazard when the windows are removed.

One window has missing sash but glass in the frame which might break when trying to remove window.

One window in the northeast room was broken with plastic sheeting taped in the opening. There was jagged glass in this window frame.

There was evidence of, and the person conducting the survey had observed homeless persons in the second floor. This evidence consisted of possible body fluids, clothing and food and beverage objects on the floor of several rooms.

First Floor Conditions

The kitchen area had considerable debris underfoot, overhead duct work and various jars with unknown liquids in them. The floor appeared to have remains of dirt and possible grease. This room also had minimal to no natural light access. There was a large refrigeration unit outside in the lean-to shed area that probably has freon or other refrigerant that will be a hazardous material.

There is a restroom located in the center of the first floor area that does not have access to natural light and any degree of ventilation except for the doorway. This area has toilets, sinks, etc.

Behind the bar there was considerable broken glass on the floor and a long wall mounted mirror.

The bar and kitchen area in general contained considerable debris and possible food and beverage waste in various containers.

There was one broken window on the east side of the building that had been partially closed off with plywood.

Site Conditions

The access ramp on the east side of the building has a section of top railing broken off leaving an open edge at about 24" above the grade below. The posts on this elevated walkway were several feet apart and there was no mid-rail. The small covered entryway platform on the southwest corner of the south-side 1 story addition had several rail stiles broken off of the railing.

There are considerable number of trees and brush including palmettos mainly on the east and north side of the building with branches protruding at eye-level. These bushes will be removed and/or trimmed to allow access to the sides of the building and remove eye and tripping hazards.

There are sections of chain-link fence and wood fence that limit clear access around the perimeter of the building, on the west and south sides, that will be removed through mechanical means at the beginning of the project and before the hand labor team begins work.

Overhead power lines will remain in place along the west edge of the property. These do not pose a hazard to workers, but may pose a hazard for the use of heavy equipment and the dropping and pulling of roll-offs along that side of the building.

There is a brick wall of an adjacent building that limits access for heavy equipment and roll-off containers on the east side of the building. It is about 20' from the east side of the building. The south side of the building is open area, which is formed by this building and adjacent buildings on the block. It currently has some debris including metal roofing and miscellaneous wood and masonry. This area will be cleared to make room for work activities.

Structural Layout

The building has 4 clearly defined sections. The original structure is a T-shaped 2-story building which appears to have had a first story front porch at the NE corner and a porch at the back or south side, on the second floor. Both of these porch areas were enclosed.

Two 1 story sections were added extending south from the south side of the 2-story building and another partially open 1 story addition was added to the west side of the structure. The building has one central stairway providing access to the second story and directly to the outside via a separate entrance door.

Condition of wall framing, floors, roofs

Condition of wall framing, floors, roofs are all sound, no major damage or danger of imminent collapse. Small holes in the roof were recently created by the abatement of asbestos caulking and mastic around several chimneys, at the intersection of the chimney and the roof finish. Wall and floor framing are intact.

Possibility of unplanned collapse

The building is structurally sound as is. Deconstruction process will create weakened sections as supporting elements are removed, such as roof sheathing, wall sheathing. Cross-bracing and supports will be added to insure any structural elements remain sound during the process. The table on the next page illustrates the deconstruction process.

Schedule and Process for dismantling 15 SW 2nd Place

Date	Major Tasks	Workers/Super
M 11/05	Site clearing, get tools on-site, confirm agreements, other equipment, roll-off locations, demolition fencing and wood deck on east side, make entry ramps for workers.	1/1
T 11/06	Remove bushes, demolish the open-air addition on the west side	1/1
W 11/07	Clean-out interior garbage, fixtures, bar, appliances, remove all windows and doors	6/2
Th 11/08	Remove windows and doors, interior fixtures, interior trim, lathe/plaster	6/2
F 11/09	Remove trim, lathe/plaster, dropped ceilings, ductwork, wiring, insulation	6/2
S 11/10	Remove lathe/plaster, dropped ceilings, ductwork, wiring, insulation	6/2
T 11/13	Remove 2 nd floor non-load-bearing walls, 2 nd floor roof finish, chimneys above roof line	6/2
W 11/14	Remove 2 nd floor exterior sheathing, 2 nd floor exterior walls	6/2
Th 11/15	Remove 2 nd floor exterior walls, 1 st story roof finish	6/2
F 11/16	Remove 1 st story roofs, remove 2 nd floor structure, chimneys down to second floor, wood processing	12/2
S 11/17	Remove 2 nd floor structure, remove 1 st floor exterior siding	6/2
M 11/19	Remove 1 st floor exterior siding, 1 st floor non-load-bearing walls, 1 st floor exterior walls	12/2
T 11/20	Remove 1 st floor exterior siding, walls, floor finish	6/2
W 11/21	Remove 1 st floor structure, 1 st floor piers, chimneys	6/2

Appendix VII: Sample Agreement

This Agreement made and entered into on January 2001, by Alachua County Public Works Department, and the University of Florida (UF) on behalf of the Center for Construction and Environment (CCE), a part of the M.E. Rinker, Sr. School of Building Construction, College of Design, Construction and Planning, for the CCE to conduct research and training via the deconstruction of the structure at 1521 NW 71st Street, Gainesville, Florida, 32605. The work will entail field training/supervision, data collection, and the deconstruction of the aforementioned structure during a period from February 1, 2001 to March 26, 2001. The deconstruction of the structure will hereafter be referred to as The Project in this document. Alachua County will hereafter be referred to as The Owner in this document. The structure at 1521 NW 71st Street will hereafter be referred to as The Building in this document.

Period of Performance

This Agreement shall become effective on February 1, 2001 and shall terminate on June 5, 2001.

Project Director

The Project Director at Alachua County

Name

Street

City, State

Tel:

Fax:

The Project Director for Administrative matters at the University of Florida

Sandra Goldstein, Associate Director for Research

Division of Sponsored Research

219 Grinter Hall

PO Box 115500

University of Florida

Gainesville, Florida 32611-5703

The Project Manager for Technical matters at the Center for Construction and Environment

Bradley Guy, Research Associate

Center for Construction and Environment

PO Box 115703

Gainesville, Florida 32611-5703

Tel: (352)-392-7502

Fax: (352)-392-9606

Scope of Work

The Scope of Work of The Project will be: 1) a certified lead and asbestos survey, 2) abatement of asbestos containing materials (ACM) if required before commencement of work, 3) all permits and waivers required for the removal of The Building, 4) the removal of The Building and all building-related debris within three (3) feet of The Building perimeter, above ground, and excluding the building slab-on-grade, sidewalks, parking areas, septic tanks, and utilities.

Allocation of Funds

It is agreed to and understood by the parties that this Agreement will be for a Contract Amount not-to-exceed \$9,500.00. The CCE shall make invoices for the project based on two project phases, 1) Fifty percent (50%) completion of the work, and 2) One hundred percent (100%) completion of the work. Total project costs will be due within 30 days of the final completion of The Project. If The Project is terminated before the first invoice is submitted, through no fault of UF-CCE, all documented costs incurred by UF-CCE will be paid in full. If The Project is terminated after the first invoice is submitted, but before the final completion of The Project, through no fault of UF-CCE, additional costs will be paid in full by The Owner upon submittal of invoices by UF-CCE.

