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BUILDING DECONSTRUCTION GUIDELINES: TOOLS FOR  
RECOVERING BUILDING MATERIALS

by

Ali Ayedh Merzen

A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment of the  
requirements for the  
Degree of Master of Science  
Department of Construction Engineering,  
Material Engineering and  
Industrial Design

Western Michigan University  
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Mrs. Nichole Tai, Program Manager, NY Waste Match,

Mr. Matthew Reynolds, Resource Management Group, Inc.,

Mr. Kris Singleton, Howard County Government.

Ali Ayedh Merzen

# BUILDING DECONSTRUCTION GUIDELINES: TOOLS FOR RECOVERING BUILDING MATERIALS

Ali Ayedh Merzen, M.S.

Western Michigan University, 2002

The traditional method of tearing down building when its life cycle is completed is known as demolition, which means destroying most of the structures and burying it in the landfills. This is the most common practice in most countries, but in recent years there is a new movement toward using the components of these buildings. Burying usable or recyclable materials in landfills means more pollution and increasing the need for more landfills. The concept of reusing or recycling building materials is known as Deconstruction. This practice is relatively new in the construction industry and requires more research and studies to supersede the practice of demolition. This study will address many factors related to deconstruction such as: environmental, economical and social benefits, building codes and regulations, safety, challenges facing deconstruction, and others. This thesis will develop guidelines to promote effective deconstruction. These guidelines have been validated through personal communication with four deconstruction experts, focusing on how to set general rules and procedures to reuse or recycle building materials in historic buildings rather than demolishing them. The intention in producing these guidelines is to assist the deconstruction industry in overcoming the time and cost barriers inherent in the deconstruction process.

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## CHAPTER I

### INTRODUCTION

#### 1.1 Current Trend

The current trend in removing old buildings in the construction industry is to destroy them and bury them in landfills, which recovers the least amount of building materials. This practice is increasing the amount of construction wastes, which means more landfills and air and noise pollution to communities when applying demolition. This problem has sparked a debate among construction companies, demolishing companies, and environmental experts regarding recycling or reusing these building materials in new or renovation projects.

According to Leroux and Seldman (1999) “every year, as many as 300,000 buildings are demolished in the United States” (p. 1). In the most developed country in the world, it seems that the amount of wastes produced by these buildings ought to be used or recycled. After all, the United States has been one of the leading countries in the recycling of cans, papers and aluminum over the past several decades. In recent years, the construction industry, the public, and the government have been carrying on a debate about old buildings, which are planned for demolition. Environmental experts and construction professionals have struggled to come up with a solution to reduce the amount of construction wastes.

The methods used to reduce construction wastes by reusing or recycling the

maximum amount of building materials during demolition has lately been termed “Deconstruction”. A recent example of a demolition resulting in the loss of valuable building materials and causing environmental problems occurred in Kalamazoo, MI, with a structure formerly known as Harding’s Market Place. A lot of materials in this project were destroyed and transported to landfill areas. The materials included doors, shingles, air-conditioning ducts, bricks, electric wires, plumbing fixtures, hollow blocks, control panels, insulation materials and many other materials as shown in Figures 1.1-1.4 below.



Figure 1.1. Roof Shingles, Hollow Blocks, and Steel.



Figure 1.2. Destroyed Concrete and Hollow Blocks.



Figure 1.3. Steel Stairs and Electric Wires.



Figure 1.4. Electric Panel and Electric Wires.

### 1.2 Problem Statement

As discussed earlier the amount of loss of valuable building materials when applying demolition is very significant. Dealing with construction wastes may become more valuable as the public, government and demolition industry moved toward reusing or recycling building materials.

Deconstruction is relatively new and, like any new idea, will face some difficulties in gaining acceptance. In recent years deconstruction organizations, the government, and demolition industry have debated on the efficiency of deconstruction

when it is applied as an alternative to demolition, concentrating on the cost effectiveness of deconstruction compared to demolition and how deconstruction could help the environment. Demolition is an option but other valuable avenues are available to be tested and compared to demolition in term of advantages and disadvantages.

During a recent conference (Rebuilding Communities through Deconstruction Enterprises) different experts in the field discussed many related topics. One of the newest raised is the need for more comprehensive deconstruction guidelines to help overcome cost and time factors. The Deconstruction Industry Trade Association has some reservations about the effectiveness of deconstruction, and the Department of Housing and Urban Development (HUD), which spends just under \$1 billion/year on demolition of public housing units, has been slow to adjust to deconstruction (Seldman, 2000).

More research is necessary to educate the regulators, the public and the construction industry. Perhaps the best way to accomplish this is through a comprehensible study to substitute demolition with deconstruction. Nowadays, most of the deconstruction projects are within low-income areas and the aim of these projects is job creation and building housing for such people.

The overall goal of this study is to investigate the current trend in deconstruction and to provide and develop proper guidelines to improve the process based on previous work related to deconstruction and the future needs of the environment and the construction industry.

### 1.3 Thesis Objectives

The objectives of this study are as follows:

- Reviewing Deconstruction current trend and presenting previous case studies.
- Designing and developing guidelines for effective deconstruction process.
- Validating proposed guidelines.

### 1.4 Research Methodology

This study intends to inform the construction industry, the public, and the government as well as help the environment by applying deconstruction to protect valuable resources. This research was conducted through constructive web sites related to deconstruction organizations and educational institutes working on deconstruction, and from newspapers and magazines articles related to the concept of reusing and recycling building materials. The Institute of Local Self-Reliance based in Washington DC is one of the best known organizations that work hand-in-hand with the Environmental Protection Agency to nationalize the deconstruction movement.

Other information collected through personal discussions with deconstruction experts. Analysis of recent case studies will be presented to verify the importance of deconstruction as an alternative to demolition and to determine the worthiness of deconstruction process.

Deconstruction is part of the relatively new sustainable buildings concepts.

One of the most valuable research techniques presented in this study is gathering information and thoughts from deconstruction E-mail list serves.

Effective planning for deconstruction is presented as part of following the proper deconstruction guidelines. These proposed guidelines are validated through a discussion with Mrs. Amy Bauman Director of Business Development (Green Goat), Mrs. Nicole Tai, Program Manager at New York Wa\$te Match, Mr. Kris Singleton from Howard County Government, and Mr. Matthew Reynolds from Resource Management Group Inc.

Deconstruction experts' opinions are presented and analyzed according to their responses. Subsequently, a discussion of these opinions is presented. These guidelines should help overcoming the cost and time challenges facing deconstruction. A model for an appropriate deconstruction process is presented. This model consists of guidelines developed to help deconstruction organizations, contractors and policy makers interested in replacing demolition with deconstruction. The final output of these guidelines should help to overcome some of the obstacles facing the deconstruction industry.



## CHAPTER II

### DECONSTRUCTION--THE CURRENT TREND

#### 2.1 Historical Background

According to Goldstein (1999), “salvaging building materials from buildings has been going on for a very long time. Just a few decades ago, some demolition contractors only did hand wrecking of buildings, selling the reusable materials” (p. 29). But the new demand to end or reduce the construction wastes stream in the United States is getting more attention from environmentalists and recycling organizations. The reusing and salvaging concept never disappeared, but fell into disuse partially due to the public's lack of knowledge of how to use salvage materials. Another factor is that building codes and regulations must be adapted to meet the environment needs without harming the building standards (D2PC, 1999).

One of the earliest deconstruction projects occurred on the West Coast of the United States when the army began disassembling their old bases. Most deconstruction projects target old housing projects to help train new workers and build new houses for needy families (Dejesus, 1998).

#### 2.2 Glossary of Terms

Deconstruction experts try to recover as many materials as possible from old buildings, but some times they are hampered by the condition of the building. If the

building is not a good candidate for deconstruction and recovering maximum materials, there are other avenues. The five available options, according to Morris (2001), are:

Deconstruction: The process of selectively and systematically disassembling buildings that would otherwise be demolished to generate a supply of materials suitable for reuse in the construction or rehabilitation of other structures.

Demolition: Rapid destruction of a building with or without prior removal of hazardous materials.

Salvage: Removal of structural and non-structural building materials from residential, industrial, commercial and institutional buildings deconstruction projects for the purpose of reuse or recycling.

Recycle: Any process by which waste and recyclable materials are transformed or collected for the purpose of being transferred into new products.

Reuse: Repeated use of a product in the same form but not necessarily for the same purpose.

These five options could be used separately or combined depending on the condition of the structure. Deconstruction is the recommended starting point to recover the maximum amount of building materials. If deconstruction is not possible, the following options could be used consecutively: salvage, recycle and reuse. If the above practices are not applicable, the owner's last resort is demolition (Kibert, 2000).

### 2.3 Challenges Facing Deconstruction

The traditional practice for the removal of most structures in the USA and most countries is demolition, but there is a new movement toward deconstruction. People in communities and the demolition industry still disagree about the effectiveness of deconstruction as compared to demolition in terms of cost and time; this is the first challenge facing the deconstruction industry. Deconstruction experts are working to bolster deconstruction companies through governmental financial support for the donation of building materials. It is clear that demolition is cheaper and faster than deconstruction if environmental and economical benefits are ignored (Seldman, 2000).

According to Lund (1997):

...standard demolition (including no salvage and limited recycling of materials, wood, and cleaning rubble) was estimated at \$3.50 to \$5.00 per square foot. Total cost for deconstruction (including maximum salvage and recycling) was estimated at \$4.50 to \$5.40 per square foot. (p. 25)

This shows that deconstruction cost is almost the same as demolition and could produce more profit if the owners of buildings could receive tax breaks from the government for the donation of materials. According to GHD (2002) the cost of land filling fees are increasing compared to the cost to reuse or recycle building materials (see Figure 2.1). This situation will make deconstruction the common practice in the future.

Another challenge is the time factor, which in the construction industry equates to money. The key is to have a tight schedule and proper planning before

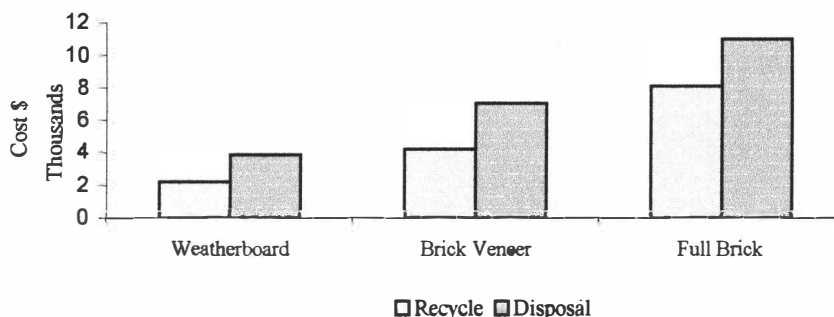


Figure 2.1. Cost for Recycling and Disposal (GHD, 2002).

starting the deconstruction process. Part of successful planning is to buy the site if it is available to save on the time and cost of transporting materials to site storage, and to have a deconstruction crew prepared to work the site.

The other important factor is that deconstruction requires skilled workmen in order to perform their jobs in a timely efficient manner and to recover the maximum amount of materials. Both the public and contractors' lack of education regarding the volubility of recovered building materials in term of quality and price is yet another factor associated with the used building materials market. Lastly, the lack of resale centers in some states and cities in the USA is an important concern (California Environmental Protection Agency, 2001).

#### 2.4 Deconstruction Benefits

It is common knowledge that any new idea or theory faces some challenges in the beginning. The challenges that deconstruction faces have to do with time and cost when compared to demolition, and will require more study and research if it is to

overcome such difficulties. In the last few years there have been many successful deconstruction projects, which are addressed later in this study (Leroux & Seldman, 1999).

#### 2.4.1 Environmental Benefits

The Environmental Protection Agency (EPA) is one of the best sources to find out the benefits of deconstruction. The aim of the EPA is to reduce the amount of Construction and Demolition (C&D) debris and to facilitate the removal of hazardous materials from such buildings. EPA estimates that about 65 millions tons of demolition wastes are generated each year; deconstruction is the preferable way to decrease the amount of C&D debris (see Figure 2.2).

The materials specified by EPA that cause vast amounts of debris include concrete blocks, bricks, lumber, soil, paving materials, finishing materials, and siding

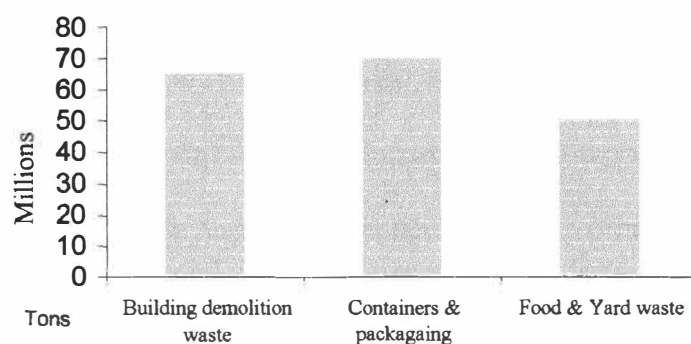


Figure 2.2. Comparing Demolition Waste to Other Waste Streams (U.S.EPA, 1996).

materials. Most of these materials could be reused in new buildings or renovation projects, or they could be recycled (EPA, 2000).

It is evident that demolition produces a massive amount of noise and air pollution to communities, whereas deconstruction, which employs small tools and machines rather than using heavy machinery, can remove structures quietly and safely.

#### 2.4.2 Economic Benefits

Economy is the key factor for both the government and the communities when dealing with the construction industry. Deconstruction is one solution for helping the economy of the government and communities by creating new job opportunities for unemployed people and non-skilled laborers. Unlike demolition, the deconstruction process requires a larger workforce to accomplish the task because workers use small tools to disassemble any building (Leroux & Seldman, 1999).

According to Snyder (2002) of the Urban and Economic Development Division of the EPA, deconstruction in general, is intended to “provide job training opportunities for unskilled workers, create infrastructure to support small business development, divert valuable resources from landfills into profitable reuse, and present a model that can be replicated across the nation” (p. 2).

Another economical benefit of deconstruction is the reduction of landfill areas, which could be used to build new plants, factories or public parks. New businesses produced through deconstruction can spur the growth of the economy of the country,

whether by recycling the materials or reusing them in existing buildings-- particularly for materials that have high architectural values.

According to Guy (2002), “the net cost of the deconstruction is modeled by the expression:  $[\text{Deconstruction} + \text{Disposal} + \text{Processing}] - [\text{Contract Price} + \text{Salvage Value}] = \text{Net Deconstruction Costs}$ . The net cost for demolition is:  $[\text{Demolition} + \text{Disposal}] - [\text{Contract Price}] = \text{Net Demolition Costs}$ ” (p. 5).

### 2.5 Materials to Be Deconstructed

Most of the materials used during construction can be recovered during the deconstruction process if they are still in good condition. The most valuable material to be disassembled is wood. Neil Seldman and Mark Jackson (2000) said, “The value of recovered wood is rising, because many species of wood are no longer available from forests” (p. 36). Thus, it is very important to reuse this material or reshape it to meet the standards of the American Society of Testing and Materials (ASTM). The types of wood that can be disassembled are those used in roofing, interior and exterior walls, and flooring.

Another material to be recycled is concrete, which can be crushed and used as an aggregate for any construction purpose; asphalt also can be crushed and reused as backfill or dirt. Other components of structures, such as windows, screens and doors, can be repainted or reassembled and used in other buildings directly if they fit the new buildings standards.

The electromechanical parts of structures that can be deconstructed and used

in new or existing buildings planned for renovation include electrical wires, cables, switches, panels, ducts, pumps, water riser and air handlers. If kitchen appliances are still in the building, they can be prepared for reuse by cleaning and performing maintenance on them before delivering them to resale centers (Ross, 1997).

Materials such as sinks and plumbing fixtures are usually in good shape and arrangements can be made for on-site sales; they are regarded as inexpensive yet valuable materials, but they do need careful disassembly. Leslie Kerkland, director of the Loading Dock, said, "We go into buildings that would otherwise be bulldozed or burned down, and we salvage what we want to sell in our warehouse and what we know our customers want. It's mainly doors, toilets, lumber, flooring" (Joyce, 1998, p.1).

## 2.6 Deconstruction Case Studies

In recent years many deconstruction projects took place nationwide. Most of these projects were economically, socially and environmentally successful. The major goals of these projects were job creation and resources conservation. Building deconstruction is targeting old building planned for demolition to prevent burying these buildings in landfills. Many challenges faced these projects, such as time, building codes and regulations, labor costs, the lack of public and government awareness about deconstruction benefits, and others. Deconstruction organizations and deconstruction contractors resolved most of these problems.

This chapter examines some of these projects with an analysis of the strategies



used to overcome cost, time, and other challenges. In these case studies much information was collected to better facilitate the deconstruction process in the future.

#### 2.6.1 Case Study No. 1

This project took place in Gainesville, Florida. Six old houses built between 1900-1950 were deconstructed during the period from August 1999 to May 2000. The aim of the project was to determine how cost effective was deconstruction. The students of the Center for Construction and Environment, University of Florida, undertook half of the project. The project consisted of six wood-framed residential buildings. The students deconstructed the first three buildings and Americorps National Civilian Community Corps workers (NCCC) deconstructed the other three (Guy& McLendon, 2002).

The issues include:

- Historic preservation.
- Demolition delay requirements.
- Licensed contractor requirements
- Safety and health certificate for hazardous materials management.

In the following pages an analysis of building 901 SR 301 (see Table 2.1) will be demonstrated as follows:

- The building is located in Gainesville, Florida.
- No asbestos containing materials.
- Some lead-based paint found and removed.