UF will submit Invoice #1 of \$4,750.00 (50%) due at the fifty percent (50%) completion of The Project.

UF will submit Invoice #2 of \$4,750.00 (50%) due at the final (100%) completion of The Project.

Responsibilities of the Parties

- Pre-deconstruction job meeting(s), and job-site meetings as needed.
- Coordination of required permits, waste disposal, utility disconnects, asbestos and lead survey, and ACM abatement (if required)
- Coordination of selected building salvage removal and disposition for items as requested by The Owner.

The Responsibilities of The Owner

- The Owner will require waivers of liability for all workers and consultants who will enter the project site.
- Secure demolition permit and utility disconnects, as required.
- Provide up to eight (8) - twenty (20) cubic yard roll-off containers on site as needed in coordination with CCE Job Supervisor and with adequate (three (3) working days) notice.

The Responsibilities of UF-CCE

- Complete removal of the structure at 1521 NW 71st Street, Gainesville, Florida and all building –related debris within three (3) feet of the building perimeter, above grade, excluding slab-on-grade, sidewalks, parking areas, septic tanks, and utilities.

- Removal and delivery of selected salvage items to The Owner, as agreed upon before commencement of work.

Financial Records/Reports

Both The Owner and UF-CCE shall maintain books, records, documents, invoices, and other evidence and accounting procedures and practices as will permit UF to sufficiently and properly reflect all costs and materials quantities of any nature associated with the project, and permit such records to be subject to inspection, review, and audit by either The Owner or UF, or their respective representatives.

Activity and Final Reports

UF shall keep records and make a final report to The Owner if requested.

Insurance

During the term of this agreement, the UF shall provide and maintain, at its own expense, worker's compensation and unemployment insurance as required by law. Said insurance policies (worker's compensation, unemployment, liability, and other insurance) shall be and remain in full force and effect for the duration of this agreement, including any extensions or renewals thereof. UF shall provide proof of such insurance coverage upon request. UF shall notify The Owner of any cancellation or reduction in such insurance coverage.

Indemnification

The UF assumes any and all risks of personal injury (including death) and property damages (including destruction) attributable to negligent acts or omissions of the CCE and the officers, employees, servants, and agents thereof in the performance of this agreement. The UF and The Owner further agree that nothing contained herein shall be construed or interpreted as, (a) denying to either party any remedy or defense available to such party under the laws of the State of Florida; (b) the consent of the State of Florida or its agents and agencies to be sued or the consent of the University of Florida, its officers, agents, and employees to be sued; or (c) a waiver of sovereign immunity of the State of Florida or of the University of Florida beyond the waiver provided on Section 768.28, Florida Statutes (1993).

Termination

The failure of either party to comply with any provision of this agreement shall place that party in default. Prior to terminating this agreement, the non-defaulting party shall notify the defaulting party in writing. The defaulting party shall be given seven (7) days in which to cure the default. Notification shall make specific reference to the provision, which gave rise to the default. Either party may terminate this agreement without cause by first providing at least fifteen (15) days prior written notice (received in writing) to the other party prior to the termination date.

Entire Agreement

This agreement constitutes the entire Agreement between the UF and The Owner. Any modifications, amendments or alterations shall be in writing and executed by both parties prior to becoming effective.

The parties have executed this Agreement the day and year first written above.

UNIVERSITY OF FLORIDA

ALACHUA COUNTY

Witness: _____

Witness: _____

Acknowledged by Bradley Guy, CCE

Appendix IX: Deconstruction Checklist

- ❑ Inventory materials in building and assign to categories with estimated quantity and value. Categories are: reuse, recycle, hazardous disposal, C&D disposal, solid waste disposal. (See Appendix VIII)
- ❑ Know where the reusable, recyclable, hazardous disposal, C&D disposal, and solid waste disposal will go and the means to get it there. Understand and prepare specific outlets (contacts), general markets (advertisement) and methods (equipment, labor, sub-contracts) for removal of all materials from site.
- ❑ Determine if the building is has a historic designation, is in a historic district, or the local municipality has a review process, delay, or variable fee structure for demolition permits.
- ❑ Estimate cost and finalize contract, this can vary, as with the preference to have the Owner pay directly for lead and asbestos surveys and any asbestos abatement, given the unknown cost. The contract also determines the scope of work for the deconstructor as either a sub-contractor or the contractor responsible for the complete removal of all building-related debris including foundations, septic tanks, site cleaning, etc. Lastly, the contract can stipulate ownership, donation value of the salvaged materials by the Owner, or revenue-sharing between Owner and Contractor depending upon scope, for-profit versus non-profit, potential reuse of the materials.
- ❑ Do lead and asbestos surveys by certified environmental firm if building built before 1981.
- ❑ Disconnect all utilities and obtain demolition permit. These are often intertwined - i.e. a demolition permit must have a certification that utilities have been disconnected in order for it to be issued.
- ❑ Do building engineering survey and dismantling process plan. This is completed and signed off on by the competent person who will oversee the deconstruction itself. This plan indicates known hazards at the time of the inspection and the general schedule, tasks, techniques and tools to be used to conduct the deconstruction. The survey and plan are updated as the project progresses.
- ❑ Complete asbestos abatements (if needed)
- ❑ Secure labor, and materials storage areas both on and off-site. This includes security against pilferage during project if needed.
- ❑ Secure use of heavy equipment and disposal roll-offs, access to landfill, i.e. sub-contractors, includes Porta-Potty for duration of project.

- ❑ Determine locations and arrangements of delivery or pick-up for recyclables such as metals, concrete including possible trees and plants salvage.
- ❑ Determine locations for disposal of any additional hazardous materials found such as paint, oils, refrigerants, and solvents.
- ❑ Determine nearest medical care facility, routes and telephone.
- ❑ Complete any site access arrangements and/or site security arrangements.
- ❑ Complete job site plan for ingress and egress, locations of worker parking, roll-offs, tool storage and dispersal, job “office” (can be a table or bed of pick-up, etc.) job-site sign, metals “pile,” denailing and processing stations, materials lay down area(s) for processed materials or materials not requiring processing, “sales area” for on-site sales, and loading area for materials removal. (Roll-offs, de-nailing will change the most over the duration of project.)
- ❑ Storage and inventory areas should be as out of way as possible for duration of project to avoid double moving. Organizational and job specific safety plan includes respiratory protection, fall protection, etc. as well as OSHA 200 forms, job-site daily log, job site hazard analysis and personal protective equipment certification forms.
- ❑ Conduct worker training pre-deconstruction and sign waivers of liability (if appropriate)
- ❑ Prepare site with any site clearing, signage placement, drop-off of roll-offs, placement of sawhorses for processing, materials storage areas, etc.
- ❑ Insure adequate clear area around building, shade for processing areas, no overhead hazards such as branches, powerlines that will interfere with roll-off deliver and pick-up, workers on roof. Inspect site for holes, tripping hazards, animal hazards, etc. and remediate all potential hazards.
- ❑ Removal of windows and doors, simultaneously inspect and remove all biological hazards, miscellaneous interior and exterior trash, insure water lines are drained, electrical, natural gas, etc. are off and flushed out.
- ❑ Continue with daily safety training, tool talks, and task-based safety analysis and training throughout the deconstruction.

Appendix X: Web site References and Sources

Alameda County Waste Management Authority

<http://www.stopwaste.org/fsbuild.html>

Building Savings: Strategies for Waste Reduction of Construction and Demolition Debris from Buildings

www.ilsr.org/recycling/buildingdebris.pdf

Building Deconstruction Consortium

<https://www.denix.osd.mil/denix/Public/Library/Sustain/BDC/bdc.html>

California Integrated Waste Management Board (CIWMB)

www.ciwmb.ca.gov/condemo/

Center for Construction and Environment

www.cce.ufl.edu

City of Austin – Deconstruction and Green Building

<http://www.ci.austin.tx.us/sustainable/deconstruction.htm>

Community Woodworks

www.communitywoodworks.org

Construction Materials Recycling Association (CMRA)

www.cdrecycling.org

Deconstruction Institute

www.deconstructioninstitute.com

Defense Reutilization and Marketing Service

www.drms.dla.mil/

Demolition Practices Under the Asbestos NESHAP

<http://www.epa.gov/region4/air/asbestos/demolish.htm>

FDEP Innovative Recycling Program Grants

<http://www.dep.state.fl.us/dwm/programs/recycling/igg2k/default.htm>

Ft. Ord Military Base Pilot Deconstruction Project

www.fora.org/pilot.html

Ft. McCoy Army Base Demolition Program

<http://www.mccoymilitary.com/factsheets/BLDGDEMO.asp>

Greater Vancouver Regional District – Job-site Recycling Program

<http://www.gvrd.bc.ca/waste/bro/dlcgde.html>

Green Building Information Council of Canada

<http://greenbuilding.ca/>

A Guide to Deconstruction. U.S. Department of Housing and Urban Development

www.huduser.org/publications/pdf/decon.pdf

Habitat ReStore Network

<http://www.habitat.org/env/restore.html>

INFORM Reports: Building for the Future: Strategies to Reduce C&D Wastes in Municipal Projects

<http://www.informinc.org/>

Institute for Local Self Reliance's (ILSR's) Building Deconstruction Page

www.ilsr.org/recycling/builddecon.html

King County, Washington C&D Recycling

http://dnr.metrokc.gov/swd/bizprog/sus_build/how_others.htm

The Materials for the Future Foundation

www.materials4future.org

National Association of Home Builder's Research Center

<http://www.nahbrc.org/builders/green/index.html>

Online Building Materials Exchange

www.building99.com

OSHA Demolition Guidelines

<http://www.osha-slc.gov/SLTC/demolition/index.html>

Recommended Management Practices for the Removal of Hazardous Materials from Buildings Prior to Demolition

<http://www.uwm.edu/Dept/EHSRM/PROJECT/Demolition.PDF>

Smart Growth Network – Series of Reports on Deconstruction

<http://www.smartgrowth.org/ISSUEAREAS/buildings.html>

Sources of Asbestos in Buildings

<http://www.worksafe.org/Training/bldgmaterials.shtml>

Sustainable Architecture Compendium. National Pollution Prevention Center for Higher Education, University of Michigan

www.umich.edu/~nppcpub/resources/compendia/architecture.html#ranr

Sustainability at University of British Columbia

http://www.sustain.ubc.ca/whatsnew_archive.html

Used Building Materials Association (UBMA)

www.ubma.org

U.S. Environmental Protection Agency Construction and Demolition Debris

www.epa.gov/epaoswer/non-hw/debris

US EPA Asbestos Web page

<http://www.epa.gov/opptintr/asbestos/>

US EPA Jobs Through Recycling

www.epa.gov/jtr/comm/construc.htm

US EPA Lead-Based Paint Regulations

<http://www.epa.gov/opptintr/asbestos/>

WasteSpec. Model Specifications for Construction Waste Reduction, Reuse, and Recycling.

Triangle J Council of Governments

www.tjcog.dst.nc.us/cdwaste.htm

Job Site Daily Checklist

Job Site Safety

- ❑ A pre-start site meeting will be held every day to review procedures and the day's activities / responsibilities.
- ❑ Deconstruction hazards shall be identified and appropriate actions taken to prevent any possible injuries from these hazards, including proper equipment, signage, and barriers.
- ❑ Medical emergency information and cell phone location will be noted.
- ❑ First aid kit will be placed in visible / accessible location.
- ❑ Fire extinguisher will be placed in a visible / accessible location.
- ❑ Hand washing station and drinking water station will be set up. Reusable cups will not be used.
- ❑ Smoking is prohibited in or near any building under deconstruction and is prohibited on any site where lead-based paint has been identified.
- ❑ Work in lead environment will require lead and asbestos awareness training, use of half-mask respirator, blood lead level test before and after project (short term less than 6 months).
- ❑ Other lead environment engineering control protocols and procedures will be followed including providing maximum ventilation, use of HEPA vacuum and wetting as needed, smoking prohibition, hand washing and glove use protocol, change of clothing at end of work day.
- ❑ Basic job site cleanliness, removal techniques, and materials /tools storage practices will be followed including:
 - ❑ Do not leave tools underfoot or in a door or passageway.
 - ❑ Do not place a board or material with nails pointing up and do not place these materials where someone is working (unless pulling nails), near or sticking into a doorway or passageway.
 - ❑ All workers are responsible for their own and others safety and shall inform the supervisor of any conditions that they deem unsafe for themselves or for any other.
 - ❑ Safety and health violations will be noted. Repeated violations or failure to take corrective action as instructed by supervisor will be grounds for dismissal.

Personal Safety and Protection

- ❑ Check and distribute - hardhat, gloves, ear plugs, safety glasses, steel-toed boots, and absence of personal jewelry that may pose a hazard.
- ❑ Hard hats are to be worn at all times within 10 feet of the building perimeter and whenever working under or near objects overhead, such as ladders, scaffolding, heavy equipment that may be present at the site.
- ❑ Long sleeves shirts should be worn when there is exposure to fibrous materials.
- ❑ Fall protection will be used for any surface 6 feet above the surface below.
- ❑ Fall protection will be used by those properly trained in its use.
- ❑ Half-mask respirators rated at least N-95 as per NIOSH standards for particulate filter efficiency shall be worn whenever there is possible exposure to dust, fibers, particulates, microbial agents, oils, etc.

- ❑ Use of half-mask respirator will require physical check-up, training in care and use, fit testing.
- ❑ Hands shall be washed before taking a break or eating food, and at the end of the workday.

Tools and Equipment

- ❑ Tools will only be used by those trained and competent in their use.
- ❑ Instruction on proper use of hand tools will be conducted in accordance with manufacturer's instructions.
- ❑ Instruction and proper use of ladders and scaffolding will be conducted in accordance with manufacturer's instructions.
- ❑ Ladders with broken parts will not be used.
- ❑ Instruction and proper use of power tools, including but not limited to power saws, drills, and generator.
- ❑ Tools with damaged or broken parts will not be used.
- ❑ Power tools and cords that are damaged or broken will not be used.
- ❑ Damaged or broken tools, ladders and power tools will be taken out of service, tagged and locked as needed to warn against and prevent further use and removed for repair or replacement.
- ❑ Generator will be provided with a ground fault interrupter.