Table 2.1

Building Information for 901 SR (Guy &amp; McLendon, 2002)

Building Information	901
Built	1920's
Stories	1
Light framed wood construction	Yes
Size	992 SF
Urban or rural-sized parcel	Rural
Number of additions	3
Internal renovations	Yes
Inhabitable	Yes
Required major repair	No
Exterior wall finish	No
Roofing	No
Insulation	No
Floor tile	No
Drywall	No
Abetment	No
Interior trim	No
Exterior trim	No
Interior surface	Yes
Exterior surface	Yes
Removal for development reason	Yes

### 2.6.2 Economic Summary of 901 Building

The cost to demolish this building would have been \$4,506.96, but by using the deconstructing process, the final cost was \$390.88 (see Table 2.2). This indicates that deconstruction is more effective than demolition financially, though it took more

Table 2.2

Comparing Demolition and Deconstruction  
for Building No. 901 (Guy, 2002)

Costs	Demolition cost (\$)	Deconstruction cost (\$)
Permit	50.00	50.00
Asbestos	700.00	700.00
Disposal	1,874.88	445.20
Truck	62.00	293.13
Toilet	74.00	74.00
Gas	10.00	80.00
Supplies	10.00	100.00
Labor and Equipment	1,726.08	3,262.50
Total Costs	4,506.96	5,004.83
REVENUES		
SALVAGE	0.00	4,613.95
TOTAL NET COST	4,506.96	390.88

time than demolition would have (see Figures 2.3 and 2.4). The effectiveness of deconstruction is somewhat dependent on the building condition. Generally, in all of the six building the cost of deconstruction was less than demolition, though it took the teams 10 months to clear the site (see Table 2.3).

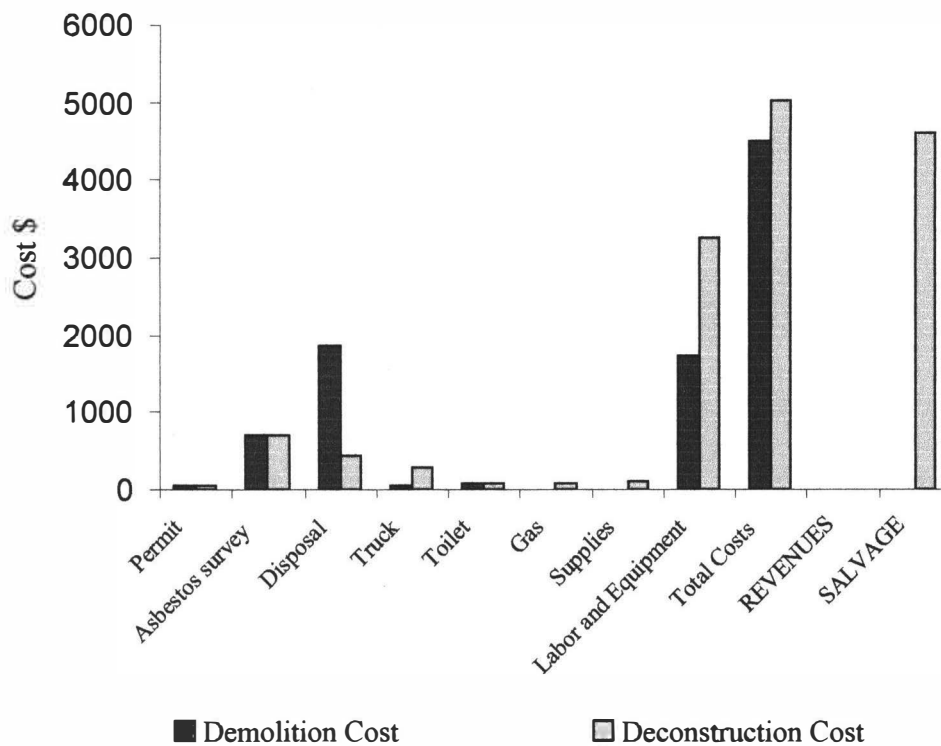


Figure 2.3. Comparing Demolition and Deconstruction Costs in Building No. 901.

### 2.6.3 Conclusion

This case study showed that deconstruction can be an effective practice as an alternative to demolition if the time factor can be coordinated with the owner. There are lessons learned during this project such as:

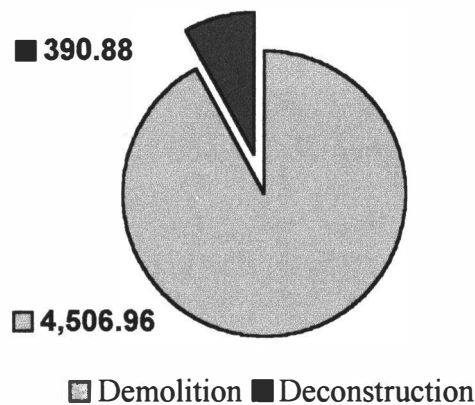


Figure 2.4. Total Net Cost for Demolition and Deconstruction.

- Workers should keep the structure as stable as possible.
- Move disassembled materials directly to the processing section.
- Keep an eye on any material containing nails till they are denailed.
- Keep job site as clean as possible.
- Workers must know different types of structures.
- Workers must ask for help when dismantling or moving huge elements.
- Doors and windows are the first materials to remove to create ventilation on site (Guy& McLendon, 2002).

It is important prior to deconstructing any building to conduct a feasibility study to ensure the worthiness of the structure. As discussed before, each building is unique, which affects the value of salvaged materials.

Table 2.3

Labor Time by Work Categories (Guy &amp; McLendon, 2002)

Category Hours	901	992 SF	Per SF
Hour Percentage	Hr	%	Hr
Supervision	11.75	4.50	0.012
Deconstruction	124.75	47.80	0.126
Processing	47	18.01	0.047
Demolition	27	10.34	0.027
Disposal / Clean up	25.75	9.87	0.026
Non- Production	23	8.81	0.023
Loading / Unloading	1.75	0.67	0.002
Total	261.00	100.00	0.263

## 2.7 Case Study No. 2

This project was located in Stowe Village in Hartford, Connecticut. Six public housing units were dismantled. One of the project goals was to train nine of the housing residents in the deconstruction process. The project started in October 1998 and ended in December 1998. Table 2.4 illustrates the project summary (EPA, 2000). Figures 2.5 and 2.6 provide clarification regarding materials recovered and actions taken toward the buildings.

Table 2.4

## Stow Village Project Summary (EPA, 2000)

Project Square Footage	8,250 sf
Total Waste Generated	265.5 Tons
Disposed	132.8 Tons
Total Materials Diverted:	132.8 Tons
Recycled	26.6 Tons
Reused	106.2 Tons
Hauling and Disposal Cost	\$23/ Ton
Net deconstruction Costs	\$72,107
Planning and Development	\$20,000
Labor	\$60,400
Hauling and Recycling Fees	\$617
Disposal Tip Fee	\$3,083
Materials Sales	\$300
Materials Salvaged	\$8,610
Avoided Disposal	\$3,083
Net Cost per Square Foot	\$9
Potential Net Deconstruction Cost	\$4,700
Labor	\$10,000
Hauling and Recycling Fees	\$600
Disposal Tip Fee	\$3,100
Miscellaneous	\$3,000
Materials Sales	\$300
Materials Salvaged	8,600
Avoided Disposal	\$3,100
Potential Net Cost per Square Foot	\$1

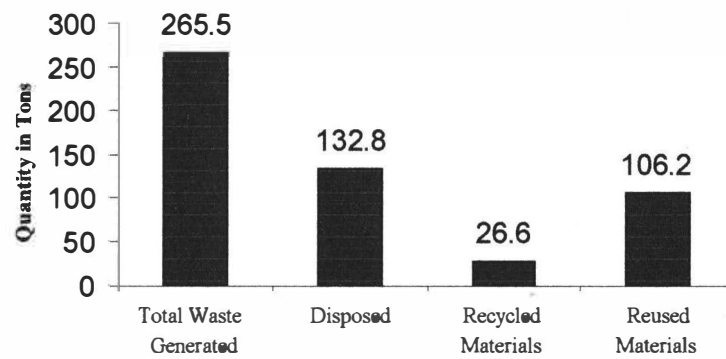


Figure 2.5. Total Summary.

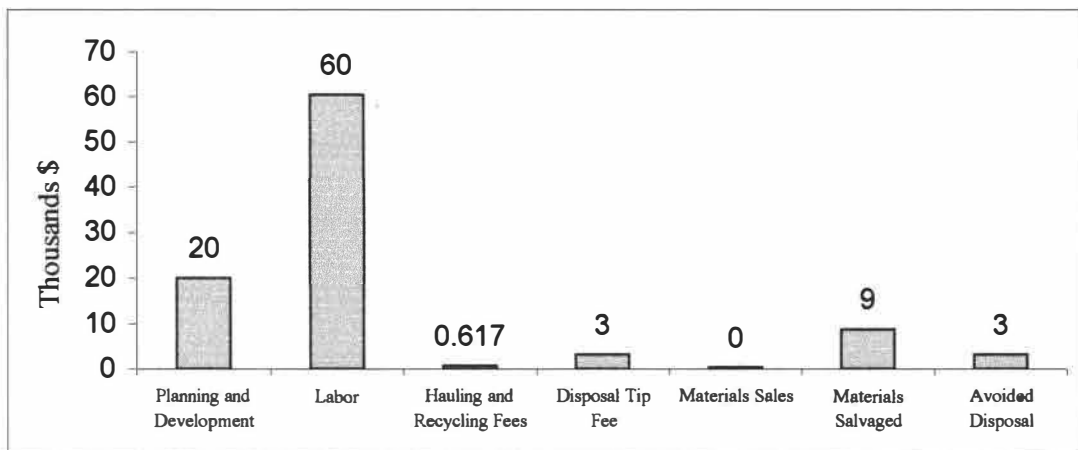


Figure 2.6. Action Taken Toward the Buildings.



## CHAPTER III

### DEVELOPMENT OF GUIDELINES FOR EFFECTIVE DECONSTRUCTION

#### 3.1 Introduction

Deconstruction is known in the construction industry as the reverse process of construction, which generally means the last materials installed will be the first materials to be disassembled. There are no perfect guidelines for deconstruction because each project has a different nature and circumstances. However, there are some rules and steps which must be followed in any deconstruction project.

In this research, the deconstruction process will be divided into three phases according to the sequence of activities. This also aids in separating the process itself from other activities not related to it. The first phase is the Pre-Deconstruction Phase which primarily involves governmental regulations and workers' training. The second phase is the Deconstruction Phase which deals with the actual disassembly and how to perform the job in the right way and according to scheduled. The third phase is the Post-Deconstruction Phase which focuses on the salvaged materials in terms of handling, onsite selling, storing and transportation to resale centers.

#### 3.2 Pre-Deconstruction Phase

This phase precedes disassembly and it consists of structure assessment,

governmental regulations, workers' training, and project funding. In this phase the owner of the building may contract with a deconstruction contractor or organization to perform the deconstruction. Both the owner and the contractor will have duties to perform depending on the type of agreement between them. This phase is broken down into the elements that follow.

### 3.2.1 Building Assessment

The owner should provide detailed information about the structure whether he requests bids or donates the structure. Such information will help deconstruction contractors or organizations to make an offer. It is recommended that the owner give permission to deconstruction organizations and contractors to visit the site and obtain more information about the structure and site access. A deconstruction expert should approve the following preliminary information given by the owner:

- History of the structure and the function used for.
- Structural system used in this structure.
- Materials used in this structure.
- Assessment of any hazardous or banned materials in the structure.
- Time needed to perform whole removal of the structure.
- The age of the structure (GVRD, 2002).

During this time it is recommended that the owner or his representative disconnect utilities such as gas, electricity, and water if they are still connected (see Appendices A and B).

### 3.2.2 Permit Process

In most states there are no special permits for deconstruction, but anyone who plans to deconstruct should follow the same general practice of obtaining a demolition permit. According to Robert Patrick the Building Official at the City of Kalamazoo Community Development Division: “To deconstruct, to wreck or to move any structures there are two forms to be filled (forms) to get the permit.” Similar to other cities in Michigan, in order to get the permit an application for a wrecking permit must be filed with the City no less than thirty (30) working days before wrecking is scheduled to commence and shall contain the following information:

- The street number, property description, type of building or structure, type of construction, width, length and number of stories.
- The number of dwelling units within the structure, when totally or partially residential.
- The name of all owners of the premises.
- Written consent to the wrecking or deconstruction by all owners.
- Utility notification information.
- Completion date of the wrecking or deconstruction.
- A complete list of any and all substances stored or used on the premises that are, or may become, injurious to the public health or safety.
- A complete description of any barrels, tanks, vats or other containers and their location on the premises or underground. Said description shall

include a statement of the substances which are or were stored in said containers.

Such other information as may be listed on the application and as the Building Official shall deem necessary.

Any or all of the above information will be published in the legal notice of the local newspaper (City of Kalamazoo Building Officials, 1999--see Appendix C).

The permit process is time consuming and relatively costly, depending on the size of the project. The proper solution to help nationalize the deconstruction movement is to reduce the time it takes to obtain permits, and to cancel or reduce the permit fees, because all the processing can lead to delays of projects and in some cases, deconstruction is shelved in favor of demolition.

### 3.2.3 Planning for Deconstruction

Planning is the key factor regarding time constraints because the deconstruction process is profoundly affected by both cost and time factors. Several major considerations should be heeded in planning for deconstruction:

- Determination of any hazardous materials, for example lead, asbestos and any other materials banned by EPA regulations and how to remove them.
- Detailed scheduling and progress plan for the project.
- Listing of materials to be reused, recycled or disposed.
- Listing of materials, which will be delivered to resale centers, and materials planned for on-site sale.

- Determination of deconstruction methodology.
- Overall project information, such as size and type of structure.
- Getting deconstruction permits if the owner requires it.
- Site preparation, for example, fencing, access and locked gates for security reasons.
- Training of deconstruction team if they are not skilled enough.
- Pre-Deconstruction meeting (Morris, 2001).

#### 3.2.4 Feasibility Study

A feasibility study is conducted by the contractor, which requires detailed a building materials inventory to determine the amount of materials to be recycle, recovered, or disposed. Other information included is the type of structure, materials used in this structure, condition of the structure, and how secure it is for the workers' safety. This study should be comprehensive and should include the environmental, social and economical impact of deconstructing any building (USDHUD, 2000).

#### 3.2.5 Workers' Training

Having a skilled labor force is crucial in deconstruction for the workmen to complete their tasks in a timely fashion and to handle disassembled materials carefully. Deconstruction is one way of creating jobs. Workers need to be trained how to disassemble structures and handle salvaged materials. On the other hand, construction workers would be the quickest to train as they already have experience in

handling construction materials, even if it were done in the reverse order of construction.

According to NAHB Research Center (2000), deconstruction crews should be aware of the following issues:

- how to use tools and machines.
- the nature of building materials.
- materials fasteners and joints.
- the construction method used when constructing the building.
- crew safety, site safety and materials safety, and
- site security.

The time it takes a laborer to become a skilled deconstructionist varies depending on his/her background in the construction industry and the building materials specifications. It is easier to train a construction or demolition laborer than non-skilled worker.

### 3.2.6 Projects Funding

One of the duties of the deconstruction movement is to help communities by creating jobs and building houses for needy people. As stated, one of the challenges facing the deconstruction industry is the cost issue. To overcome this, the deconstruction organization should seek funds to cover the cost of disassembling materials and building new houses using recovered materials.

The owner of the building could obtain funding for these projects by donating

its components to deconstruction organizations, taking advantage of tax-exemption or tax reduction, and eliminating the cost of demolition. Other funding sources could be government agencies. The role of government is important to nationalize the deconstruction movement. The U.S. Environmental Protection Agency (EPA), the Department of Health and Human Services, and the Department of Defense are agencies that have funded projects in recent years and are still willing to help communities (Seldman, 2000).

Another way to fund deconstruction is by opening saving accounts throughout the states or nationwide. This would assure the flow of money in any needed project. Collecting money to open accounts could be done by fund raising or through donations from individuals or the government. Nationwide there are many non-profit organizations, such as the Local Initiative Support Corporation and Habitat for Humanity, building new houses from used or donated building materials.

### 3.2.7 Pre-Deconstruction Phase Guidelines

The following guidelines are the main issues, which are important for the pre-deconstruction phase as a preparation for the next phase. These guidelines include building assessment, the permit process, planning for deconstruction, a feasibility study, workers' training, and projects funding.

Building assessment. The purpose of the building assessment step is to help contractors and deconstruction organizations which are conducting the deconstruction. The owner of the building must provide clear, correct information about the

building intended for deconstruction, including the age, type of structure system used, type of materials used during construction, and any hazardous materials. In addition, the following guidelines are proposed to be part of the building assessment process:

- Owner of the old building must seek professional deconstruction estimates to determine the worthiness of the structure to be deconstructed.
- Owner of the old building must specify the type(s) of activities conducted in previous years, which may affect the stability of the structure.
- Owner must determine the function(s) which the structure used during the last several years.
- Owner of the old building must provide a list of any renovations or maintenance work done to the structure in previous years.

Permit Process. There are no specific procedures for obtaining deconstruction permits as there are for getting demolition permits, which presents a barrier to nationalizing deconstruction as an alternative to demolition. To resolve this problem, new building codes and regulations must be developed. One way to foster to deconstruction would be to make the deconstruction permit process shorter than the demolition permit process. Another would be to reduce deconstruction permit fees and taxes. A third way to encourage the use of deconstruction would be to create a rule stating that deconstruction is the first choice for removal of any applicable building. In addition, the following guidelines are proposed to be part of the permitting process:

- Policy makers must give incentives to any individual who intends to



deconstruct or donate materials from buildings planned for demolition to deconstruction companies and organizations.