Site and Building

- ❑ Remove the first layer of materials that you can see before removing anything behind it, for example, remove ALL trim and electrical socket or switch plate covers before removing drywall.
- ❑ Treat any salvage as though it is yours and you are using it in your own house.
- ❑ Keep the structure as stable as possible via the order of the deconstruction.
- ❑ Do not throw away materials to be salvaged.
- ❑ Do not throw away any materials unless throwing directly into the dumpster.
- ❑ Remove nails as soon as possible, either from materials still in place or after taking directly to a de-nailing area.
- ❑ Do not hit materials or have a material in a position that horizontal projectiles can be created.
- ❑ Always control both ends of the material as it is being removed, either by someone holding on to it at the other end or with one end already resting on the ground.
- ❑ Do not remove structural walls or any walls or materials which are supporting something else until they are no longer acting in this structural capacity.
- ❑ Cleanup debris on all work surfaces CONSTANTLY.
- ❑ If you are walking on top of debris and cannot see the ground below, it is past time to clean up!!
- ❑ After materials have been removed either waste or salvage they should be removed in a timely fashion from the work area, either to 1) a dumpster, 2) a de-nailing station, or 3) a storage location for reusable materials.
- ❑ A material is not reusable until it has had all nails removed.

- ❑ When removing components that have parts such as screws or a light fixture with a glass lamp and separate fixture, keep the parts together by taping them, wrapping them in plastic or paper, or placing into a plastic bag, box, etc.
- ❑ Crowbar, flat bars, pry bar, shovel are to be used for removing materials. A sledgehammer is to be used for limited purposes and primarily to remove non-reusable items.

Some Facts

- US EPA has estimated that U.S. companies generate 136 million tons of building-related construction and demolition (C&D) waste per year.
- 92% of building-related C&D waste is from renovation and demolition.
- C&D waste is approximately 30% of all solid waste produced in this country excluding road and bridge debris.
- US EPA has estimated that only 20-30% of C&D waste is presently recycled.
- Excluding food and fuel, construction activities consume 60% of the total materials used in the U.S. economy.
- About 245,000 residential structures and 44,000 commercial structures are demolished each year in the US.
- Many older buildings contain asbestos and lead-based paint both hazardous to human health in renovation and demolition processes.
- Heavily leaded paint was used in about 1/3 of homes constructed before 1940, about 1/2 of homes constructed between 1940 and 1960, and then to a lesser extent until it was limited to 0.06% in any product in 1978.
- Landfills and incinerators are increasingly more expensive and problematic to open, operate and close.
- In order to sustain human society into the next century, resource efficiency will have to increase by a factor of 10.

Log on to www.deconstructioninstitute.com for an interactive benefits calculator with more facts.



Dumpster full of C&D waste

Deconstruction Overview

Below is an overview for preparing and carrying-out a deconstruction project. This checklist provides a quick overview of the basic steps. This is a general list only. Please refer to each section for more details.

Safety First

You will see the word **safety** throughout this deconstruction guide. Important safety points are noted with an orange bar.



Before considering a deconstruction program, the person who will manage the program must create a Deconstruction Safety Plan. For each new project, a Project Safety Plan will be created to handle any additional requirements to maintain safety at that specific project site. Elements of the Safety Plan will include worker orientation, hazard identification and training, guidelines for the use of tools, respiratory protection, fall protection, etc. The Safety Plan will contain procedures to handle emergencies, the proper OSHA forms, a job-site daily log, Personal Protective Equipment (PPE) use, and procedures for correcting unsafe behavior.

The Safety Plan is an accident prevention plan. Safety is a daily activity, and should be incorporated through DAILY safety talks at the beginning of the workday.

Survey

The first step in a potential deconstruction is a site visit to examine the building. This consists of visually surveying the building (inside and out) to estimate the basic material types and the overall condition of the structure. The next step is a building materials estimate that is comprised of inventorying the building material types and quantities, by number of items and by measuring the building.

It is also helpful to note basic conditions such as fire damage, water damage, rot, obvious leaks, and possible biological hazards such as bird or rat droppings.

Environmental Health and Compliance

Environmental surveys for lead and asbestos must be completed for any building built before 1978. The US EPA, OSHA and HUD all have regulations for dealing with asbestos containing materials (ACM) and lead-based paint materials (LBP). Although the EPA NESHAPS regulations exempt demolitions from the removal of non-friable ACM, deconstruction and salvage necessitate the removal of ALL asbestos before work begins. The deconstruction costs and processes will be heavily influenced by the presence of ACM and LBP materials. (Refer to www.epa.gov or www.osha.gov for detailed information on regulations or contact your local agency representative)

Workers should receive asbestos awareness training in order to be able to recognize “suspect” ACM both before and during the deconstruction. The presence of LBP will require worker protection and care in the handling of these materials.

Asbestos Abatement

Follow the law! All asbestos containing materials (ACM) must be removed before work begins. Be aware of all health and safety regulations for asbestos handling and disposal and handling of lead-based materials if they are in the building. Be sure that the abatement contractor makes proper notifications and permit applications to the state environmental protection department and that the abatement receives a proper clearance certifying that the building is safe to work in before starting the deconstruction. It is important to coordinate with the abatement contractor if their activities might damage salvageable materials. Plan for the time required for notification and abatement within the overall project schedule. (Refer to www.epa.gov/region4/air/asbestos for local regulations and contacts)

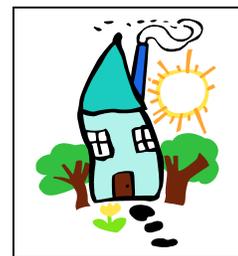
Contracts and Specifications

Estimating costs and finalizing a contract are the final pre-planning steps before agreeing to the deconstruction. There are many considerations in figuring out the project costs - starting with who is responsible for which costs. For example, if the Owner pays directly for necessary lead and asbestos surveys and asbestos abatement, then this does not need to be figured into the deconstruction costs. If the deconstruction is done by a non-profit, and the recovered materials are going to be a tax-deductible donation by the building Owner, this is also a major determining factor in how to price the deconstruction.

The contract also determines the scope of work for the deconstructor. It should be determined who is responsible for the complete removal of all building-related debris such as foundations, septic tanks, site cleaning, etc. as well as who will get any recovered materials. The costs of the deconstruction itself will be determined by the answers to these questions.

Historic Preservation

If a building is in an older part of the town or looks older than 50 years it may have historic preservation oversight by the local municipality. After determining the address, the municipal planning department or historic preservation organization should be contacted to research any historic building or district designations and the local demolition or deconstruction permits processes associated with historic buildings.



Permitting and Utilities

Disconnection of all utilities must take place before any work can begin. This includes - electricity, natural gas, water, wastewater, telephone and cable. Check with local utilities to determine the requirements and to have the work completed. Often the completion of the disconnection of the utilities is included in the demolition permit approval process. If activities such as on-site sales of materials are planned, there may be a required permit to carry out this activity as well.

Engineering Survey

According to OSHA, a demolition must have a building engineering survey and dismantling plan completed before work starts. The engineering survey and plan is completed and signed off on by a competent person who will oversee the deconstruction itself. This plan indicates known hazards at the time of the inspection, the structural make-up of the building and the general schedule, tasks, techniques and tools to be used to conduct the deconstruction.

The most critical aspect of the engineering plan is the identification of anything that is part of the building's structure and how these structural elements will be removed so as to not cause any unplanned collapses. The survey and plan are updated as the project progresses.

Organizational Plan

The organizational plan is the plan for dealing with all the management and worker issues and the specifics of how the deconstruction will take place. Taking the time to plan ahead can prevent many hardships later on. This plan is divided into several components that are described in the detailed section. Specific topics include Schedule, Labor and Responsibilities, Tools and Equipment, Sub-Contractors, Training, and Safety.

Site Plan

The Site Plan will determine the locations of everything that will happen on the site. The Site Plan can begin when the Building Survey is completed. The Site Plan has to work within the physical constraints of the project site and should be sensitive to neighboring properties and roads. The location of the site in the community will determine a lot about the site plan as well. For example, a highly visible site can facilitate on-site sales but increases opportunities for pilferage. It is not a bad idea to sketch out the site ahead of time and label it in order to communicate the site plan to others involved in the project.

Site Security

Planning for the site is the time to consider Site Security. Site Security includes preventing the theft of equipment and tools, as well as the safety of anyone trespassing onto the site. A partially dismantled house can be a temptation to vandals. Before any deconstruction begins, the decision about whether salvaged materials will remain

overnight will determine the needs for fencing, and lockable containers for storage or the time that it will take each day to remove materials from the site. Signage and warning tape should be used as due diligence to protect the public from the hazards of a deconstruction site.



Posting Signs



Warning tape for hazardous area

Materials Management Plan

Recovered materials have three places to go: Reuse, Recycle or Disposal. The steps in the detailed section describe ways to efficiently manage the materials, allocation of persons responsible for managing the materials, and the methods for planning and communicating efficient materials “flow” on the site. The materials management is the key to a successful and safe project. Remember that deconstruction is creating materials for reuse in the most cost-effective manner. Removing materials without damaging them and keeping them in good condition when handling them will insure that your effort is not wasted.

Always ask before any deconstruction: how will materials be distributed for reuse?

Plan ahead so that materials are not handled any more than three times !!

- First time: take it off the building.
- Second time: de-nail, trim and clean at the same time, and/or put it on the trailer, or stack on the site sale for reuse.
- Third time: take it off the transport for reuse or for storing at the reuse store. This type of efficiency will happen only by planning ahead.



Removal



De-nailing



Transport for reuse

Deconstruction Process

Once all of the planning has been completed, the actual deconstruction can begin. Each deconstruction project is different. For resources, case studies, links and online tools to help in the deconstruction process, log onto www.deconstructioninstitute.com.

Pete Hendrick's Seven Samurai Principles of Deconstruction

1. **Accumulation technique** - As you take down the building you will get different types of materials. Store materials according to dimension and from each project or part of the same project, keep adding that type of material until you have a critical mass large enough to use or sell as a large unit, i.e. pallet, forklift, square of roofing, room's worth. A critical mass is equivalent to what is found in a retail store, 1,000 BF for example.

2. **Personality phenomenon** - Apply your labor to the job that suits them. There are two parts; people who have to be pulling stuff off of the building are Type A. Those who can do the more mundane task like de-nailing are Type B. Third type carries the materials, cleans up, always moving from task to task and that is Type C.

3. **Excitement code** - Clean up as you go. Don't become so involved in doing the whole roof for example that you end up with large backlog of dangerous, and dirty and in the way stuff. Do not allow materials to be piled up between the Type A and the Type B people/ tasks.

4. **Monday morning conceptual and organizational lecture** - Periodically stop and talk about the next phase of the deconstruction; why it's next, so everybody understands not to go off on their own. How the crews are organized for each phase of the materials is very important and should be communicated so that everyone understands.

5. **Fatigue factor** - There are certain things you do not do when you are tired: Such as working on a roof or a ladder. Pace the hard stuff by switching off between jobs. For instance if you have three Type A's, instead of them all doing the hard tasks together, switch them around so that they can relieve each other over time and one is always fresher. Be aware of the heat factor get out of the sun whenever possible, put the de-nailing station in the shade or on the porch if you have one.

6. **Daily briefing of theories** - Every morning check out everyone for general health, sore body parts, and coordinate what is coming off the building and how much space is left for that phase. Decide the materials flow, when and where de-nailing stations are needed. Arrange how the crew is arranged between areas of the buildings. Everybody needs to know what everybody else is doing for that day. If one person or group gets caught up, they will know how to go to the next phase or help somebody else.

7. **Doing the right one** - Walk around and get a general view of the building you are considering deconstructing to determine age, species of wood and types. Look at the whole building. Look at the practicality of taking the building apart. Figure out the number of people and how long it will take. If two houses are the same size and both made of pine for instance, look at the amount of time they have been exposed, the older the house is, the better it is, it will have higher quality materials so if you get less, it will be worth more of your time if considering two similar buildings in size and type of construction.

Section 1: Safety

When dismantling a building element, it is helpful to know how it was put together and what tools were used. This means that in general the deconstruction will follow the rule of “last on - first off” (LOFO) sometimes including the additions to the building.



Remember - It rains in Florida! The roof should be left in place as long as possible during the process, and all salvageable interior finishes should be removed before the roof is taken off.

Pre-Planning

Deconstruction is considered demolition and is covered by the OSHA Code of Federal Regulations (CFR) 29 Part 1926 for Labor. See OSHA for more details.
<http://www.osha.gov/>



Safety starts with planning for the worst and taking every measure to prevent even the most minor incidents. It is reasonable to expect small minor cuts, scrapes, bruises, etc. but it is not reasonable to expect falls, electrical shocks, any major cuts or impact injuries. One aspect of deconstruction that differentiates it from more traditional and mechanized demolition is the use of predominantly hand labor. In the case of an integrated hand labor and mechanical labor process, the greatest care must be taken to insure the separation of people activities from the operation of mechanical equipment.

A competent person must always be on site to assess any potential safety hazard and have the authority to take corrective action.

A **competent person** “means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.” (OSHA29 CFR 1926.32)

The location of the nearest medical emergency treatment and telephone numbers for emergency services should be known by all workers, or if one is not available, a person who has a valid certificate in first aid training must be on the site.

The deconstruction process begins with protecting worker health in the removal and handling of lead-based painted materials (buildings built before 1978), exposure to possible biological hazards, and any asbestos containing materials that were missed by the asbestos survey.

At the beginning of the deconstruction process, the entire site should be checked for miscellaneous hazards such as holes, roots and uneven ground, biting animals and insect nests, tree limbs that might be in the way, overhead wires, fences, etc. that might cause accidents and inhibit equipment movement.

How the building will be taken apart, the movement of people and materials, and the use of tools and equipment all create potential on-going hazards during the deconstruction.

Safety starts with the site and ends with each worker. Think of safety as a series of concentric rings from the outer ring of site and building conditions, to the inner ring of the actions of workers and their personal protective equipment. Refer to Appendix I “General Organizational and Safety Plan”.