- Deconstruction professionals should educate policy makers regarding the benefits of deconstruction.
- Deconstruction must be incorporated into building codes and regulations gradually.
- City policy makers should contact deconstruction professionals to establish deconstruction codes and regulations.
- Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.
- The percentage of materials that must be reused or recycled by the demolition industry should be increased gradually. For example, 20% in 2003 and 25% in 2004.

Planning for Deconstruction. Detailed planning and scheduling is the key to deconstruction success. With proper planning and scheduling, the time and cost factors can be controlled to avoid extra time and more cost. In this step the main factors are deconstruction techniques, method of removal of hazardous material, crew training, and job site preparations. The following guidelines are proposed in addition to those listed previously:

- Deconstruction organizations and companies are required to plan in advance to avoid projects delay.

- Deconstruction companies and organizations should be aware of new tools and equipment, which may ease the deconstruction process.
- Deconstruction organizations and companies should be aware of technology, such as computer programs, which will help in deconstruction planning and scheduling.
- Deconstruction companies and organizations should encourage workers to learn new deconstruction techniques.
- Deconstruction companies and organizations must give incentives to workers with high productive rates.

Feasibility Study. The contractor or deconstruction organization must use this study to make a decision whether the structure is worth deconstructing. A deconstruction expert must inspect the building and use the building assessment information to arrive at this decision. In this study a building inventory form must be used. A study of the used building materials market must also be included.

- Deconstruction companies and organizations must survey the used building materials market demands.
- Deconstruction companies and organizations should use technology such as computer software to estimate the value of recovered materials.
- Deconstruction companies and organizations must be aware of hazardous materials removal cost.

Workers' Training. Trained laborers and staff is a critical issue in deconstruction. The importance of training is to ensure that work is done on time with the maximum recovery of building materials. Laborers must be trained for job site safety and security. Other issues they need to be familiar with are material safety, tools, machines, first aid treatment, the nature of building materials, and different construction methods.

- Deconstruction companies and organization must provide training workshops periodically.
- Deconstruction companies and organizations should inform workers about new health and safety measures.
- Universities and educational institutions must include deconstruction in their curriculums.
- Deconstruction organizations and companies should encourage workers to be creative.

Projects Funding. Deconstruction organizations must seek funds to overcome the cost of deconstruction. The cost of deconstruction can be less than the cost of demolition if there are enough financial resources. These funds could come from different sources such as government agencies, donated buildings planned for demolition, and through opening deconstruction saving accounts.

- Deconstruction organizations must ask for government funds to help overcome deconstruction cost.

- Deconstruction organizations and companies should encourage owners and developers to donate building materials planned for demolition.
- Deconstruction organizations and companies should search for volunteer workers to take down buildings.
- Deconstruction companies and organizations should establish their own resale centers and use the revenue to fund other projects.

### 3.3 Deconstruction Phase

This is the disassembling phase where the deconstruction crew is taking down the structure piece by piece. This phase consists of many steps, which educate the workers how to perform the deconstruction process. Site security, crew safety and tools are examples of this phase, which follows the pre-deconstruction phase.

#### 3.3.1 Site Security

Maintaining a secure site is an essential step for deconstruction projects because of the security of the workers and the recovered materials, particularly when the latter have high architectural value. Like any other construction site, it is important to have a fenced deconstruction site with a locked gate, and not allow anyone to enter without prior permission (CEPA, 2001).

Another security measure on the site is to maintain full access to the site for crew and delivery trucks. Warning signs should be obvious to the public and the workers. Finally, the safety and security of adjacent structures, landscaping and

sidewalks must be maintained (Morris, 2001).

### 3.3.2 Deconstruction Safety

Safety issue in construction industry is very important and in deconstruction the same safety procedures and regulations must be followed, regulations issued by both EPA and OSHA and additional rules are essential when dealing with old buildings. When training deconstruction crews there are some safety rules related to deconstruction should part of that training.

3.3.2.1 Workers' Safety. Workers should keep in mind that they are dealing with old structures which may collapse. Full protection rules should be applied.

- Old buildings may contain hazardous materials such as asbestos, lead in paint, and other banned materials. In those cases, workers should stop work and ask for professional help.
- Workers should keep the job site as clean as they can to avoid injury and health problems.
- Deconstruction projects expose workers to lots of dust, so they should wear dust masks at all times.
- Workers should keep in touch with each other in case anyone faces any type of risk (CEPA, 2001; see Appendix D).

According to Morris (2001), other protection procedures should be followed in deconstruction projects:

- Minimize any interference to neighbors and site access.

- If any operation causes any risk to nearby structures, work should stop and responsible personnel should be notified.
- The use of heavy machinery or equipment in deconstruction is limited to the safe load of the structure.
- The contractor should provide emergency light, fire alarms, and fire extinguishers.

3.3.2.2 Materials' Safety. The second part of security in deconstruction is the safety of recovered materials because it is crucial to maximize the revenue of these materials. These materials should be stored or delivered in the best shape after recovery by following these steps:

- Materials to be recycled should be separated from materials to be reused.
- Materials to be disposed of should be removed immediately to conserve on space on-site.
- Maximum care should be taken to avoid damage to disassembled materials.
- Disassembled material should be cleaned and repaired before storing.
- Any damage to recovered materials should be reported (Morris, 2001).

### 3.3.3 Deconstruction Tools

In deconstruction, basic tools will be available onsite for individual use. In some cases, special tools or machinery may be necessary depending on the structure's

condition. These tools and their purposes are shown in Tables 3.1 through 3.3 and in Figure 3.1.

Tools shown in the tables are considered to be basic and could vary from one project to another. One of the most recent tools designed especially for deconstruction is the Nail Kicker. Denailing is time-consuming, but with this new denailing gun, workers will save time, which will reduce the time needed to complete the project. "This equipment sucks nails from wood and cuts by 2/3 the time required to

Table 3.1

Individual-Use Tool and Equipment for Deconstruction Tasks (CEPA, 2002)

Item	Purpose
Cats-paw	Nail removal
Flat bar	Material removal
Glove	Hand protection
Hammer	Material removal
Hard hat	Head protection
Screwdrivers-Philips, flathead	Material removal
Safety goggles	Eye protection
T-bar	Material removal
Tape measure (25-foot)	Measure material
Tool belt	Holds tools
Wire cutters	Cuts electrical wires

Table 3.2

## Site Tools and Equipment for Deconstruction Tasks (CEPA, 2002)

Item	Purpose
Banding Materials	Banding wood or other materials together for travel
Crimper	Crimps the clips that holds the bands together
Tensioner	Tightens the banding material
Tin snips	Cuts excess banding material
Chainsaw	Cutting through wood
Chisel	Mortar removal
Crowbar	Material removal
Extension cord	Extend power source
Fall protection equipment	Fall protection
Fire extinguisher(s)	Extinguish fire
First aid kit	Emergency first aid
Floorboard puller	Fits over wood boards and removes them without breaking them
Generator	Power source if no power available
Hand truck	Material transport
Ladders (different sizes)	Climbing



Table 3.2--continued

Item	Purpose
Masonry hammer	Mortar removal
Push broom	Cleanup
Saw horses	Workbench for denailing
Sawzall	Cutting through objects that are difficult to cut
Scoop shovel	Cleanup
Sledge hammer	Material removal
Tear-off spade	Removing roofing materials or prying wood boards
Wheelbarrow	Material transport

Table 3.3

Supporting Equipment for Deconstruction Tasks (CEPA, 2002)

Item	Purpose
Dumpster	Trash
Flat bed truck	Material transport
Forklift	Transport and stacking of materials
Storage	Storing equipment and materials
Pallets	Moving and stacking materials

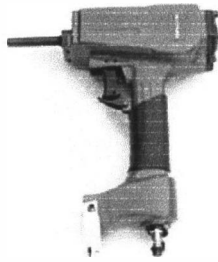


Figure 3.1 Denailing Gun (Reconnx, 2002)

denial recovered wood, and has proven a valuable asset at the Santon Dwelling project” (Ruben, 2002, p. H01).

### 3.4 Deconstruction Phase Guidelines

This phase takes place after the pre-deconstruction phase and deals with the process of deconstruction. Most of this phase's activities are on-site and involve workers, materials, and delivery trucks. This phase include the following elements: site security, workers' and materials safety, and deconstruction tools.

#### 3.4.1 Site Security

Having a secure site is necessary in deconstruction because of the need to keep the work environment isolated from outsiders, and to protect the dismantled materials from theft, especially if they are of high value. This requires a secure fence with a locked gate and warning signs to prevent any non-staff from entering the site. The site must be accessible to workers, machines, and delivery trucks. Another important point is to avoid interference with neighbors and adjacent buildings.

- Warning signs must be posted on all sides of the project fence to avoid public interference.
- Security personnel must be available at all times to ensure job site security.
- Any security violation must be reported directly to management.

#### 3.4.2 Deconstruction Safety

The same safety precautions taken on any construction site apply to deconstruction sites. However, additional concerns must be addressed because workers are doing the reverse process of construction and dealing with old buildings, which may collapse. In deconstruction the safety of workers and materials are important to ensure the maximum recovery of materials.

#### 3.4.3 Workers Safety

In addition to the construction safety procedures, deconstruction workers must be aware of fall protection rules, keep the job site clean, wear dust masks, ask for help if any suspicious material found, and ensure the safety of adjacent structures.

- Safety guidelines must be posted on job sites to be available in emergencies.
- Workers' health and accident insurance must be valid at all times.
- Deconstruction companies and organizations must schedule routine health check for workers.

- In case of injury, workers must know how to ask for medical health.

#### 3.4.4 Material Safety

As deconstruction cost depends on the value of recovered materials, the safety of material is extremely important. Workers must handle material with maximum care, separate reusable material from recyclable and disposal material, and clean and repair all material before storing it.

- Workers must be aware that any material damaged means a loss of money.
- Workers must use designated tools for each material.
- Any recovered material must be removed to a designated area.
- In case of difficulty in disassembling any material, workers must look for professional help.
- The job site must be clear from recovered material.

#### 3.4.5 Deconstruction Tools

Unlike noisy and massive equipment used for demolition, the deconstruction process can be done quietly with small tools and equipment. Most of the tools are considered to be basic, unless there is a special material, which requires heavy machinery to be disassemble it. This makes the deconstruction site a quiet environment for workers and nearby neighborhoods.

### 3.5 Deconstruction Techniques

Deconstruction is the reverse of the construction process. Workers must be aware of construction techniques in order to be able to assess the impact that the removal of any material will have on the stability of the structure (Fehrenbacher, 2000).

The deconstruction industry deals with different types of structures, such as residential, commercial and industrial. As a result, there is no special technique that applies to all types of structures because each structure is a unique situation.

Most deconstruction projects target residential areas. The majority of building material used during the construction of residential buildings is wood. If the recovered wood can be reconditioned to meet current building standards, it is better to use it, especially as several types of older species are no longer available. Recovered wood that is not appropriate for use in new buildings could be donated to people or other organizations for use in other type of projects. According to Seldman (2000):

In the deconstruction sector, wood is the name of game. At a project in Riverside, Maryland, over 60 cubic yards (32 percent) of the materials recovered were wood, including framing lumber and sheathing, hard wood flooring, stair tread, shelves and cabinets. (p. 2)

On the deconstruction site, experts must train novices in deconstruction techniques, focusing particularly on the methods used to disassemble all types of wood. This will help to ensure the maximum recovery of wood.

At the beginning of the deconstruction process, it is important to start with non-structural elements, such as doors, windows, kitchen appliances, plumbing

fixtures and any others. After removing these materials, more space will have been created to ease the removal of structural members. This process is called soft stripping. Each recovered material from this process must be transported to a storage area or recycling place (BCES, 2002).

According to GHD (2002) “the aim of deconstruction is to recover maximum amount of materials and find reuse/recycling markets for as many materials as possible.” This recovery done in eight main stages:

- Stripping out
- Roof tiles or shingles
- Roof beams
- Timber removal
- Internal plasterboards or gypsum boards
- Exterior cladding
- Floor removal
- Footings (GHD, 2002)

### 3.6 Post-Deconstruction Phase

This phase deals with the activities that follow the disassembly of structures. It includes on-site sale, on-site storage, and transportation of building material and salvaged material to markets. Handling recovered materials with maximum care is critical because they are the primary purpose in deconstruction projects--as much as possible they should be in same condition as prior to disassembly. The following

items illustrate the steps that must be taken to deliver the materials to the end customer.

### 3.6.1 On-Site Sale and On-Site Storage

Deconstruction contractors and organizations must know the salvaged materials market well before starting the deconstruction process. It is better to sell materials on-site to interested parties, so as to save on the cost of transporting materials to resale centers. The items planned for on-site sale should be identified in advance to prevent mixing with materials planned for transportation. Some states have municipal regulations that prevent on-site sales. More research is necessary to overcome this problem (D2PC, 1999).

After disassembling the materials, the workers must clean them and repair any damage. The job site should be divided into different areas for sorting purposes. There should be a place for materials planned for on-site sale, a place for recycled materials, and a storage area for materials planned for delivery to resale centers. The place for on-site sale must be accessible to customers' trucks to facilitate the loading of materials and to prevent interference with workers on the site.

In most deconstruction projects, the main material (which is sold on-site) is lumber, in all of its sizes and types. Buyers are categorized into four types: householders, small business people, artisans, and builders (Kreitner, 1997).

If the recovered materials will be used on the same site to construct new buildings, or if it is recycled on-site, it will minimize the cost of transportation to the

end customer or the recycling factories (Ross, 1997).

If the recovered materials are to be transported to resale centers, then there must be a locked storage area on-site or a locked gate for the whole project. Materials must be sorted in the storage area according to their type and volume. Cleaning and repairing damaged materials is an important step prior to storing them. Each material must be named and numbered, and, if the price was discussed previously with customers, a price label should be posted.

### 3.6.2 Transportation and Resale Centers

Handling and transporting recovered materials from old buildings is an important step in the deconstruction business. The materials planned for delivery to resale centers must be specified early on to avoid any conflict that could increase the cost of recovered materials. The loading of such materials must be coordinated in the proper way to minimize any interference with site work. For each delivery trip to resale centers, a form indicating all available information about each material, such as name or description, color, size, quantity and condition, is desirable as it helps to ensure that materials arrive in the same condition they left the site.

Resale centers or used building material markets are the best place to get used building materials. These types of markets face problems such as:

- Lack of awareness of the public and builders of the value of used building materials.
- Lack of awareness of the inexpensive price of used materials when



compared to new material prices.

- Lack of awareness of the environmental benefits of working with used building materials (UEDD & U.S.EPA, 1999).

Educating the public, the government, and contractors about the benefits of using recovered building materials will help to overcoming these problems. The sources of materials in these markets may be seen in Table 3.4 (U.S. HUD, 1999).

Nowadays, resale centers for used building materials are spreading nationwide, which builds the credibility of deconstruction over demolition. Materials resold

Table 3.4

Used Material Sources and Used Material Markets

Used material source	Used material market
Private sector housing	Non-profit salvage market-retail
Public sector housing	Salvage market-retail
Government housing	Public agency salvage market-retail
Commercial housing	Auction
Commercial properties-light construction	Used building material broker
Commercial properties-industrial construction	Public agency reuse
Public properties-light construction	Private sector reuse
Public properties-industrial construction	Non –US market

in such centers are much cheaper than new ones and are in good condition.

According to Yeung (1998) “the greatest benefit in recycling building materials comes to the consumer, who purchases the material at incredibly low prices” (p. 1).

### 3.7 Post-Deconstruction Phase Guidelines

According to the division of this study, this phase is the last phase, which deals with recovered materials handling, storing, selling, and transportation to resale centers. In this stage the most significant element is the condition of the recovered materials. Workers and the delivery workforce must keep the materials away from any situation which would adversely affect the quality of the materials.

#### 3.7.1 On-Site Sale and On-Site Storage

Two steps follow the disassembly of materials. The first step is sorting materials planned for on-site sales, which requires prior contact with sellers regarding pick up. Materials planned for on-site sale must be cleaned, repaired, and separated from other materials on the site. This step will give workers more on-site space to handle other materials. Clear access for pick-up trucks is required to prevent interference with other duties on-site.

The second step is the separation of materials intended to be stored on-site from materials to be recycled on-site or transported to recycling facilities. In this step workers must clean all recovered materials and repair them if needed before storing them on-site. Proper storage is necessary to protect such materials. Prior to storing

the materials, it is a professional practice to label each material and sort them according to description, quantity, color, size, and condition.

Some materials may be recycled on-site if such facilities exist on the site. In building new structures which use recovered materials from the same site, it is best to recycle any materials and reuse them on-site to reduce transportation costs. Otherwise, such materials must be transported to urban recycling facilities to be processed for other construction uses.

- Deconstruction organizations and companies must contact buyers in advance.
- Deconstruction companies and organizations may advertise in local newspapers about recovered materials for on-site sale.
- Policy makers should modify on-site sale regulations.
- Site manager must give clear access to buyers' trucks.
- Designated loading area must be easily accessible to avoid interference with workers.
- On-site storage is an essential step in any deconstruction project.
- On-site storage must be lockable to avoid theft.
- All materials on storage must be sorted according to its description.
- Storage personnel must schedule materials transportation to resale centers.

### 3.7.2 Transportation and Resale Centers

Scheduling stored materials for delivery to resale centers and salvaged

materials markets is the last step in the post-deconstruction phase. In this step, a previous study of the local used building materials market is an essential step to ensuring that such materials will be sold. There are some challenges facing such markets, and the deconstruction industry should attempt to overcome them. Perhaps the best way to resolve the problems in the long run is to educate the public and the government about the benefits of using used building materials.

Transportation of materials must be done with maximum care to ensure the arrival of the materials in good condition. Resale centers must be contacted in advance. Nowadays, the used building materials markets is available nationwide to serve customers looking for used materials with competitive prices.