The following table was adapted from the top 100 Causes of Injuries published by OSHA. It shows the most frequently cited OSHA construction standards related to physical hazards in 1991.

Rank	Description of Standard	
1	Fall Protection	Guarding open sided floors/platforms
2	PPE	Head protection from impact, falling objects
3	Electrical	Ground fault protection
4	Electrical	Path to ground missing or discontinuous
5	Trench/Excavation	Protective systems for trenching/excavating
6	Scaffolding	Guardrail specs for tubular welded frame scaffolds
7	PPE	Appropriate PPE used for specific operation
8	Ladders/Stairways	Stair rails required
9	Fire Protection	Approved containers or tanks for storing combustible liquids
10	General Provisions	General Housekeeping

Safety - First Line of Defense

The Building

The first aspect of preventative safety is that the building has been abated of all asbestos (see photo) and that any possible and accessible biological hazards have been dealt with.



The building elements should be physically sound and able to support the weight of workers, and not present a danger of collapse wherever workers might be present. Any shoring or stabilizing should be completed prior to the deconstruction and as needed during the process.

No worker should contribute to the instability of the building by (for example) removing load-bearing walls when they are still supporting a floor or roof above. Do not remove vertical or horizontal structural elements “before their time.”

The Environment

Rain and wet conditions pose immediate hazards and work should not take place in the rain or in excessively wet conditions. Wet conditions can cause slips and electrical shocks.



Extremely hot and or humid conditions and lack of ventilation are sources of heat exhaustion and stroke, and care should always be taken to insure adequate water consumption, as much shade as possible, and not overtaxing workers to the point that they might make serious mistakes.

Tools

The tools to be used should be adequate to the tasks, in proper working condition and used properly. Power tools must have proper insulation and grounding. The proper tools also include safety systems such as grounding for electrical generators, harnesses for fall protection, lock-out tags, warning tape, medical first aid kit, and fire extinguishers. (See Appendix II for “Basic Tools Necessary”).



Supervision and Training

The persons supervising the work (competent person) must know how to spot hazards and what to do about them, the proper order and techniques for the deconstruction, and how to communicate tasks to the workers. Training should always be given and acknowledged for any new worker and then again for each new task and piece of equipment.

Safety is the result of communicating to workers how to do things in a safe manner. Safety is also the result of communication between workers. Everyone on a deconstruction site needs a constant “heads up” attitude about what and where people are in relation to the building, the ground, the materials, pieces of equipment, and to each other.

Clean Site

A clean job site is a safe one. The simplest cause of nail punctures and tripping is when salvaged wood members with nails still in them are allowed to pile up or are allowed to sit in areas where people are walking. Tripping and slipping comes from allowing debris to pile up in the work areas. **Always remove nails from wood at the earliest opportunity and stack materials for denailing away from where people are working or walking.**

Clean up salvage and debris as you go!!

Safety - Last Line of Defense

When all else is considered, from the weather to the building itself, Personal Protective Equipment (PPE) is the last line of defense. Lumber with nails sticking up in a pathway or a piece of flying debris should not be present in the first place, BUT if an accident happens, PPE will help prevent injuries. Basic PPE for every worker are:



Ready to work

- **Hardhat** - for any work where objects are overhead, debris might fall, or even someone might be carrying a piece of lumber nearby for example. Hardhats should be put on whenever entering the work zone and kept on!!
- **Gloves** - leather palm gloves provide some impact resistant; help prevent blisters and splinters, and cuts from sharp objects.
- **Safety Glasses** - safety glasses prevent impacts to the eyes from small flying objects, and dust, debris, and fibers that might fall from above, and sparks or splinters from cutting or chiseling metals or masonry. It is extremely important to use safety glasses whenever using power tools that might cause debris to fly about or in case of a broken blade.
- **Steel-Toed Boots** - steel-toed boots and preferably also steel soles provide protection from objects that might impact the foot from above and from the side, and provide protection from stepping on nails. Boots with steel soles are the only real protection from stepping on nails. Boots also provide ankle support for uneven footing.
- **Long Pants** - long pants may be hotter than short pants, but provide an invaluable layer of protection from sharp edges or nails.



- **Ear Plugs** - ear-plugs are used when power tools and generators are creating a lot of noise. OSHA provides a guideline for the levels of noise when ear-plugs should be used.
- **Particle Filter Masks and Half Mask Respirators** - respiratory protection is an important aspect of worker health and safety whenever there is potential for respiratory hazards such as dust, fibers, and lead-based paint. A particle filter mask is only good for dust and is not sufficient for protection against lead-based paint. A properly fitted-tested half mask respirator with proper filter is required for working in an environment containing lead-based paint.



Hard Hat with Ear protection



Particle filter mask and ear plugs

Safety - Bottom Line

Two of the most dangerous aspects of deconstruction are being caught or struck by - materials, tools, and especially by nails, and falls - from ladders, by tripping, slipping, and from positions on roofs or the roof structure

Being hit by materials often comes from lack of communication between workers so that one worker hits another with a piece of material. Another cause of being caught or struck by is from hitting materials or trying to muscle something apart and having it suddenly give. When a tool involved, this also often results in workers hitting themselves with a tool such as a crowbar. **“Sorry” doesn’t count after someone is hurt!**

Refer to “Job Site Daily Checklist” in Section 6.

Fall Prevention



It is not the fall that hurts - it's what you land on at the end of the fall!!

Do not leave dangerous things for yourself or others to be tripped by, or to fall on!!

OSHA requires fall protection for heights starting at 6 feet above the surface below.

Many people are uncomfortable with heights. No workers should be asked to work at heights, unless they are comfortable doing so. Care should be taken when workers are tired, or exposed to high heat and humidity, which can reduce alertness and balance. The best fall protection strategy to begin with is a healthy and alert worker.

Fall protection comes in several forms - from personal body harnesses to railings, to controlled access zones and monitoring. Personal body harnesses must be properly anchored to be effective.



Fall protection gear



Side view on



Back view on

Deconstruction is unique in that it involves removing the building elements from around the worker. This means creating a “leading edge” - reducing the places to secure a body harness or place a railing and to stand safely - all at the same time!!

In the case of removing a roof structure or second floor, the worker is actually creating more openings through which to fall!! At some point during the removal of roofs and upper floors, it will be necessary to start working from below on scaffold or ladders, thereby reducing the fall hazard.

***Follow OSHA regulations for using ladders and fall protection.
Do not use ladders that are broken or too short for the task.
Minimize dragging and banging ladders around.***

When using extension ladders always tie the ladder off to the edge that it is leaning against. Use buddies to help hold the extension ladder from the backside, hold a regular ladder, and to hand up tools. Holding a ladder from the backside, the opposite side from the person on the ladder will insure that if the person on the ladder does fall, they do not fall on the person holding the ladder. (Refer to Appendix III “Sample Fall Protection Plan” for how to set up a fall protection plan for the deconstruction project).

OSHA provides guidelines for the placement and angle, and extension of extension ladders - the angle should be 70 degrees, feet placed on firm ground, and the top of the rail should extend 36 inches above the level where stepping off of the ladder.

Ladder Use

Rules of Thumb:

- Keep passageways clear and clean-up debris. This prevents slips and also allows for placing ladders on a flat clear surface.
- Know where you are stepping, know where edges and steps are, mark them and use rails.
- Check floors and roofs for holes and rotted wood or weaknesses before using them for support. Take the time to reinforce, stabilize, and cover holes with plywood, etc.
- Always work facing into a ladder, if something gives, you will fall into the ladder, which is the strongest position. Never assume that a ladder is latched properly, set on the ground properly. Always check it yourself.
- Standing at the base and extending your arms straight in front of you can approximate the proper angle of an extension ladder. Your fingers should comfortably touch the ladder. If you do not reach the ladder, the angle is too low. If you reach past the ladder it is too steep.



Proper use of step ladder



Proper angle of extension ladder

Safety Training

A safe deconstruction project requires that all those present on the site know the Safety Plan and know how to accomplish the work. It is also necessary to assign clear roles and responsibilities so that each worker knows who is responsible for specific tasks such as Supervision, Safety, Medical and First Aid, Tools, Materials Management, Deconstruction - and knows where information is and what to do in special circumstances. **This deconstruction guide is part of the training process.**

Specialized training may be required for such things as Fall Protection and Respiratory Protection.

Do not allow untrained persons to work at the site, even for a moment. If an untrained person is hurt the deconstruction contractor is responsible for not properly preparing the worker. Train all workers and make sure that they acknowledge this training in writing.

Job site safety includes not only the actual process of being safe but also the formalities of training and record keeping that serve for legal requirements. These formal structures serve an invaluable purpose of giving structure to job site safety training and consequently the process of the deconstruction itself.

Emergency Planning

The American National Standards Institute (ANSI) in its ANSI A10.6-1983 - Safety Requirements For Demolition Operations states: "No employee shall be permitted in any area that can be adversely affected when demolition operations are being performed. Only those employees necessary for the performance of the operations shall be permitted in these areas."

Medical Services and First Aid

Prior to starting work, provisions should be made for prompt medical attention in case of serious injury.

- The nearest hospital, infirmary, clinic, or physician
- Instructions for the most direct route to these facilities.
- Proper equipment for prompt transportation of an injured worker, as well as a communication system to contact any necessary ambulance service, must be available at the job site.
- Post the telephone numbers of the hospitals, physicians, or ambulances in a conspicuous spot.
- A properly stocked first aid kit must be available at the job site. The first aid kit should contain approved supplies in a weatherproof container with individually sealed packages for each type of item. It should also include rubber gloves to prevent the transfer of infectious diseases.



- Provisions should be made to provide for quick drenching or flushing of the eyes should any person be working around corrosive materials. Eye flushing must be done with water containing no additives.

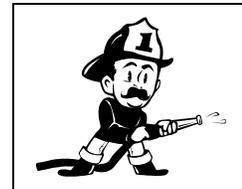
Check the contents of the first aid kit on each job and at least weekly to ensure that expended items are replaced.

Police and Fire

- The telephone numbers of the local police, ambulance, and fire departments should be available at each job site.
- Notify police in the event of any traffic problems, such as the movement of equipment to the job, uncontrolled fires, or other police/fire matters.
- Notify police to report any vandalism, unlawful entry to the job site, or accidents requiring police assistance.

Fire Prevention and Protection

A "fire plan" should be set up prior to beginning a deconstruction job. This plan should outline the assignments of key personnel in the event of a fire and provide an evacuation plan for workers on the site. Common sense should be the general rule in all fire prevention planning.



- All potential sources of ignition should be evaluated and the necessary corrective measures taken.
- Electrical wiring and equipment for providing light, heat, or power should be installed by a competent person and inspected regularly.
- Equipment powered by an internal combustion engine should be located so that the exhausts discharge well away from combustible materials and away from workers.
- All internal combustion equipment should be shut down prior to refueling.
- Fuel for this equipment should be stored in a safe location.
- Sufficient firefighting equipment should be located near any flammable or combustible liquid storage area.
- Only approved containers and portable tanks should be used for the storage and handling of flammable and combustible liquids.
- Heating devices should be situated so that they are not likely to overturn and shall be installed in accordance with their listing, including clearance to combustible material or equipment.
- Competent personnel should maintain temporary heating equipment, when utilized.
- Smoking should be prohibited at or in the vicinity of hazardous operations or materials.
- Roadways between and around combustible storage piles should be at least 15 feet wide and maintained free from accumulation of rubbish, equipment, or other materials.
- When storing debris or combustible material inside a structure, such storage shall not obstruct or adversely affect the means of exit.
- A suitable location at the job site should be designated and provided with plans, emergency information, and equipment, as needed.

- Access for heavy fire-fighting equipment should be provided on the immediate job site at the start of the job and maintained until the job is completed.
- An ample number of fully charged portable fire extinguishers should be provided throughout the operation.
- All motor-driven mobile equipment should be equipped with an approved fire extinguisher.

OSHA Coverage

One very important consideration for a non-profit organization is the use of the term “employee” for the requirement to follow OSHA regulations. If the deconstruction is carried out by an organization with at least one employed person and/or one or more employed persons are supervising or working at the deconstruction project, OSHA regulations apply to the deconstruction project, no matter how many volunteers may be engaged in the work, and regardless of whether the organization is a non-profit or a for-profit.

Safety Rules of Thumb:

COMMUNICATION

Knowing where you are in relation to others, walls, roof edges, steps, or changes in level, overhangs, any building element on the ground, OTHER workers and their activities, is probably the most important concept of all.

- Workers must be alert and invested in the work they are performing.
- Cleanup of debris on all work surfaces will occur after each phase of deconstruction.
- Piles of debris will not be allowed to accumulate in work areas where they could generate a hazard or impediment to the workers.
- One person will be appointed Job Safety Officer and will have overall responsibility for job safety.
- Every person on the site must act responsibly.
- Understanding of the Deconstruction process and Goals.
- Stabilizing weakened sections of buildings, and working in such a way as to keep the structures as stable as possible via the order of the deconstruction.
- Taking care in handling windows (glass), long items, heavy items, and objects with the nails still in them.
- Understanding how components are connected and the best method and tool to use in removing it to minimize force that in turn can result in sudden movements, creating projectiles, slipping, etc.
- Importance of cleaning debris and removing materials from areas where they can be hazards either off or on the ground.
- Understanding load bearing components and stresses produced by gravity, including awareness of damaged components and weak points caused by termite, water damage, etc.
- Use of safety harnesses, scaffolding, ladders, guardrails, and 2x4s nailed horizontally for footholds when working on roofs.

- Using a two-person system for the majority of materials removal so that long wood members, for example, can be handled at both ends to protect both workers and materials from any sudden movements.



Proper tool use



Correct hand placement



Scissors Technique



Proper use of tool



Proper use of tool

Schedule A

Preparation and Condition of Materials

(These are the guidelines TRP requires its Certified Deconstruction Contractors to follow and adhere to)

TRP will be responsible for preparing a fixture inventory and a lumber inventory of salvaged materials as needed for the completion of the donation process. The fixture inventory will be prepared by a TRP representative prior to deconstruction and will include all materials other than framing lumber, roofing tile, bricks, pavers, etc. since these materials are difficult to see and to count until they have been prepared for shipping. The fixture inventory may also include specific reference to the handling of special materials like bricks and roofing tiles. Contractor will work with TRP and Owner to arrange for the fixture inventory to be taken at least three days prior to the start of deconstruction. The lumber inventory, including roofing tiles, bricks, pavers, etc. will be taken after deconstruction has been completed and before these materials are shipped off site. All materials being shipped off site must be noted on the inventory and a copy of this inventory must accompany each shipment.