- Maximum care must be taken when loading recovered materials.
- Workers must report any damaged materials before disposing of them.
- Form detailing all materials' sizes and conditions should be completed during loading.
- Any damage during transportation must be reported.
- The number of resale centers should increase nationwide.
- Recovered building materials prices should be less than new materials prices.
- Resale centers must educate the public and contractors about the benefits of using recovered building materials.
- Materials in resale centers must be reconditioned to be used in other buildings.

- Resale centers should start in the non-profit sector.
- Resale centers must participate in the deconstruction process.

## CHAPTER IV

### DISCUSSION, ANALYSIS, AND VALIDATION OF GUIDELINES AND DECONSTRUCTION INDUSTRY RESPONSES

The guidelines being proposed in this study may be used in conjunction with the existing guidelines for each deconstruction step. This conjunction should ease the process and reduce the impact of time and cost factors, which are the primary obstacles to nationalizing deconstruction. The method used in this research to consider the proposed guidelines is to discuss (a) each point in term of its importance, (b) reasons to address each point or guideline, and (c) the impact it has on the deconstruction industry. In addition, any arguments raised by deconstruction experts will be discussed and analyzed (see Figures 4.1 - 4.3 and Tables 4.1.1 - 4.1.13).

#### 4.1. Discussion of Building Assessment Guidelines

- Owners of old buildings must seek professional deconstruction estimate to determine the worthiness of the structure to be deconstructed.

The importance of this step is to ensure the revenue if the owner decides to deconstruct. In some cases when hazardous material is found in old buildings, the cost to remove it is high. Therefore, a professional estimate is required to help the owner decide whether to deconstruct or demolish. Another important issue regarding this point is the qualification of the deconstruction estimators. Specialized personnel must be educated and trained to do this job.

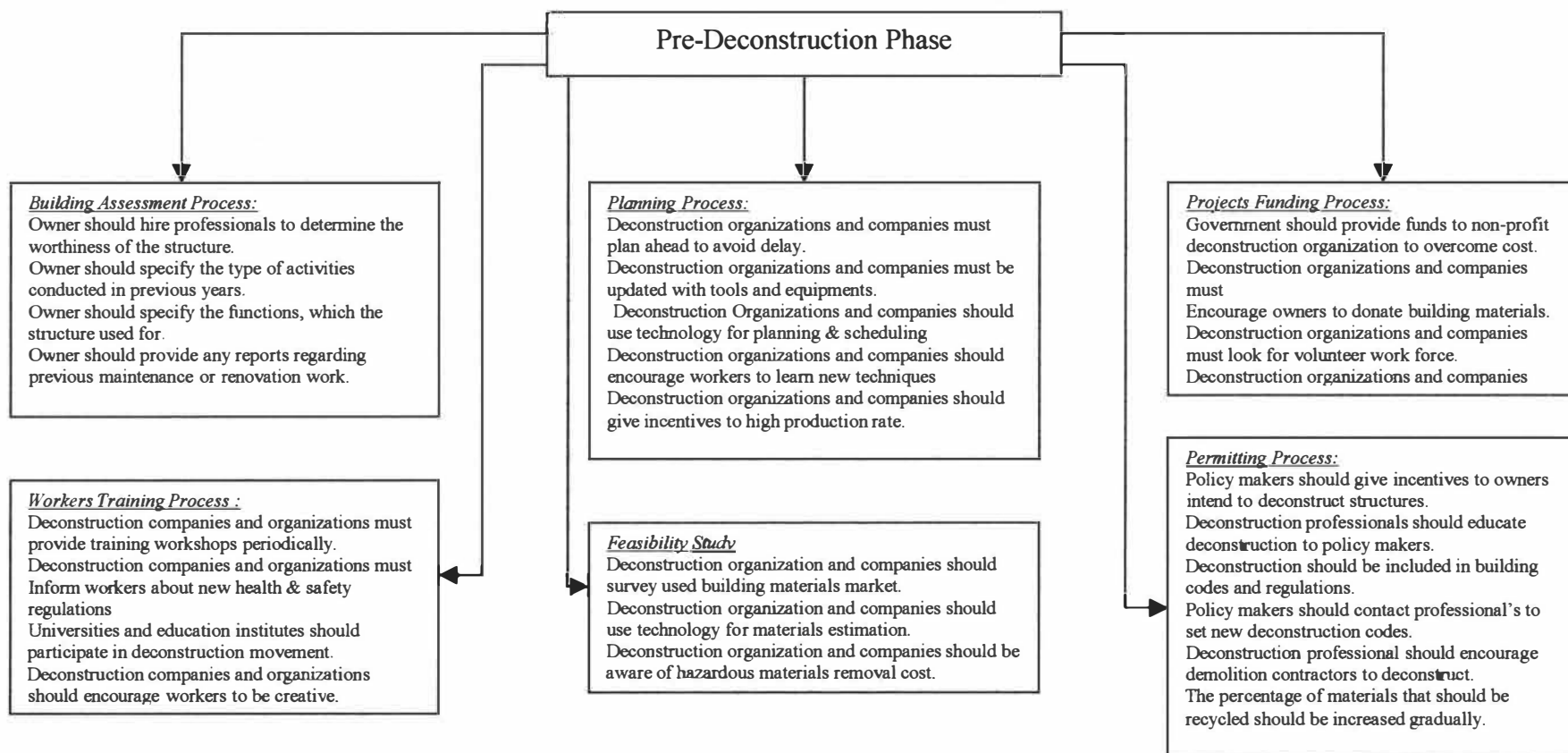


Figure 4.1. Pre-Deconstruction Phase Guidelines Chart.

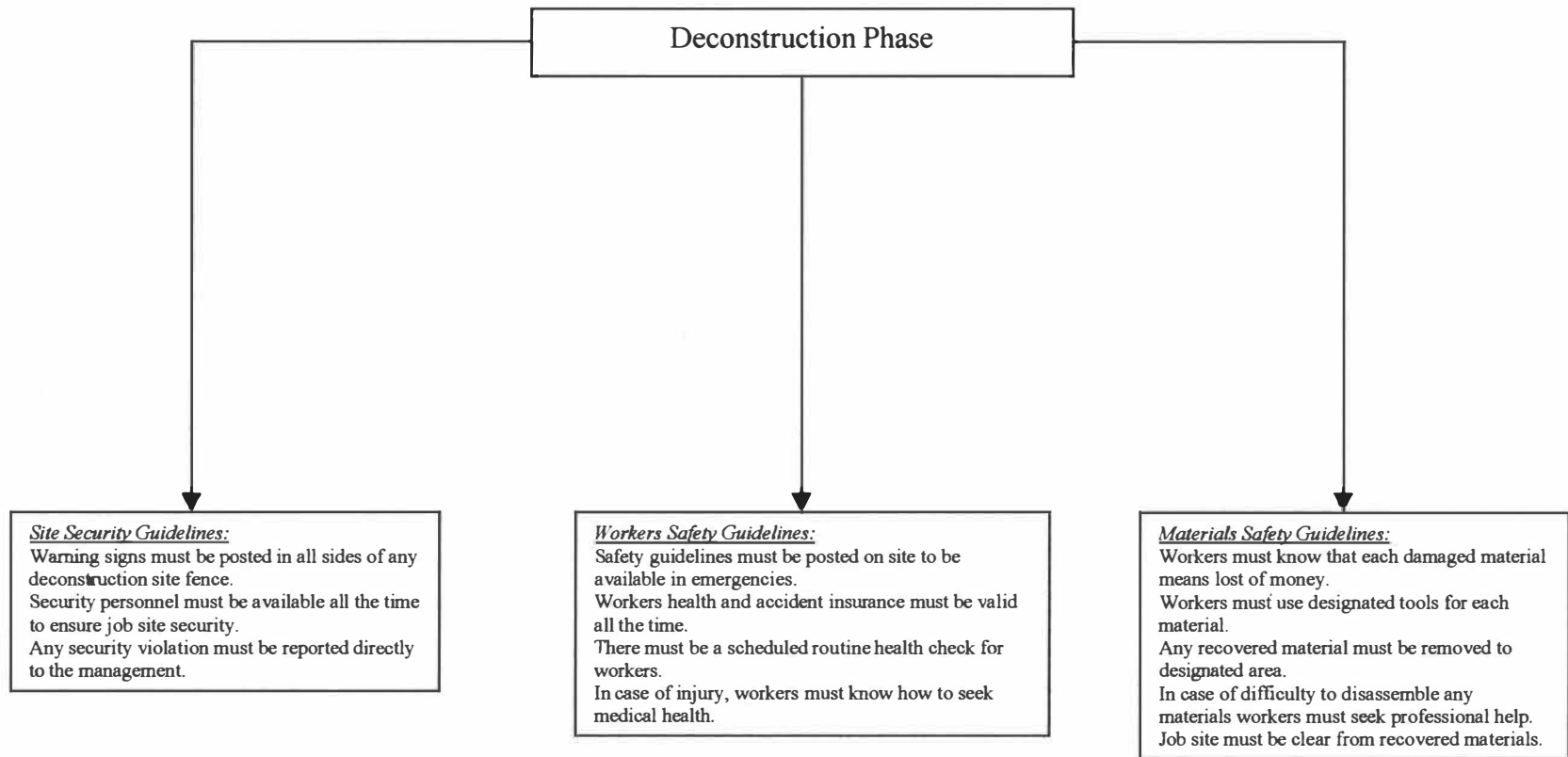


Figure 4.2. Deconstruction Phase Guidelines Chart.



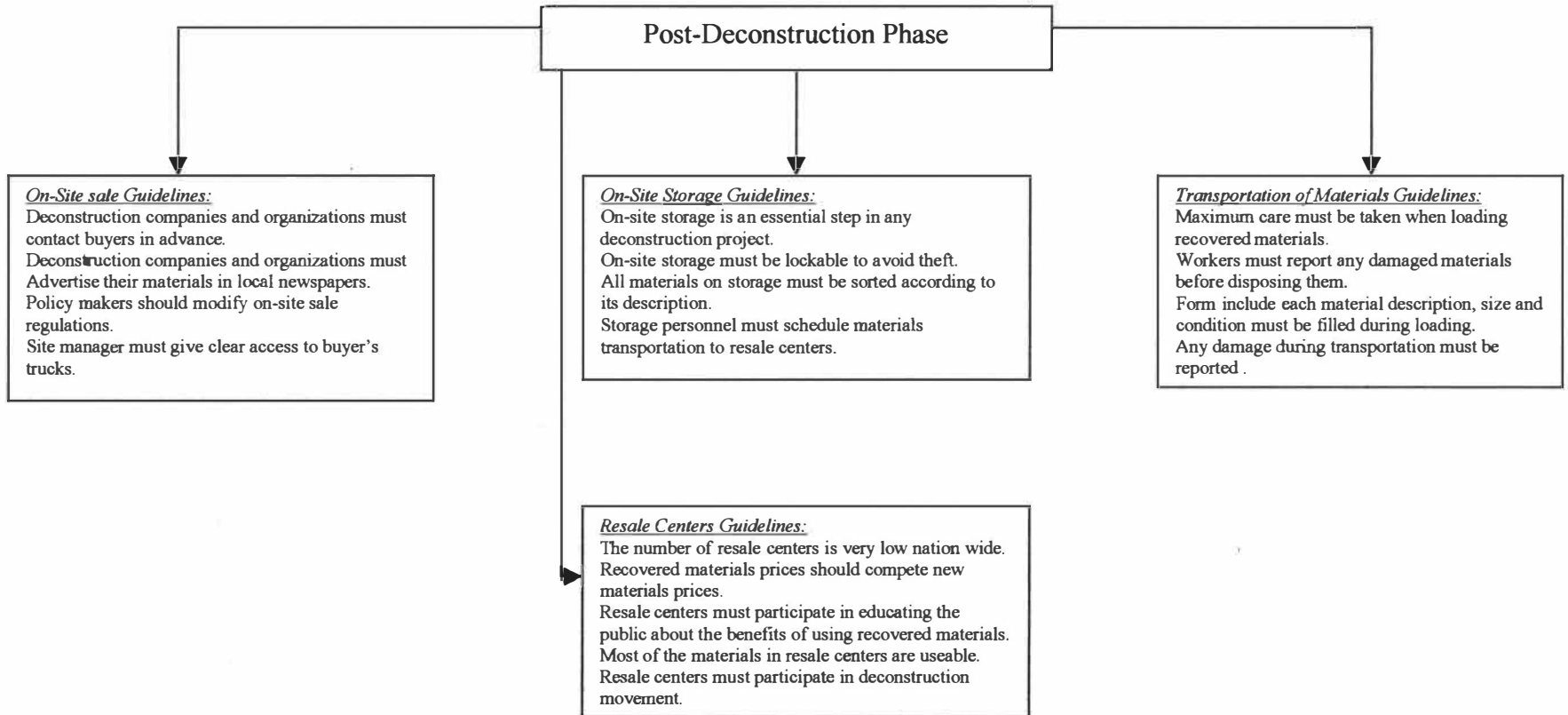


Figure 4.3. Post-Deconstruction Phase Guidelines Chart.

Table 4.1.1

Proposed Guidelines, Building Assessment, Deconstruction Industry Responses and Comments

No.	<u>Building Assessment</u>	Agree	Disagree	Deconstruction Industry Comments
1	Owner is required to hire professional estimation personnel or company to determine the worthiness of the building.	2	2	<ul style="list-style-type: none"> <li>• Deconstruction must have bidding procedures to compete with demolition.</li> <li>• All buildings are worthy.</li> </ul>
2	Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure	3	1	<ul style="list-style-type: none"> <li>• To prevent accident during deconstruction.</li> <li>• Demolition companies should be able to determine the stability of the structure.</li> </ul>
3	Determine the function(s) that the structure used for during last years.	3	1	<ul style="list-style-type: none"> <li>• Important factor to identify any hazardous materials.</li> <li>• Copy of structure plans are more important</li> </ul>
4	Owner must provide reports regarding any renovation or maintenance activities done to the structure.	3	1	<ul style="list-style-type: none"> <li>• Important to determine the value of recovered materials.</li> <li>• A lot to ask from someone deciding to take down the structure.</li> </ul>

Table 4.1.2

## Proposed Guidelines, Permit Procedures, Deconstruction Industry Responses and Comments

No.	Permit Procedures	Agree	Disagree	Deconstruction Industry Comments
1.	Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.	4	0	<ul style="list-style-type: none"> <li>• Incentives should be provided to any developer or individual to promote deconstruction.</li> <li>• Tax break for donated materials.</li> </ul>
2.	Deconstruction professionals should educate policy makers about deconstruction benefits.	4	0	<ul style="list-style-type: none"> <li>• Very important to educate policy makers as well as the industry.</li> </ul>
3.	Deconstruction must be included in building codes and regulations gradually.	3	1	<ul style="list-style-type: none"> <li>• Address deconstruction in local unions.</li> </ul>
4.	Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations	4	0	<ul style="list-style-type: none"> <li>• Some states started to contact deconstruction professionals.</li> </ul>
5.	Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.	3	1	<ul style="list-style-type: none"> <li>• It is not applicable, must be part of the specifications.</li> <li>• Most of demolition contractors know about reusing and recycling building materials.</li> </ul>
6.	The percentage of materials that must be reused or recycled by demolition industry should be increased gradually. (e.g. 2003 20%, 2004 30%)	3	1	<ul style="list-style-type: none"> <li>• Start banning materials from landfills, material by material.</li> </ul>

Table 4.1.3

Proposed Guidelines, Planning for Deconstruction, Deconstruction Industry Responses and Comments

No.	<u>Planning for Deconstruction</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Deconstruction organization or contractors must plan ahead to avoid delay	4	0	Prior planning is the key factor for successful deconstruction.
2.	Keep your company or organization updated about new tool and equipment, which may ease the deconstruction process.	4	0	
3.	New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.	4	0	Tools are helpful in deconstruction projects.
4.	Deconstruction companies and organization must encourage workers to learn new deconstruction techniques.	4	0	All companies should teach its employees.
5.	Deconstruction companies and organization must give incentives to workers with high production rates.	3	0	Depending upon the attitudes and culture of each area.

Table 4.1.4

Proposed Guidelines, Workers' Training, Deconstruction Industry Responses and Comments

No.	<u>Workers' Training</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Deconstruction companies and organization must provide training workshops periodically.	3	1	<ul style="list-style-type: none"> <li>• Should be part of any business to promote success.</li> </ul>
2.	Deconstruction companies and organization must inform worker with the new health and safety regulations.	4	0	<ul style="list-style-type: none"> <li>• Cost saving</li> <li>• Better safety means better pool job candidate.</li> </ul>
3.	Universities and education institutes must include deconstruction in their curriculums.	3	0	<ul style="list-style-type: none"> <li>• Those with construction, civil engineering and architecture programs.</li> </ul>
4.	Deconstruction companies and organization must encourage workers to be creative.	3	1	<ul style="list-style-type: none"> <li>• Creativity is a strong word.</li> <li>• Creativity may cause injuries.</li> </ul>

Table 4.1.5

Proposed Guidelines, Projects Funding, Deconstruction Industry Responses and Comments

No.	Projects Funding	Agree	Disagree	Deconstruction Industry Comments
1.	Deconstruction organization must ask for government funds to help overcome deconstruction cost.	2	2	<ul style="list-style-type: none"> <li>• Government funds are required</li> <li>• Efficient labors and updated technology minimize costs.</li> <li>• Deconstruction must find ways to compete cost.</li> <li>• Non-profit organizations.</li> </ul>
2.	Deconstruction companies and organization should encourage owners to donate buildings planned for demolition.	3	1	<ul style="list-style-type: none"> <li>• Donate only to the non-profit sectors.</li> <li>• Add the expected revenue to the bid price.</li> <li>• No person will donate real state.</li> </ul>
3.	Deconstruction companies and organization must seek for volunteer work force.	3	1	<ul style="list-style-type: none"> <li>• Volunteer driven organizations.</li> <li>• Not applicable on union jobs.</li> </ul>
4.	Deconstruction companies and organization should establish their own resale centers and use the revenue to fund other projects.	4	0	<ul style="list-style-type: none"> <li>• If there is no resale centers in region.</li> <li>• Separate line of business.</li> <li>• Self-sufficiency.</li> </ul>

Table 4.1.6

## Proposed Guidelines, Feasibility Study, Deconstruction Industry Responses and Comments

No.	<u>Feasibility Study</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Deconstruction companies and organization must survey the used building materials market demands.	4	0	<ul style="list-style-type: none"> <li>• Must find market for the debris.</li> </ul>
2.	Deconstruction companies and organization should use technology to estimate the value of recovered materials.	4	0	<ul style="list-style-type: none"> <li>• Regional markets determine the value.</li> <li>• Special web sites.</li> </ul>
3.	Deconstruction companies and organization must be aware of the cost to remove hazardous materials.	3	1	<ul style="list-style-type: none"> <li>• The owner duty to do such work.</li> <li>• Deconstruction manager should be able to identify hazardous materials before deconstruction started.</li> </ul>

Table 4.1.7

## Proposed Guidelines, Site Security, Deconstruction Industry Responses and Comments

No.	<u>Site Security</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Warning signs must be posted in all sides of the project fence to avoid public interference.	4	0	
2.	Security personnel must be available all the time to ensure job site security.	3	1	<ul style="list-style-type: none"> <li>• Site supervisor can manage security.</li> <li>• Depends upon the size of the project.</li> <li>• More research to address liability.</li> </ul>
3.	Any security violation must be reported directly to the management.	3	1	<ul style="list-style-type: none"> <li>• Reporting procedures must be clear to crew.</li> <li>• Depends on how serious.</li> </ul>

Table 4.1.8

Proposed Guidelines, Workers' Safety, Deconstruction Industry Responses and Comments

No.	<u>Workers' Safety</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Safety guidelines must be posted on site to be available in emergencies.	4	0	
2.	Workers health and accidents insurance must be valid all the times.	4	0	
3.	Schedule workers routine health check.	3	1	• Over killing to companies.
4.	In case of injury, workers must know how to seek medical health.	4	0	



Table 4.1.9

Proposed Guidelines, Materials' Safety, Deconstruction Industry Responses and Comments

No.	<u>Materials' Safety</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Workers must know that each damaged material means lost of money.	4	0	<ul style="list-style-type: none"> <li>• The goal of deconstruction is to recover materials.</li> </ul>
2.	Workers must use designated tools for each material.	4	0	
3.	Any recovered material must be removed to designated area.	4	0	<ul style="list-style-type: none"> <li>• Clear staging area is required.</li> </ul>
4.	In case of difficulty to disassemble any material, worker must seek professional help.	3	1	<ul style="list-style-type: none"> <li>• Depends upon the value of the material.</li> <li>• Professional cost maybe higher than the value of the material.</li> <li>• A material that doesn't have market should be disposed.</li> </ul>
5.	Job site must be clear from recovered materials.	3	1	<ul style="list-style-type: none"> <li>• Depends on security and marketing plan.</li> </ul>

Table 4.1.10

## Proposed Guidelines, On-Site Sale, Deconstruction Industry Responses and Comments

No.	On-Site Sale	Agree	Disagree	Deconstruction Industry Comments
1.	Deconstruction companies and organization must contact buyers in advance.	3	1	<ul style="list-style-type: none"> <li>• Buyers should be obtained in advance.</li> <li>• Always there is no time.</li> <li>• Ideal idea.</li> </ul>
2.	Deconstruction companies and organization may advertise in local newspapers about recovered materials.	4	0	
3.	Policy makers should modified on-site sale regulations.	4	0	
4.	Site manager must give clear access to buyer's trucks.	4	0	<ul style="list-style-type: none"> <li>• Access to designated areas only.</li> </ul>
5.	Designated loading area must be easily accessible to avoid interference with workers.	4	0	

Table 4.1.11

Proposed Guidelines, On-Site Storage, Deconstruction Industry Responses and Comments

No.	<u>On-Site Storage</u>	Agree	Disagree	Deconstruction Industry Comments
1.	On-site storage is an essential step in any deconstruction project.	3	1	
2.	On-site storage must be lockable to avoid theft.	4	0	<ul style="list-style-type: none"> <li>• Depends upon the material value.</li> </ul>
3.	All materials on storage must be sorted according to its description.	4	0	
4.	Storage personnel must schedule materials transportation to resale centers.	3	1	<ul style="list-style-type: none"> <li>• Could be managed by the reused materials market.</li> </ul>

Table 4.1.12

Proposed Guidelines, Transportation of Materials, Deconstruction Industry Responses and Comments

No.	<u>Transportation of Materials</u>	Agree	Disagree	Deconstruction Industry Comments
1.	Maximum care must be taken when loading recovered materials.	4	0	
2.	Workers must report any damaged materials before disposing them.	2	2	<ul style="list-style-type: none"> <li>• Reporting during disposal.</li> <li>• Reporting if it is going to be used.</li> </ul>
3.	Form include each material description, size, condition must be filled during loading.	3	1	<ul style="list-style-type: none"> <li>• Could be done at the unloading site.</li> </ul>
4.	Any damage during transportation must be reported. (Insurance)	3	1	<ul style="list-style-type: none"> <li>• Not to the materials but to the vehicles.</li> </ul>

Table 4.1.13

Proposed Guidelines, Resale Center, Deconstruction Industry Responses and Comments

No.	<u>Resale Centers</u>	Agree	Disagree	Deconstruction Industry Comments
1.	The number of resale centers is very low nation wide.	4	0	<ul style="list-style-type: none"> <li>• Not during recession.</li> </ul>
2.	Recovered materials prices are relatively higher than expected.	3	2	
3.	Resale centers must educate the public about the benefits of using recovered materials.	4	0	
4.	Most of the materials in resale centers are not useable.	2	2	<ul style="list-style-type: none"> <li>• Everything is useable.</li> <li>• Public awareness.</li> </ul>
5.	Most of the resale centers are for-profit.	2	2	<ul style="list-style-type: none"> <li>• Most are non-profit.</li> </ul>
6.	Resale centers must participate in deconstruction process.	2	2	<ul style="list-style-type: none"> <li>• Different types of business.</li> </ul>

#### 4.1.1 Analysis of First Point

Two of the responses agreed and the other two disagreed. According to Green Goat Business Development, “All buildings are worthy. A deconstruction methodology will help *most* projects at the very least break even.” Howard County Government also disagreed with the first point while NY Waste Match, Resource Management Group Inc. agreed, and according to NY Waste Match, “This is important to bring deconstruction on-line in the same bidding process as demolition. This often enables them to compete with or complement demolition projects” (see Table 4.2).

Table 4.2

#### Responses of Deconstruction Experts to the Building Assessment Proposed Guidelines

No.	Building Assessment	Agree	Disagree
1	Owner must seek professional deconstruction estimate to determine the worthiness of the building.	2	2
2	Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure	3	1
3	Determine the function(s) that the structure used for during last years.	3	1
4	Owner must provide reports regarding any renovation or maintenance activities done to the structure.	3	1

#### 4.1.2 Analysis of Second Point

Three responses agreed that the owner of the building must specify the type(s)

of activities conducted in the building in previous years, which may affected the stability of the structure. According to NY Waste Match, “This point is an important safety protocol to prevent accidents during deconstruction.” However, Green Goat Business Development disagreed commenting that, “The demolition company should be able to assess the stability.”

#### 4.1.3 Analysis of Third Point

Third point stated that the owner should determine the function(s) that the building used for during last years. Three responses agreed with this point and according to NY Waste Match, “This step will help identifying any potential toxic materials and could be a deciding factor in whether the deconstruction crew can take the job before a professional environmental risk firm has cleared the property.” On the other hand Green Goat Business Development disagreed commenting that, “...more important to have a copy of the plans, which will speak much better than anecdotal information.”

#### 4.1.4 Analysis of Fourth Point

This point stated that the owner must provide reports regarding any previous maintenance or renovations activities done on the structure. Three responses agreed, and according to NY Waste Match “this will be useful in determining the value of the materials, especially appliances and household equipment. In addition, new renovations will have other valuable materials such as kitchen furnishings, wood floors and

molding.” On the other hand, Green Goat Business Development disagreed and commented, “That is a lot to ask of someone who will take down the structure.”

#### 4.2 Discussion of Permit Process Proposed Guidelines

The permit process is considered a key step in deconstruction because deconstruction is relatively new. Since there are no specific procedures for deconstruction permits in most states, it is very important to set unique procedures for deconstruction to help nationalize the process.

- Policy makers must give incentives to any individual who intend to deconstruct or plans to donate materials from buildings slated for demolition to deconstruction companies and organizations.

The role of policy makers in nationalizing deconstruction is a significant one. New support and regulations must be carried out to educate the public and the demolition industry to reuse or recycle building materials. New codes and regulations are the best way to prevent landfills from being filled with materials that could be reused or recycled. This point tends to encourage policy makers to give incentives to individuals and developers who plan to replace demolition with deconstruction. These incentives could come through reducing fees and streamlining the permit process. Policy makers in all states should work together to learn from other cities and states who promote deconstruction as an alternative to demolition.

- Deconstruction professionals should educate policy makers regarding deconstruction benefits.



The responsibility of deconstruction professionals is not only to disassemble buildings--it is also to work with other parties to nationalize the deconstruction movement. This can be done through periodical conferences and workshops to raise the awareness of both policy makers and the public. Documentation of deconstruction case studies and their results will help to convince regulators to include deconstruction in building codes and regulations.

- Deconstruction must gradually be worked into building codes and regulations.

Deconstruction needs to gradually be included in building codes and regulations year by year. Policy makers should make decisions regarding the amount of waste sent daily to landfills. A law specifying a specific limit would alert demolition contractors to the benefits of deconstruction. As an example, to reduce the waste of building materials going to landfills, the law could state that each demolition project in 2003 must reuse or recycle 20% of building components. That percentage also could be increased annually.

- Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations.

This point is valid if policy makers intend to regulate deconstruction. Their best source for advice is deconstruction professionals who work in the field daily. Professionals should cooperate with policy makers to create new codes and regulations for deconstruction. It is essential to regulate deconstruction in order for it to compete with demolition. Policy makers should draft preliminary regulations and

evolve them over time until deconstruction becomes a common practice in line with demolition.

- Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.

Most demolition contractors know about the deconstruction movement, which is slowly spreading across the country. Deconstruction professionals should enter into dialogues with leaders in the demolition industry to inform them of the benefits of deconstruction. This could be done by inviting them to attend conferences, workshops, and special meetings to draw them into the field. Demolition is the faster process for removing buildings, but it creates environmental problems. The amount of waste generated by demolition is quite massive according to the EPA.

- The percentage of materials that must be reused or recycled by the demolition industry should gradually be increased. For example, 20% in 2003 and 25% in 2004.

During the demolition process, contractors are required to recycle some types of materials, such as concrete, asphalt and aluminum. This is a trifling amount compared to other materials being transported to landfills. New laws and regulations should be instigated to guarantee that the demolition industry participates in building materials preservation.

#### 4.2.1 Analysis of First Point

This point proposed that policy makers must give incentives to any individual

intend to deconstruct or donate building materials planned for demolition. All of the four responses agreed with this point. According to NY Waste Match “incentives should be provided to developer and individuals to promote deconstruction.” Green Goat Business Development commenting that “they already give tax break for building materials donated to BMRC, Habitat for Humanity, or other non-profit organizations.” All of them agree that this statement is valid but it should say, “Should” instead of “Must” (see Table 4.3).

Table 4.3

Responses of Deconstruction Experts to the  
Permit Process Proposed Guidelines

No.	Permit Procedures	Agree	Disagree
1.	Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.	4	0
2.	Deconstruction professionals should educate policy makers about deconstruction benefits.	4	0
3.	Deconstruction must be included in building codes and regulations gradually.	3	1
4.	Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations	4	0
5.	Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.	3	1
6.	The percentage of materials that must be reused or recycled by demolition industry should be increased gradually. (e.g. 2003 20%, 2004 30%)	3	1

#### 4.2.2 Analysis of Second Point

This point states that deconstruction professionals should educate policy makers about deconstruction benefits. All four responses agreed with this point. Green Goat Business Development commented, “Absolutely. Everyone in every industry needs to be their own advocate, and this is no different.” Thus, educating policy makers is an important step that should be followed by educating other parties such as the public and the industry. Therefore, this point is valid.

#### 4.2.3 Analysis of Third Point

This point intends to include deconstruction in building codes and regulations gradually. NY Waste Match argued that, “Deconstruction must be addressed by unions in the local area”. Green Goat Business Development, Resource Management Group Inc., Howard County Government agreed with this point. Building codes and regulations should be the beginning to nationalize deconstruction business.

#### 4.2.4 Analysis of Fourth Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations. Mrs. Bauman said, “This is already happening in Massachusetts and she is part of a subcommittee proposing regulation wording to the Department of Environmental Protection.” As a result, this point is valid.

#### 4.2.5 Analysis of Fifth Point

Mrs. Bauman somehow disagrees with this point. According to Mrs. Bauman, “It is not applicable. It needs to be a part of the specifications of the project, or it won’t get done.” Most demolition contractors already know about recycling markets. ‘Reuse’ doesn’t mean anything to a demolition contractor, unless they are a part of a construction company who has the project for rebuilding the same site.” On the other hand, Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point. Therefore, this validates this point.

#### 4.2.6 Analysis of Sixth Point

The goal of this point is to regulate deconstruction as part of the demolition industry gradually; the way it should be done is increasing the percentage of materials that should be recovered from demolition projects every year. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point. Mrs. Bauman disagreed with this point and suggesting that, “The way to do it is to ban certain materials from landfills, going material by material according to stage of development of the market for that material.” All of these suggestions are applicable but they need some regulations to support them, which validate this point.

### 4.3 Discussion of Planning for Deconstruction Process Proposed Guidelines

Planning in the deconstruction industry is critical for it will produce well-managed projects. The following guidelines would help enhance the deconstruction-

planning step:

- Deconstruction organizations and companies are required to plan in advance to avoid projects delay.

Deconstruction organizations and companies must plan ahead for:

1. Labor force required for the project.
2. Labor training if needed.
3. Materials to be reused, recycled, or disposed.
4. Material transportation schedules.
5. Removal of hazardous materials.
6. On-site sale and on-site storage.
7. Deconstruction techniques.

This will ensure that the final results will be positive in terms of the time and cost of deconstruction.

- Deconstruction companies and organizations should be aware of new tools and equipment, which may better facilitate the deconstruction process.

Tools and equipment are important in deconstruction because workers continually recover materials during disassembly. Unlike the use of demolition machines and equipment, deconstruction workers use tools that avoid damaging materials. Workers should be updated with new tools or equipment, which may reduce disassembling time and the cost.

- Deconstruction organizations and companies should be aware of advances in technology, such as computer programs, which will help in

deconstruction planning and scheduling.

There are many computer programs in the construction industry that are used for project planning and scheduling. Such programs could be adapted to deconstruction estimation planning and scheduling. The use of technology could be a determining factor for owners and developers intending to use deconstruction as an alternative to demolition.

- Deconstruction companies and organizations should encourage workers to learn new deconstruction techniques.

Encouraging and teaching workers to learn new deconstruction techniques when disassembling building materials will improve their efficiency. New techniques may ease the process and save time, but workers should not use any techniques not approved by the site manager. New techniques could be learned in workshops, by reading specialized magazines or periodicals, and through visits to manufacturers.

- Deconstruction companies and organizations should give incentives to workers with high productivity.

Any business should give incentives to workers to ensure high productivity. In deconstruction it is even more important because the aim of deconstruction is to recover the maximum amount of materials. If workers know that they will be rewarded when they produce more than their scheduled rate, they will put more effort into reaching a higher rate.

#### 4.3.1 Analysis of First Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. According to Mrs. Tai, “The key to successful deconstruction is to know the plan in advance, and provide everyone with all the information required to make the right decision based on the project.” So, this point is valid (see Table 4.4).

Table 4.4

Responses of Deconstruction Experts to the Proposed  
Guidelines for the Planning for Deconstruction Step

No.	Planning for Deconstruction	Agree	Disagree
1.	Construction organization or contractors must plan ahead to avoid delay.	4	0
2.	Keep your company or organization updated about new tool and equipment, which may ease the deconstruction process.	4	0
3.	New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.	4	0
4.	Deconstruction companies and organization must encourage workers to learn new deconstruction techniques.	4	0
5.	Deconstruction companies and organization must give incentives to workers with high production rates.	3	0

#### 4.3.2 Analysis of Second Point

This point insists that the deconstruction firm or organization must be updated about new tools and equipment, which may ease the deconstruction process. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point this shows



the importance of new tools and equipment to faster the deconstruction process if it could shorten the time and reduce labor cost. As a result, this validates the point.

#### 4.3.3 Analysis of Third Point

Like in construction, this point stated that new technology such as computer software's, are important tools, which could be used in deconstruction planning and scheduling. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. In addition Mrs. Tai said these tools are "helpful." However, this validates the point.

#### 4.3.4 Analysis of Fourth Point

Fourth point insists that deconstruction companies and organizations must encourage workers to learn new deconstruction techniques. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point according to Mrs. Bauman, "Any company should teach new technology to its employees. It makes the company more profitable (long term)." So, this point is valid.