- **Labels.** All fixtures marked with a white TRP label and item number are to be removed and delivered to a location designated by TRP. The item numbers correspond to the materials on the fixture inventory. All materials marked with a green TRP label are to be recycled.
- **Doors.** Doors are to be removed with jambs attached and the bottom of the jamb fastened to the edge of the door. Doors which are not being salvaged are to be stripped of their hardware (hinges, locksets and strike plates) and placed in plastic bags – 1 bag for each door.
- **Windows.** Remove them with the frames and sashes intact and the windows latched. They are to be stored and shipped in their upright position. Generally, if the windows are aluminum single glazed, the glass should be broken out and the aluminum recycled.

- **Carpets.**

Carpets are to be measured before rolling and the top side is to be rolled inward with the backing on the outside. The rolls are to be secured with duct tape and the size in feet and inches (e.g. 12' 5") written with a marker on the outside of the roll along with the item number.

Save the carpet padding for protecting fragile items or those that may be easily scratched, like cabinets, during shipping. Also, retain the carpet padding for future deconstruction projects which may not have padding.

- **Cabinets.**

After being detached, replace all doors and drawers that were removed. All exposed nails and screws are to be removed. All cabinets are to be shrink wrapped.

If possible, all sink or vanity cabinets are to be detached with their tops, sinks and faucets attached.

- **Granite Countertops.**

Leave countertops attached to the cabinets whenever possible. Do not break granite countertops. Use a grinder with a diamond blade and cut the top into pieces which may easily be handled by two people.

If the countertop is too heavy or the counter top tile is broken, then the sinks and faucets are separated. If any part of the countertop has broken tile, all tile must be removed and disposed of on the job site. When removing the tile, protect the sinks and garbage disposal from debris.

- **Plumbing Fixtures.** If the faucets are attached to the sink they should remain attached. All sinks, toilets and bathtubs are to be clean and free of debris before loading. Disconnect all garbage disposals from the sinks.
- **Electrical Fixtures.** Most electrical fixtures have small screws, caps and brackets that are integral to the fixture. Please ensure that these parts are salvaged, placed in sealed plastic bags and taped to the fixture in a secure manner.
- **Moldings and Trim.** Check with your TRP representative regarding the salvage or disposal of door and window trim and other moldings. Trim does not have to be identified with a specific window or door, however, each type should be kept separate (casings, base boards, chair rails, crown moldings, etc.). All bundles to be sized for one person to carry and held together with shrink wrap.
- **Finished Wood Flooring.** Always check with your TRP representative regarding the salvage of top nailed flooring. All finished t&g flooring (hardwood, softwood or engineered) is to be salvaged. Boards are to be de-nailed and unitized in bundles of short, medium and long lengths or they may be palletized and banded with sufficient shrink wrap to hold them together for handling and transportation.
- **Lumber.**
All lumber six (6) feet and longer is to be de-nailed, unitized and banded. Any lumber less than six feet should be recycled or discarded – check with your TRP representative.

All units of lumber shall have a nominal width of forty-eight (48) inches unless they are 2x10s in which case the units will be fifty (50) inches with 5 boards wide or 2x14s that will be forty-two (42) inches. The units shall have a height as close to thirty-six (36) inches as possible. All units will be flush or square on one end with the longest boards on the bottom.

All units up to twelve feet in length shall have at least two bands evenly spaced, and longer lengths shall have three bands. All banding material shall be three-quarter (3/4) inch steel and fastened with steel fasteners.

When banding 2x4s, use a 2x4 bolsters across the top of the unit and under each steel band so keep the unit square.

All lumber of same dimension shall be unitized together and lumber of varying dimensions shall not be mixed except as provided below. The lengths in any single unit shall not vary by more than two (2) feet from the shortest to the longest piece. The longest pieces shall be on the bottom of the unit and the shortest pieces shall be on the top, and all pieces of lumber shall be flush with each other on one end of the unit.

At the end of any job, there may be various pieces of odd-sized lumber left over which did not fit in previously banded units. It is permissible to mix this lumber together in one unit as long as a 48" unit width and a maximum height of 36" are maintained.

Lumber shall be stacked with sets of two (2) bolsters to allow room for forklift forks to lift the units. These bolsters shall be at least three (3) inches thick.

- **Roofing Tile.** All roofing tile will be placed on pallets that have been constructed with wood sides to hold and protect the tile. The tile will be placed on edge with the long dimension in a vertical position. When the entire pallet is fully packed with tile, plywood or other durable material will be placed on top of the tile so that a second row of tile can be stacked on top. Note: the wood sides must be above the height of the second row tile so that one pallet may be stacked on top of another.
- **Bricks & Pavers.** Bricks are to be cleaned and stacked on pallets in a 2-by-2 criss-cross pattern. Generally, a pallet will hold up to 500 bricks. Use shrink wrap to keep the brick tightly packed and secured to the pallet. At the end of the job, after they have been palletized, TRP will inventory these materials.
- **Protection of Materials.** Protecting the fixtures after they have been disconnected from the house and prior to shipping is important. Always protect fixtures from weather damage during staging and shipping. All materials are to be placed on trucks in such a manner that they will not be damaged during shipping. Small or fragile items like hardware or lighting fixtures are to be protected and placed in boxes. Use carpet padding for the protection of cabinets and other fragile materials.
- **Damaged Materials.** While it must be the intent and practice of the contractor to remove items without damaging them, it is understood that some items may be damaged in the removal process. All damaged items shall be placed in one location (not just thrown away) for inspection by a TRP representative prior to disposal.
- **Removal of Materials from Job Site.** Your TRP representative must be notified prior to any materials being shipped from a job site. No materials shall be removed from the job, sold or disposed of, other than in the normal course of delivery to TRP, without the expressed written permission of TRP.
- **Recycling.**

In order to comply with many state and local diversion regulations, TRP will need the following data from each individual job:

- Weights for each fixture load.
- Weights for all recycled metals.
- Weights for all other recycled materials (clean lumber, wood shakes, glass, carpeting, etc.) as well as those taken to a materials recovery facility (MRF).

All weight tickets on every project must be given to your TRP representative.

- **Safety.** Our MOC requires that all local, state and federal safety rules be followed. In addition, we do require that all fixtures be delivered in trucks with lift gates so that the unloading at our warehouse can be done safely and that all lumber be delivered in flatbed trucks that can be unloaded from the side with a forklift. Only box and flatbed trucks will be accepted for delivery at our warehouse – no roll-off boxes.
- **Inventories.** A copy of the fixture inventory with loaded items clearly marked must accompany each load and be given to the recipient. The driver shall be responsible for waiting until the materials are unloaded at the destination.
- **Final Inspection.** On the last day of a job an on-site meeting shall be arranged by Contractor with a TRP representative to ensure all materials have been properly salvaged and delivered. Materials on the inventory but not received will not be included in the final appraisal value.