#### 4.3.5 Analysis of Fifth Point

The aim of this point is to encourage deconstruction companies and organization to give incentives to workers with high production rates. Mrs. Tai, Mrs. Bauman, and Mr. Reynolds agreed with this point Mr. Singleton did not have any opinion to this point. Mrs. Tai added that, "The incentives may vary from region to region

depending upon the attitudes and culture of the area.” On the other hand, Mrs. Bauman said, “But what does this have to do with deconstruction? All companies should reward good performance.” As a result, this point is valid.

#### 4.4 Discussion of Workers’ Training Proposed Guidelines

Workers’ training is an important procedure because laborers are dealing with old buildings and they have to know the proper sequence in disassembly. They should know the risks they face on the job site. The following proposed guidelines are an addition to other procedures in the deconstruction industry.

- Deconstruction companies and organizations should provide training workshops periodically.

In any industry, workshops are important to update staff with new and improved techniques and methods. Deconstruction workers need to be aware of these. Workshops will update workers with techniques and tools to improve productivity rates, which will hasten the deconstruction process and reduce costs.

- Deconstruction companies and organizations should inform workers about new health and safety measures.

Workers’ safety is the highest priority in deconstruction. Deconstruction companies and organizations must update their workers with any new safety and health procedures to promote a successful job site. Keeping workers updated about safety and health regulations will result in fewer site accidents and injuries, which in turn will help maximize recovery of materials.

- Universities and educational institutions should include deconstruction in their curriculums.

The participation of educational institutions, and especially those departments related to construction and the environment, is very important to the deconstruction movement. Deconstruction is a social, environmental, and economical issue that should be part of the educational system. This will help to nationalize deconstruction as well as get the public and policy makers' attention. Including deconstruction in curriculums will result in graduating professional deconstruction supervisors, site managers, and estimators.

- Deconstruction organizations and companies should encourage workers to be creative.

Creativity is important in any field, but it should be used with restrictions. Workers may create new techniques to disassemble old buildings, but they should be aware of their safety first and the materials' safety as well. Managers should encourage workers to be creative, but if the safety of their creativity appears dubious, they should prevent any action they believe to be harmful.

#### 4.4.1 Analysis of First Point

This point stated that deconstruction companies and organizations must provide training workshops periodically. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point. Mrs. Bauman disagreed only because of the word "must" and added that "this is a normal part of any business." Hence, this point is valid (see

Table 4.5).

Table 4.5

Responses of Deconstruction Experts to the Proposed  
Guidelines for Workers' Training

No.	Workers' Training	Agree	Disagree
1.	Deconstruction companies and organization must provide training workshops periodically.	3	1
2.	Deconstruction companies and organization must inform worker with the new health and safety regulations.	4	0
3.	Universities and education institutes must include deconstruction in their curriculums.	3	0
4.	Deconstruction companies and organization must encourage workers to be creative.	3	1

#### 4.4.2 Analysis of Second Point

This point insists that deconstruction companies and organization must inform their workers about any new health and safety regulations. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point according to Mrs. Bauman “this is cost savings, ultimately, the better your safety rating is the better the pool of job candidates.” As a result this point is valid.

#### 4.4.3 Analysis of Third Point

This point suggests that universities and education institutes must include deconstruction in their curriculums. Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point Mrs. Tai said, “Not all, but an increase at those with

construction, civil engineering and architecture programs.” Thus, this point is valid.

#### 4.4.4 Analysis of Fourth Point

Three people agree that deconstruction companies and organizations must encourage workers to be creative namely, Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point Mrs. Bauman disagreed with this point saying, “Creativity is a strange word- sometimes creativity in methodology gets workers harmed, creativity in finding markets for C&D debris, however, is always good thing.” So, this point is valid.

#### 4.5 Discussion of Project Funding Proposed Guidelines

The deconstruction industry faces the high cost of laborers and the lengthy time needed to deconstruct old buildings when compared to demolition. To overcome such obstacles, the deconstruction industry must find ways to obtain funds till it has become more common in the industry.

- Deconstruction organizations must seek government funding to help overcome deconstruction costs.

Non-profit deconstruction organizations need financial assistance to stay in business. Deconstruction organizations serve communities by creating jobs, building new houses, and reducing the amount of building materials going to landfills.

Government funding is necessary to encourage non-profit organizations to become involved in this business.

- Deconstruction organizations and companies should encourage owners and developers to donate building materials planned for demolition.

This is essential because owners and developers are paying money to demolition contractors to remove their old structures. Deconstruction could be more profitable to owners and developers if they allowed deconstruction companies and organizations enough time to disassemble structures. If the owner and developers donate building materials they could be rewarded with a tax-exemption from the government, which would benefit them and ultimately, the environment.

- Deconstruction organizations and companies should search for volunteers to disassemble buildings.

One alternative for getting deconstruction into the public sector would be by training non-skilled laborers. A volunteer work force could be assembled through student summer training programs. Other volunteer organizations could be contacted to provide volunteer laborers. If this workforce is available, there should be some incentives, such as accommodations, foodstuff and rewards.

- Deconstruction companies and organizations should establish their own resale centers and reuse the revenue to fund other projects.

It is very important to have an independent source of income in this business. Establishing resale centers will ensure that there is another line of revenue available to the deconstruction organization or company and will encourage them to bid or obtain other projects, and make sure that workers' incomes are stable.

#### 4.5.1 Analysis of First Point

This point suggested that deconstruction organizations and companies must ask for government funds to help overcome deconstruction cost. Two of the deconstruction experts agreed with this point namely, Mrs. Tai and Mr. Reynolds. According to Mrs. Tai “other structures do exists-but generally government funds are required. Mrs. Bauman and Mr. Singleton disagreed with this point. According to Mrs. Bauman “if done right, efficient labor practices coupled with updated technology minimize costs a lot faster than hanging out the possibility for a grant/subsidy.” And according to Mr. Singleton, “deconstruction must find ways to compete on cost.” Hence, this point needs more research in future (see Table 4.6).

Table 4.6

#### Responses of Deconstruction Experts to the Proposed Guidelines for Projects Funding

No.	Projects Funding	Agree	Disagree
1.	Deconstruction organization must ask for government funds to help overcome deconstruction cost.	2	2
2.	Deconstruction companies and organization should encourage owners to donate buildings planned for demolition.	3	1
3.	Deconstruction companies and organization must seek for volunteer work force.	3	1
4.	Deconstruction companies and organization should establish their own resale centers and use the revenue to fund other projects.	4	0

#### 4.5.2 Analysis of Second Point

This point recommends that deconstruction companies and organizations should encourage owners of buildings planned for demolition to donate the building to be deconstructed. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point according to Mrs. Tai “if they have a non-profit status. Otherwise they should take the materials and use them as income in addition to the deconstruction bid. This will allow them to compete with the demolition firms.’ Mrs. Bauman disagreed with this point stating, “No person would simply give away real estate.” As a result, this point is valid.

#### 4.5.3 Analysis of Third Point

This point proposed that the deconstruction companies and organizations must seek for volunteer work force. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point according to Mrs. Tai “helpful if you have volunteer driven organization and not necessarily useful in all organizations, volunteers required different type of management, and can slow down the process if an organization is not equipped to handle volunteers.” Mrs. Bauman disagreed with this point and said, “This idea will not be applicable on union jobs.” As a result, this point is valid.

#### 4.5.4 Analysis of Fourth Point

This point proposed that the deconstruction companies and organizations should establish their own resale centers and use the revenue to fund the projects.



Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point according to Mrs. Bauman “agree if they can afford to, that would be great, but if it’s really a completely separate line of business and may not make sense if there are already established resale centers in the region.” And according to Mrs. Tai “generally, this a must-self sufficiency can be attained with retail centers, unless the company is both construction and deconstruction. But they still must do something with the materials.” Hence, this validates this point.

#### 4.6 Discussion of Feasibility Study Proposed Guidelines

- Deconstruction companies and organizations must survey the used building materials market demands.

This step that should be undertaken prior to the deconstruction process to ensure the maximum marketing of recovered materials. This study should be conducted locally, if possible, to save time and transportation costs. The used building materials market demands are different from region to region, depending on the public and contractors' demands. Conducting a survey of local markets is an important part of the deconstruction feasibility study.

- Deconstruction companies and organizations should use technology, such as computer software, to estimate the value of recovered materials.

Technology is an important tool to ease the deconstruction process. Computer software is a useful tool for estimating the value of recovered materials. This could be performed through a study of local and national market prices. Such a

comprehensive study combined with an estimation program could yield a reasonable pricing system of recovered materials.

- Deconstruction companies and organizations must be aware of hazardous materials' removal cost.

Old buildings may contain hazardous materials, which in recent years have been found to create health problems. Hazardous materials must be removed professionally to avoid health problems for the workers. It is a costly process, but it must necessarily be performed prior to disassembling. The cost of hazardous materials removal must be included in the deconstruction bid, and it behooves the deconstruction organization or company to have a trained professional as an estimator.

#### 4.6.1 Analysis of First Point

The purpose of this point is to request deconstruction organization and companies to survey the used building materials market demands before starting any deconstruction project. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point, in addition Mrs. Bauman said, “Absolutely, they should find market for the debris.” So, this point is valid (see Table 4.7).

#### 4.6.2 Analysis of Second Point

This point suggests that deconstruction organizations and companies should use technology to estimate the value of the recovered materials such as computer

Table 4.7

Responses of Deconstruction Experts to the Proposed  
Guidelines for Deconstruction Feasibility Study

No.	Feasibility Study	Agree	Disagree
1.	Deconstruction companies and organization must survey the used building materials market demands.	4	0
2.	Deconstruction companies and organization should use technology to estimate the value of recovered materials.	4	0
3.	Deconstruction companies and organization must be aware of the cost to remove hazardous materials.	3	1

software. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. According to Mrs. Bauman, “the regional markets determine the value. If there’s a web site or something that can give price per ton, great.” Therefore, this point is valid.

#### 4.6.3 Analysis of Third Point

This point deals with hazardous materials, pointing that deconstruction companies and organization must be aware of the cost to remove hazardous materials from buildings planned for deconstruction. Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. On the other hand, Mrs. said “the homeowner or the developer should hire an expert team to do hazardous materials work. It is helpful for the Deconstruction manager to be able to identify toxic materials before work on a project begins.” Consequently, this point is valid.

#### 4.7 Discussion of Site Security Proposed Guidelines

The aim of site security in deconstruction is to protect the job site, the public and adjacent structures. The following are additional guidelines proposed for site security:

- Warning signs must be posted on all sides of the project fence to avoid public interference.

Site security is an important issue that must be clear to workers, the public, and visitors. Posting warning signs on all sides of the job site fence will increase the protection for any person entering the job site. The signs should clearly state that the public is not permitted to enter the site and that only authorized personnel and vehicles are allowed to enter.

- Security personnel must be available all the time to ensure job site security.

A dedicated security professional should be assigned the position of site security supervisor, depending on the size of the project. Security personnel are responsible for any unauthorized personnel or vehicles.

- Any security violation must be reported directly to the management.

It is necessary to report security violations to avoid injury to workers and the public, and damage to materials. The report of the violation must be clear, showing the responsible party and the result of the violation. Management should act rapidly to ensure that the violation causes no harm to the workers or any delays.

#### 4.7.1 Analysis of First Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that deconstruction companies and organizations must post warning signs in all sides of the project fence to avoid public interference. As a result, this point is valid (see Table 4.8).

Table 4.8

#### Responses of Deconstruction Experts to Proposed Guidelines for Deconstruction Site Security

No.	Site Security	Agree	Disagree
1.	Warning signs must be posted in all sides of the project fence to avoid public interference.	4	0
2.	Security personnel must be available all the time to ensure job site security.	3	1
3.	Any security violation must be reported directly to the management.	3	1

#### 4.7.2 Analysis of Second Point

This point stated that security personnel must be available all the time to ensure job site security. Mrs. Tai, Mrs. Bauman, and Mr. Reynolds agreed with this point. According to Mrs. Bauman, “security can be managed by site supervisor too, doesn’t have to be a dedicated staff.” And according to Mrs. Tai “depending upon the size of a job. Small jobs may choose to designate trained crew members to handle site security.” On the other hand, Mr. Singleton disagreed and said, “This needs more thought to address liability concerns.” Therefore, this point is valid.

#### 4.7.3 Analysis of Third Point

This point suggests that any job site security violation must be reported directly to the management. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point. According to Mrs. Tai, “Procedures for reporting incidents must be clear to crew members.” In contrast, Mrs. Bauman said, “Depends how serious.” Thus, this point is valid.

#### 4.8 Discussion of Workers' Safety Proposed Guidelines

The safety issue is crucial in deconstruction because workers are dealing with old buildings, which may contain hazardous materials or may be liable to collapse.

The following are additional proposed workers' safety guidelines:

- Safety guidelines must be posted on job site to be available in emergencies.

Workers should have quick access to safety references in case of injury during disassembly. Posted safety guidelines on the job site must be available for workers. These safety guidelines should inform workers how to respond to various types of injury.

- Workers health and accident insurance must be valid at all times.

Workers health and accident insurance in deconstruction must be legally binding to ensure that workers are protected against any injury. Deconstruction workers are exposed to injuries from nails, falls, hazardous materials, and collapse.

- Deconstruction companies and organizations must schedule routine health

checks for workers.

Workers' health checks are part of their safety and must be done periodically. Workers are dealing with jobs that include dirt and other hazards, so a routine health check is required to ensure that workers remain healthy.

- In case of injury, workers must know how to ask for medical health.

There must be a clear procedure for workers to ask for medical or emergency help in case of injury. The reason for declaring this point is to ensure that any injured worker will get quicker medical help. Workers health and safety are the first priority in deconstruction process.

#### 4.8.1 Analysis of First Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that deconstruction companies and organizations must keep safety guidelines posted on site to be available in emergencies. For this reason, this point is valid (see Table 4.9).

#### 4.8.2 Analysis of Second Point

This point suggest that deconstruction companies and organizations must keep workers health and accidents insurance valid all the time. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. So, this validates this point.

#### 4.8.3 Analysis of Third Point

Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed that deconstruction

Table 4.9

Responses of Deconstruction Experts to the Proposed  
Guidelines for Deconstruction Workers' Safety

No.	Proposed guidelines	Agree	Disagree
1.	Safety guidelines must be posted on site to be available in emergencies.	4	0
2.	Workers health and accidents insurance must be valid all the times.	4	0
3.	Schedule workers routine health check.	3	1
4.	In case of injury, workers must know how to seek medical health.	4	0

companies and organizations should schedule workers routine health check. On the other hand Mrs. Bauman disagreed with this point saying, “Seems a bit overkill.” As a result, this validates this point.

#### 4.8.4 Analysis of Fourth Point

This point stated that deconstruction workers must be aware of seeking medical health in case of injury. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. Therefore, this point is valid.

#### 4.9 Discussion of Materials' Safety Proposed Guidelines

The aim of deconstruction is to recover as much building materials as possible from old buildings. This should be done in a way that can cause minimum damage to materials. The following are additional guidelines to ensure maximum recovery of



building materials:

- Workers must be aware that all material damaged means a loss of money.

It is essential to educate workers about the value of recovered materials, and how to handle them with maximum care. Any material damaged will cause a loss of revenue and will adversely effect the final cost of the project.

- Workers must use designated tools for each material.

It is essential that workers use the proper tools to protect themselves, and that further, they protect the materials by using the right tools. If workers used the wrong tools it may result in self-injury or damaged materials.

- Any recovered material must be removed to designated area.

All materials recovered from the job site must be removed to a designated area. This allows for more space, and protects workers from injury and recovered material from damage. There must be designated areas for reusable, recyclable, and disposable materials.

- In case of difficulty in disassembling any material, workers must look for professional help.

Some materials may need professional disassembly or removal, such as hazardous materials, large machines or equipment, especially in industrial structures. This should only be pursued if the material is valuable and by workers who are trained to deal with these situations.

- The job site must be clear from recovered materials.

It is important to keep the job site clean, clear and unfilled with nonstructural

materials, which could interfere with job site activities. This will ensure workers' and materials' safety.

#### 4.9.1 Analysis of First Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with the statement, which stated that workers must know that each damaged material means lost of money. According to Mrs. Tai “it should be clear that the goal of deconstruction is recovery of materials first, second to bring the building down.” As a result, this point is valid (see Table 4.10).

Table 4.10

Responses of Deconstruction Experts to the Proposed Guidelines  
for Materials' Safety in Deconstruction

No.	Materials Safety	Agree	Disagree
1.	Workers must know that each damaged material means lost of money.	4	0
2.	Workers must use designated tools for each material.	4	0
3.	Any recovered material must be removed to designated area.	4	0
4.	In case of difficulty to disassemble any material, worker must seek professional help.	3	1
5.	Job site must be clear from recovered materials.	3	1

#### 4.9.2 Analysis of Second Point

This point says that workers must use designated tools for each material to

avoid damage during the disassembly. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. So, this point is valid.

#### 4.9.3 Analysis of Third Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with the point, which stated that any recovered material must be removed to designated area. According to Mrs. Tai “there must be a clear work staging area developed and understood before commencement of a job. Therefore, this point is valid.

#### 4.9.4 Analysis of Fourth Point

Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed that in case of difficulty to disassemble any material, workers must seek professional help. Mrs. Tai added, “depending upon the value of material. Otherwise, salvage for metal or wood would be fine if time and cost are reduced. Professionals cost a great deal of money Mrs. Bauman, some how disagreed with this point. And according to Mrs. Bauman “certain materials that don’t have markets will be lumped together for disposal as mixed C&D, not critical in that case.” Hence, this point is valid.

#### 4.9.5 Analysis of Fifth Point

This point suggested that deconstruction job site must be clear from recovered materials. Mrs. Tai, Mrs. Bauman, and Mr. Reynolds agreed with this point. Mr. Singleton some how disagreed with this point and according to Mr. Singleton “it

depends on marketing and security plans.” So, this point is valid.

#### 4.10 Discussion of On-Site Sale Proposed Guidelines

On-site sales are desirable in that they save transportation time and cost. The following proposed guidelines are intended to improve on-site sale procedures:

- Deconstruction organizations and companies must contact buyers in advance.

This should be an advanced step in the deconstruction process to ensure that some of the materials will be retrieved directly from the site by buyers.

Deconstruction supervisors should have a list of buyers willing to pick up recovered materials from the job site. This list should contain buyers’ names, contact personnel, contact number, and type of materials for pickup.

- Deconstruction companies and organizations may advertise in local newspapers about recovered materials for sale on-site.

This step should be conducted if there are no buyers found for on-site sale. Advertising in local newspapers will allow contractors and the public to get materials they are hunting for at a low price.

- Policy makers should modify on-site sale regulations.

Some regulations prohibit on-site sales, which are a barrier to deconstruction and may cause extra cost to any deconstruction project. Policy makers should allow on-site sales for materials which buyers are willing to retrieve from deconstruction sites.

- Site manager must give clear access to buyers' trucks.

Buyers should have no difficulty when they arrive for materials pick up. Site managers should ensure clear and easy access to attract more buyers, which saves on transportation costs of moving materials to resale centers.

- Designated loading area must be easily accessible to avoid interference with workers.

The job site should be divided into different areas and one of these areas should be designated as the loading area. The loading area should be separated from other job site activities to avoid interference with workers and other activities.

#### 4.10.1 Analysis of First Point

Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed that deconstruction companies and organizations must contact buyers in advance. According to Mrs. Tai "buyers should be obtained before job is started if no retail yard elitists." Mrs. Bauman disagreed with this point arguing that, "There isn't always the time. It is a good idea, but more of an ideal." Therefore, this validates this point (see Table 4.11).

#### 4.10.2 Analysis of Second Point

This point propose that deconstruction companies and organization may advertise in local news papers regarding recovered materials for sale. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. Thus, this point is valid.

Table 4.11

Responses of Deconstruction Experts to the Proposed  
Guidelines for Deconstruction On-Site Sale

No.	On-Site Sale	Agree	Disagree
1.	Deconstruction companies and organization must contact buyers in advance.	3	1
2.	Deconstruction companies and organization may advertise in local newspapers about recovered materials.	4	0
3.	Policy makers should modified on-site sale regulations.	4	0
4.	Site manager must give clear access to buyer's trucks.	4	0
5.	Designated loading area must be easily accessible to avoid interference with workers.	4	0

#### 4.10.3 Analysis of Third Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that policy makers should modify on-site sale regulations. Therefore, this validates this point.

#### 4.10.4 Analysis of Fourth Point

This point proposed that the deconstruction site manager must give clear access to buyer's trucks to avoid conflict with job site activities. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. Mr. Singleton said, "Access to designated areas only." Accordingly, this validates this point.

#### 4.10.5 Analysis of Fifth Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that there must be a designated area for materials loading and it should be easily accessible to avoid interference with workers. Thus, this point is valid.

#### 4.11 Discussion of On-Site Storage Proposed Guidelines

Depending on the size of the project, on-site storage may need to be created, particularly in large-sized projects. The following are proposed guidelines for on-site storage:

- On-site storage is an essential step in any deconstruction project.

On-site storage will assist in clearing materials from the job site to a secure area. On-site storage should be easily accessible to delivery trucks.

- On-site storage must be lockable to avoid theft.

Secured storage is important in that it protects recovered materials from theft or damage. Recovered materials must be protected until it is delivered to resale centers because the primary goal of deconstruction is to recover materials and use the revenue to overcome the labor costs associated with deconstruction.

- All materials in storage must be sorted according to its description.

Sorting materials in storage eases the loading and transportation of recovered materials. This sorting should include a description of the material, color, condition, and estimated price.

- Storage personnel must schedule material transportation to resale centers.

It is important to schedule transportation of materials to resale centers to avoid conflict with other buyers. A storage personnel or site manager should prepare a clear schedule and contact buyers.

#### 4.11.1 Analysis of First Point

This point stated that on-site storage is an essential step in any deconstruction project. Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed with this point. Mrs. Bauman disagreed arguing, “there may be an MRF available if the project is on the West Coast.” So, this point is valid (see Table 4.12).

Table 4.12

Responses of Deconstruction Experts to the Proposed Guidelines  
for On-Site Storage on Deconstruction Projects

No.	On-Site Storage	Agree	Disagree
1.	On-site storage is an essential step in any deconstruction project.	3	1
2.	On-site storage must be lockable to avoid theft.	4	0
3.	All materials on storage must be sorted according to its description.	4	0
4.	Storage personnel must schedule materials transportation to resale centers.	3	1

#### 4.11.2 Analysis of Second Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that the on-site storage must be lockable to avoid theft. Mrs. Tai added, “If material is valuable.”



Recovered materials are the primary source funding for deconstruction projects. Any damage to materials may cause a loss of money which means a decrease in revenue. Reporting any accidents may depend on the value of the materials and whether there is insurance to cover the damage.

- Forms listing material descriptions, size and condition should be completed during loading.

This step is essential to verify that materials are in good condition prior to leaving the job site. It is also important for resale centers to check the quantities and condition of each material during unloading.

- Any damage during transportation must be reported.

Depending upon the value of damaged materials, it is important to report any damage during transportation to the owner so that action may be taken. Delivery trucks and materials should be insured against transportation accidents.

#### 4.12.1 Analysis of First Point

Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that maximum care must be taken when loading recovered materials to avoid damage. Therefore, this point is valid (see Table 4.13).

#### 4.12.2 Analysis of Second Point

This point stated that workers must report any damaged materials during transportation before disposing them. Mr. Singleton and Mr. Reynolds agreed with

Table 4.13

Responses of Deconstruction Experts to the Proposed Guidelines  
for Transportation of Materials to Resale Centers

No.	Transportation of Materials	Agree	Disagree
1.	Maximum care must be taken when loading recovered materials.	4	0
2.	Workers must report any damaged materials before disposing them.	2	2
3.	Form include each material description, size, condition must be filled during loading.	3	1
4.	Any damage during transportation must be reported. (Insurance)	3	1

this point. Mrs. Tai and Mrs. Bauman argued this point. According to Mrs. Tai, “Not necessarily--reporting can occur on the disposal end.” And according to Mrs. Bauman “reporting only if it’s going to be reused.” So, more research is preferable.

#### 4.12.3 Analysis of Third Point

Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed that there must be a form to be filled including each material description, size and condition during loading. Mrs. Tai argued, “This can be done at the unloading site to save time.” Therefore, this point is valid.

#### 4.12.4 Analysis of Fourth Point

This point proposed that any damage to materials during transportation must be reported to determine the liability. Mrs. Bauman, Mr. Singleton and Mr. Reynolds

agreed with this point. Mrs. Tai argued that, “If the damage to materials shouldn’t be reported but to vehicles.” Hence, this point is valid.

#### 4.13 Discussion of Resale Centers Proposed Guidelines

Resale centers or used building materials markets are the final step in the deconstruction process. The following are proposed guidelines for resale centers:

- The number of resale centers should increase nationwide.

The growth in the number of resale centers nationwide is important to facilitate deconstruction. The availability of resale centers in each city will alert contractors and the public to the benefits of using recovered materials.

- Recovered building materials prices should be lower than new materials prices.

The price of used building materials should be competitive with the price of new materials. Resale centers should attract customer with materials reasonably priced and in good condition.

- Resale centers must educate the public and contractors about the benefits of using recovered building materials.

Resale centers play a key role in educating the public and contractors to use recovered materials in renovations or new buildings. This can be done through advertisements, case studies, conferences, and seminars.

- Materials in resale centers must be assessed in order to be used in other buildings.

Policy makers should work hand in hand with deconstruction experts to ensure that recovered materials meet building codes and regulation standards. Most of the materials in resale centers are usable and just need to be brought to the attention of the public, government and contractors.

- Resale centers should start in the non-profit sector.

It is important to start resale centers in the non-profit sector until deconstruction becomes the more common practice in building removal. The goal of resale centers is not the revenue, but to help deconstruction to preserve building materials.

- Resale centers must participate in the deconstruction process.

Resale centers must participate in deconstruction by marketing recovered materials and helping to educate the public and contractors about using recovered materials.

#### 4.13.1 Analysis of First Point

This point argued that the number of used materials resale centers is very low nationwide. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. As a result, this point is valid (see Table 4.14).

#### 4.13.2 Analysis of Second Point

Mrs. Tai, Mr. Singleton and Mr. Reynolds agreed that recovered materials prices are relatively higher than expected. Mrs. Bauman disagreed with this point and according to Mrs. Bauman “not during a recession.” So, this point is valid.

Table 4.14

Responses of Deconstruction Experts to the Proposed  
Guidelines for Resale Centers

No.	Resale Centers	Agree	Disagree
1.	The number of resale centers is very low nation wide.	4	0
2.	Recovered materials prices are relatively higher than expected.	3	2
3.	Resale centers must educate the public about the benefits of using recovered materials.	4	0
4.	Most of the materials in resale centers are not useable.	2	2
5.	Most of the resale centers are for-profit.	2	2
6.	Resale centers must participate in deconstruction process.	2	2

#### 4.13.3 Analysis of Third Point

This point declares that resale centers must educate the public about the benefits of using recovered materials. Mrs. Tai, Mrs. Bauman, Mr. Singleton and Mr. Reynolds agreed with this point. Thus, this point is valid.

#### 4.13.4 Analysis of Fourth Point

This point argued that most of the materials in resale centers are not useable. Mr. Singleton and Mr. Reynolds agreed with this point. On the other hand, Mrs. Tai and Mrs. Bauman disagreed with this point and according to Mrs. Tai “Everything is useable--there just might not be the right people available.” Therefore, more research

is preferable

#### 4.13.5 Analysis of Fifth Point

Mr. Reynolds agreed with the point that said most of the resale centers are for-profit. Mrs. Tai disagreed and says, “Most are non-profit.” Both Mrs. Bauman and Mr. Singleton were not sure about it. As a result, more research is preferable

#### 4.13.6 Analysis of Sixth Point

This point proposed that resale centers must participate in deconstruction process. Mr. Singleton and Mr. Reynolds agreed with this point. Mrs. Tai and Mrs. Bauman disagreed and according to Mrs. Tai, “not if they are connected to a landfill, or other material source. Urban Ore does not do deconstruction.” And according to Mrs. Bauman, “they are different types of business.” So, more research is preferable.

## CHAPTER V

### CONCLUSION

#### 5.1 Conclusions

The purpose of this study is to develop effective deconstruction guidelines to help the deconstruction movement to be more popular to the public and the government. The deconstruction industry competes with the demolition industry for the removal of old buildings planned for demolition, seeking to disassemble them for reuse and recycle.

This research was based on an intensive investigation through old deconstruction literatures, discussion with some experts in deconstruction industry and previous case studies. These investigations were followed by discussions about the proposed guidelines with four of the deconstruction pioneers to further validate them.

Many valuable comments and recommendations were obtained from deconstruction industry experts regarding proposed guidelines. These comments and recommendations facilitated producing and validating the proposed guidelines. The following points should be considered in any deconstruction projects in conjunction with the proposed guidelines delineated in previous chapters.

- There must be a bidding procedure to give deconstruction a chance to compete with demolition.
- The stability of any structure planned for deconstruction must be assessed

prior to the beginning of the project.

- Hazardous materials must be removed before commencing the disassembly any structure.
- The government's role should be to encourage owners and developers to deconstruct buildings.
- A strategy to educate policy makers, the public, and the demolition industry about the benefits of deconstruction is part of the deconstruction expert's responsibility.
- Deconstruction must be addressed in local unions.
- Reusing or recycling building materials must be part of building codes and regulations.
- Policy makers should start banning certain materials from landfill, material by material.
- Educating and training of workers is a key factor in deconstruction.
- Government funds are very important to promote deconstruction.
- The use of technology in deconstruction is very important to ease the deconstruction process.
- Any materials planned for donation should go to non-profit organizations.
- Expected revenues from deconstruction projects should be added to the bid price.
- Deconstruction organizations and companies should find markets for recovered materials in the same region if possible.



- Special web sites should be established to present recovered materials for sale.
- The role of site managers is very important to promote secure and safe job sites.
- Liability issues on job sites need more research.
- An organized job site is an important step to ensure a successful deconstruction project.

Deconstruction is an opportunity to prevent the waste streams that is substantially spreading in the USA. Stopping the waste stream requires a coordinated effort from the government, the public, deconstruction organizations and the demolition industry.

Policy makers, deconstruction industry, architects and engineers should work together to find ways to assist deconstruction in future projects and research. Two important topics that need to be included in future investigations to help curtail the waste stream are: (1) design for disassembly, and (2) building materials durability.

## 5.2 Design for Disassembly

Design for disassembly is an important subject that should be studied by architects, engineers and policy makers. Future buildings should be: (a) more flexible so they could be adapted to other functions, (b) more durable, (c) ready for future expansions, and (d) easily disassembled. Architects should consider these issues and educate involved parties in the construction industry about the importance of these

criteria.

### 5.3 Building Materials Durability

Building materials should be selected carefully in future structures. This could be done through an intensive study of more durable building materials. These materials should be more durable, easy to be disassembled, flexible for future alterations, and meet building codes and regulations.

## Appendix A

### Deconstruction Inspection Forms and Actions Taken Toward Old Building Materials (Morris, 2001)

## Deconstruction Material Audit

Name of Company		Contact Person		Telephone No.		
Project Site/Location		Project Type <input type="checkbox"/> Complete Deconstruction <input type="checkbox"/> Partial Deconstruction		Estimated Time for Completion		
Building Construction <input type="checkbox"/> Combustible <input type="checkbox"/> Noncombustible		<input type="checkbox"/> Combination (specify)		Building Type <input type="checkbox"/> Residential <input type="checkbox"/> Commercial/Industrial		Total Square Footage

Pre-Demolition Audit		Project Summary				
Material	Estimated Generation	For Period:			Facility	Remarks/Comments
		Salvaged	Recycled	to Disposed		

Signature	Title	Date
-----------	-------	------

### Explanatory note:

Column 1 - "Material" - enter materials targeted for salvage, recycling, and/or disposal  
 Column 2 - "Estimated Generation" - enter the estimated volumes, quantities, or number of salvageable, recyclable, and waste materials generated (e.g., cu. yd. tonnes, bd. ft.)  
 Column 3 - "Salvaged" - enter the volumes, quantities, or number of materials salvaged (e.g., cu. yd. tonnes, bd. ft.)  
 Column 4 - "Recycled" - enter the volumes or quantities of materials recycled (e.g., cu. yd. tonnes, bd. ft.)  
 Column 5 - "Disposed" - enter the volumes or quantities of materials disposed (e.g., cu. yd. tonnes, bd. ft.)  
 Column 6 - "Facility" - enter the end-destination of salvaged, recycled, and disposed materials  
 Column 7 - "Remarks/Comments" - enter any additional comments or details as required

## Handling & Storage Procedures

Item or Material by Division	Suggested Action
<b>02 SITEWORK</b>	
Asphalt Paving	<b>Salvageable</b> - reuse for temporary road construction
Chain Link Fencing	<b>Salvageable</b> - roll up chain link and cut off posts to maximum length possible - all accessories (tops, clamps, bolts, straps, etc.) should be kept together in a container and labeled
Wood Fencing	<b>Salvageable</b> - if possible, dismantle in sections for easy re-erection - cut posts off at ground level
<b>03 CONCRETE</b>	
Cast-in-place Concrete	Recyclable - usually too large for salvage and reuse
Precast Concrete	Recyclable - usually too large for salvage and reuse
<b>04 MASONRY</b>	
Concrete Block	<b>Salvageable</b> - if not concrete filled - recyclable if filled with concrete
Paving Stones	<b>Salvageable</b> - stack and palletize for easy removal
Brick	<b>Salvageable</b> - if set with lime-based mortar - recyclable if set with concrete
Decorative Concrete Block	<b>Salvageable</b> - if not concrete filled - recyclable if filled with concrete
<b>05 METALS</b>	
Reinforcing Steel (rebar)	Recyclable - usually imbedded in concrete, therefore not reusable
Steel Flashing	Recyclable - usually not in suitable condition for reuse
Interior Metal Wall Studs	Recyclable - usually too time-consuming to save in suitable condition for reuse
Structural Steel	<b>Salvageable</b> - includes I-Beams, H-Beams, Square Tubing, Pipe, and Channel Iron - ensure care is taken to keep straight - separate by size and type
Cast Iron	Recyclable - usually too old and brittle for reuse
Copper	Recyclable - rarely salvageable due to the high likelihood of damage while salvaging
Aluminum Soffit	Recyclable - usually not in suitable condition for reuse
Misc. Steel	<b>Salvageable</b> - includes Pipe, Q-decking, Square-tubing, and Wilson joists - prior to reuse must determine the item's structural ability to meet current Building Code - recyclable if item is bent or structural ability is compromised
<b>06 WOOD &amp; PLASTICS</b>	
Regular Wood Framing	<b>Salvageable</b> - all lumber should be slated, stacked and banded according to dimension and lengths - stacks should be kept uniform (ensure piles can be accommodated on truck deck, recommend stacking 2 piles side by side to a maximum width of 4' per pile including dunnage and maximum height of 3' to 4')
Pressure Treated Wood Framing	<b>Salvageable</b> - same as regular wood framing
Regular Plywood Sheathing	<b>Salvageable</b> - stack in piles keeping full sheets together and partial sheets together in lots of 50 pieces - separate by thickness - recommend stacking nail side to nail side - materials should be kept dry by covering with plastic sheeting (which also allows for air flow)
Pressure Treated Plywood Sheathing	<b>Salvageable</b> - same as regular plywood sheathing - do not mix with regular plywood sheathing
Laminated Beams	<b>Salvageable</b> - beams should be kept dry by covering with plastic sheeting (to allow for air flow) - beams should be supported in such a manner as to keep them straight and should be slated to allow air flow when stacked
Wood Truss Joists	<b>Salvageable</b> - joists should be supported in such a manner as to keep them straight and should be slated to allow air flow when stacked - protect from rain
Heavy Timbers/Posts	<b>Salvageable</b> - all timber should be sorted according to dimension and length - timber should be slated to allow air flow - all damaged ends should be trimmed - protect from rain
Washroom Counters	<b>Salvageable</b> - if fixtures are removed, counters can be stored vertically - protect from rain

Item or Material by Division	Suggested Action
<b>07 THERMAL &amp; MOISTURE PROTECTION</b>	
Roofing Gravel	<b>Salvageable</b> - reusable
Fiberglass Bat Insulation	<b>Salvageable</b> - protect from rain
Rigid Fiberglass Insulation	<b>Salvageable</b> - protect from rain
Polystyrene Rigid Insulation	<b>Salvageable</b> - stack and band for easy transport
Copper Flashing	Recyclable - usually too time-consuming to save in suitable condition for reuse
Roof Drains, Metal	Recyclable - usually too time-consuming to save in suitable condition for reuse
<b>08 DOORS &amp; WINDOWS</b>	
Doors, Metal	<b>Salvageable</b> - remove with full frame and hardware - apply a metal self tapping screw through the top of the door to hold it in the frame as a unit - label keys belonging to each door
Doors, Wood	<b>Salvageable</b> - remove with full frame and hardware - nail the door through the frame to keep from falling out of jam - label keys belonging to each door
Bi-Fold Doors, Metal	<b>Salvageable</b> - remove all hardware parts and attach to door (e.g. in plastic zip lock bags) - wrap track on edge of door with duct tape
Bi-Fold Doors, Wood	<b>Salvageable</b> - remove all hardware parts and attach to door (e.g. in plastic zip lock bags) - screw track on edge of door
Overhead Doors	<b>Salvageable</b> - must be removed carefully (as doors have spring assembly) - all door hardware should be kept together with door- (hinges, screws, rollers, guides etc.) - door panels should be stacked face to face - track should be marked left and right - note, it is very important to keep all parts
Metal Sliding Doors	<b>Salvageable</b> - dependent on size and condition of doors and hardware - recyclable otherwise if too large or not in suitable condition
Mechanical Closures	<b>Salvageable</b> - dependent on age and physical condition
Panic Hardware	<b>Salvageable</b> - keep all parts together (e.g. in plastic zip lock bags)
Patio Doors	<b>Salvageable</b> - remove and stand vertically with drains to the bottom
Aluminum Windows	<b>Salvageable</b> - dependent on size - smaller windows should always be salvaged but larger windows can be difficult to resell (especially if fixed/non-opening) - recyclable otherwise by removing glass and recycling frame
Steel Windows	<b>Salvageable</b> - dependent on size - smaller windows can be salvaged but limited marketability - recyclable otherwise by removing glass and recycling metal frame
Sealed Glass Units	<b>Salvageable</b> - limited marketability - store vertically or horizontally - ensure panels are level or supported in order to prevent damage to the seal
Unframed Glass Mirrors	<b>Salvageable</b> - store vertically on either a carpet, cardboard, or rubber surface for protection - recommend storing face to face
Store Fronts	<b>Salvageable</b> - best to be kept in one unit - store on A-frame rack and tie back
Skylights	<b>Salvageable</b> - ensure that seal is not broken - store where not affected by wind
<b>09 FINISHES</b>	
Carpet/Carpet Tiles	<b>Salvageable</b> - dependent on condition
Terra Cotta Tile	<b>Salvageable</b> - dependent on quantities available, since sometimes difficult to match if product is obsolete
Wood Base Board	<b>Salvageable</b> - remove, denail (if possible), stack face to face, and hold together with duct tape - keep sizes and lengths together (if possible)
Hardwood Flooring	<b>Salvageable</b> - if tongue and groove flooring - remove, denail, stack face to face, and hold together with duct tape - keep lengths together (if possible) - thin strip flooring is not salvageable (i.e. too thin for refinishing)
Gypsum Panels	Recyclable
Wood Paneling	<b>Salvageable</b> - dependent on condition (otherwise not cost effective) - recyclable otherwise (with clean wood)
Metal Suspension System	Recyclable - usually too time-consuming to save in suitable condition for reuse
Specialty Wood Finishes	<b>Salvageable</b> - includes mantels, built-in shelving, bookcases, crown moldings, and window sash - keep all trim work where possible

Item or Material by Division	Suggested Action
Cabinets	<b>Salvageable</b> - includes kitchen and bathroom cabinets - if possible, photograph the cabinet in place prior to removal to indicate potential reuse and to give purchasers a better idea of how the cabinets would look in place
<b>10 SPECIALTIES</b>	
Toilet Partitions	<b>Salvageable</b> - must ensure all hardware is available
Framed Glass Mirrors	<b>Salvageable</b> - store vertically on either a carpet or rubber surface for protection - recommend storing face to face
Towel Racks, Soap Dispensers, and Other Washroom Accessories	<b>Salvageable</b> - for commercial products ensure all keys to open units are included
Shower Stalls	<b>Salvageable</b> - if acrylic stalls - ensure the stall is suitable condition and not cracked or overly worn
Chalk boards and White boards	<b>Salvageable</b> - limited marketability
Metal Lockers	<b>Salvageable</b> - for ease of handling and resale, break into units of 6 or less
Old Hardware	<b>Salvageable</b> - includes glass door knobs, hinges, and antique items
<b>11 EQUIPMENT</b>	
Household appliances	<b>Salvageable</b> - dependent on condition - includes fridges, stoves, stove hoods, dish washers, freezers, washers, and dryers - recyclable otherwise
<b>12 FURNISHINGS</b>	
Metal File Cabinets	<b>Salvageable</b> - dependent on condition - recyclable otherwise
Metal Shelving Unit	<b>Salvageable</b> - when dismantling ensure all bolts, nuts and additional parts are kept together - recommend marking sections in order to make it easier to re-erect
Commercial Metal Racking	<b>Salvageable</b> - when dismantling ensure all bolts, nuts and additional parts are kept together - recommend marking sections in order to make it easier to re-erect
Metal Desks	<b>Salvageable</b> - dependent on condition - recyclable otherwise
Wood Desks	<b>Salvageable</b> - dependent on condition - recyclable otherwise
<b>14 CONVEYING SYSTEMS</b>	
Winches	<b>Salvageable</b> - dependent on mechanical condition - recyclable otherwise <sup>9</sup>
<b>15 MECHANICAL</b>	
Toilets	<b>Salvageable</b> - limited marketability due to current Plumbing Codes (white toilets offer the best resale opportunities) - recyclable otherwise (sink with concrete and taps with metals)
Urinals	<b>Salvageable</b> - ensure there are no cracks and the hardware is working - recyclable otherwise (sink with concrete and taps with metals)
Ceramic Sinks	<b>Salvageable</b> - dependent on condition - recyclable otherwise (sink with concrete and taps with metals)
Stainless Steel Tanks	<b>Salvageable</b> - dependent on previous usage (sometimes required to destroy for contamination reasons) - recyclable otherwise
Janitor Sinks	<b>Salvageable</b> - dependent on condition - recyclable if made of old cast iron
Bath Tubs	<b>Salvageable</b> - dependent on condition and colour (white bath tubs and old claw foot tubs offer the best resale opportunities)
Radiators	<b>Salvageable</b> - dependent on size (for ease of handling, 20 to 25 ribs would be the maximum suitable size for salvaging) and condition - recyclable otherwise
Hot Water Tanks	<b>Salvageable</b> - if year 1995 or newer - recyclable otherwise
Suspended Blow Heaters	<b>Salvageable</b> - if year 1990 or newer - recyclable otherwise
Wall Mount Radiators	<b>Salvageable</b> - dependent on condition - recyclable otherwise
Wall Mount Electric Radiators	<b>Salvageable</b> - dependent on condition - recyclable otherwise
Mechanical Water Pumps & Tanks	<b>Salvageable</b> - dependent on condition - recyclable otherwise
Oil Interceptor	Recyclable
Oil Storage Tank	<b>Salvageable</b> - dependent on previous usage (sometimes required to destroy for contamination reasons) - recyclable otherwise
Ventilation Ducting	<b>Salvageable</b> - dependent on size and condition - recyclable otherwise
Metal Ducting/Ventilation	<b>Salvageable</b> - dependent on size and condition - recyclable otherwise
Stainless Steel Ducting/Ventilation	<b>Salvageable</b> - dependent on size and condition - recyclable otherwise
Copper Ducting/Ventilation	<b>Salvageable</b> - dependent on size and condition - recyclable otherwise

**Appendix B**  
**Building Materials Inventory**  
**Form (CEPA, 2001)**



## Building Materials Inventory Form

### Building Inspection Information

Building Identification: \_\_\_\_\_

Date: \_\_\_\_\_

Inspected by: \_\_\_\_\_

Roof System			
Wood framing	Roof type (gable, hip, mansard, etc.):		Pitch:
	Roofing material:		No. of layers:
	Rafter:	Size:	Length:
	Ridge beam:	Size:	Length:
	Spacing of framing members:		
	Sheathing type (tongue and groove, butt joint):	Size:	
	Ceiling joists	Size:	Length:
Exterior Wall System			
Masonry	Width (single or double wythe, cavity, etc.):		
	Location of rebar:		
	Steel lintels:		
Wood framing	Stud:	Size:	Height:
	Plate	Size:	Length:
	Top:		
	Bottom:		
	Spacing of framing members:		
	Sheathing type:	Size:	Length:
Floor System			
Wood framing	Joist:	Size:	Length:
	Spacing of framing members:		
	Center carrying beam for joists:	Size:	Length:
	Sheathing/subfloor type:		

<b>Notes</b>			
<b>Interior Walls: Wood Framing</b>			
Load-bearing walls	Stud:	Size:	Height:
	Plate: Top: Bottom:	Size:	Length:
	Spacing of framing members:		
	Total linear feet of wall:		
Partition walls	Stud:	Size:	Height:
	Plate Top: Bottom:	Size:	Length:
	Spacing of framing members:		
	Total linear feet of wall:		
<b>Foundation: Masonry</b>			
	Type (block, poured):	Width:	Height:
	Location of rebar:		
	Slab:	Thickness:	Rebar:
	Chimney type (solid, lined):		Size:
	Sump pump:		
<b>Fascia/Eave</b>			
	Fascia:		
	Rake:		
	Gutters:		

Connections between building elements (anchor bolts, strapping, hold downs, etc.)			
	Floor/wall:		
	Wall/roof:		
	Window/wall:		
Finish Materials			
	Plaster/lath:		Ceiling height:
	Finish flooring (type):	Fastening:	
	Unpainted wood (type):	Linear feet:	
	Cabinets (type):		
	Stair treads (type):	Number:	Width:
	Shelving (type):		
	Plumbing fixtures (type):		
	Appliances (type):		
Notes			

Heating System			
	System (type):		
	Boiler/furnace:		
	Hot water heater:		
	Radiators:		
Other			
	Doors (type):		Size:
	Windows (type):		Size:
	Metals: Piping for plumbing, domestic hot water, etc.:		
Miscellaneous			
	Extent of rot:		
	Lumber grading stamp:		
	Overall building dimensions:		
	Date of construction (approx.):		
	Complicating site conditions: Steep grade, trees near the building:		
Notes			

## Appendix C

### Demolition Permits (City of Kalamazoo Building Officials, 1999)

## APPLICATION FOR LICENSE TO WRECK/MOVE BUILDINGS

City of Kalamazoo, 241 W. South Street  
Kalamazoo, MI 49007 (616) 337-8026

Date Submitted \_\_\_\_\_ License No. \_\_\_\_\_  
 Rec'd by \_\_\_\_\_ Issue by/date \_\_\_\_\_  
 OK to issue \_\_\_\_\_ License Fee \_\_\_\_\_

Name of Firm \_\_\_\_\_  
 Name of Applicant \_\_\_\_\_

### MAIN OFFICE INFORMATION

### LOCAL OFFICE INFORMATION

General Manager \_\_\_\_\_ Resident Agent \_\_\_\_\_  
 Address \_\_\_\_\_ Address \_\_\_\_\_

Phone No. \_\_\_\_\_ Phone No. \_\_\_\_\_

Business Owner(s) or [ ] \_\_\_\_\_

Corporation Officers [ ] \_\_\_\_\_

Evidence of appropriate knowledge and experience attached [ ]

Public Liability Insurance [ ] Policy No. \_\_\_\_\_ Expires \_\_\_\_\_

Insurance Company Name \_\_\_\_\_

\$1,000,000. Bodily Injury [ ] \$1,000,000.00 Property Damage [ ]

30 day written Cancellation Notice Provision [ ]

City, its agents, and employees included as additional insured [ ]

\*Cancellation or Lapse of this Policy will void License and all Permits.

I hereby certify that I have read and examined this Application and know same to be true and correct. I agree to comply with all provisions of laws and ordinances governing this type of work. The granting of this License does not presume to give authority to violate or cancel the provisions of any other federal, state, or local law regulating the wrecking or moving of buildings.

Applicant Signature \_\_\_\_\_

Date \_\_\_\_\_

\*This License shall not be assigned or transferred and shall expire on \_\_\_\_/\_\_\_\_/\_\_\_\_.

**BA PAY WRK  
APPLICATION FOR A PERMIT TO WRECK**

**CITY OF KALAMAZOO  
BUILDINGS DIVISION  
241 W. SOUTH STREET  
KALAMAZOO, MI 49007-4796  
337-8026**

PERMIT NUMBER \_\_\_\_\_

DATE \_\_\_\_\_

ADDRESS OF WORK \_\_\_\_\_

CONTRACTOR'S NAME \_\_\_\_\_

OWNER OF PROPERTY \_\_\_\_\_

CONTRACTOR'S ADDRESS/TELEPHONE # \_\_\_\_\_

Building is:		Building:	Construction type
Commercial _____	Dwelling _____	Size _____	_____
Accessory _____	Units: _____	X _____	_____
	Stories _____		_____
PRE-DEMOLITION INSPECTION FOR DANGEROUS SUBSTANCES		UTILITY NOTIFICATION	
Date of Inspection _____		Water _____	Date of Removal _____
Inspector _____		Electric & Gas _____	Date of Removal _____
PREMISE TO BE FILLED & LEVELED? _____		STARTING DATE _____	
BY _____		COMPLETION DATE _____	
CASH DEPOSIT OR BOND _____		INSURANCE _____	
LIST ALL SPECIAL CONDITIONS: _____			
<p>WITH THE GRANTING OF THIS PERMIT, IT IS AGREED THAT THE WRECKING OPERATION WILL BE COMPLETED WITHIN THE TIME LIMIT SPECIFIED BY KALAMAZOO CITY CODES UNLESS OTHERWISE EXTENDED FOR CAUSE SHOWN, THAT PROPER GRADING AND LEVELING OR PROPER AND SAFE BARRICADE WILL BE PROVIDED AROUND ALL OPENINGS. IT IS ALSO AGREED THAT ON FAILURE OF PERFORMANCE PURSUANT TO THE TERMS OF THIS PERMIT, THE PERFORMANCE BOND OR CASH BOND SHALL BE FORFEITED TO THE CITY FOR USE IN COMPLETING THE WRECKING, GRADING, LEVELING OR BARRICADING AS REQUIRED BY KALAMAZOO CITY CODES.</p> <p>I DO HEREBY SWEAR AND WARRANT THAT THE ABOVE STATEMENTS ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND THAT IN CONSIDERATION OF THE GRANTING OF THIS PERMIT, I AGREE TO SAVE THE CITY OF KALAMAZOO, MICHIGAN HARMLESS FROM ANY AND ALL CLAIMS OR DAMAGES WHICH MAY ARISE FROM THE EXERCISE OF SAID PERMIT.</p> <p>I, _____, DO HEREBY AGREE TO PERFORM SAID WORK IN ALL RESPECTS IN COMPLIANCE WITH THE PROVISIONS OF THE STATUTES OF THE STATE OF MICHIGAN AND THE KALAMAZOO CITY CODES.</p>			
OWNER'S SIGNATURE _____		DATE _____	
CONTRACTOR'S SIGNATURE _____		DATE _____	

**FINAL APPROVAL:**

INSPECTOR'S SIGNATURE \_\_\_\_\_

DATE \_\_\_\_\_

 \$ \_\_\_\_\_  
 FEE

Approved for Issue \_\_\_\_\_

Appendix D

Safety Forms (CEPA, 2001)



## **Fall Protection Equipment Inspection Form**

Equipment Inspected: \_\_\_\_\_

Date: \_\_\_\_\_

Inspected by: \_\_\_\_\_

### **Full-Body Harness/Positioning Belt/Body Belt Inspection**

1. Belts and straps: Check for frayed edges, broken fibers, pulled stitches, cuts, or chemical damage.
2. D rings: Check D ring and D ring metal wear pad (if any) for distortion, cracks, breaks, and rough or sharp edges.
3. Attachments of buckles: Note any unusual wear, frayed or cut fibers, or distortion of buckles/D rings. Check all rivets.
4. Frayed or broken strands: Check webbing surface for broken/cut stitches.
5. Tongue or billet: Inspect for loose, distorted, or broken grommets.
6. Tongue buckle: Check for distortion or sharp edges.
7. Friction buckle: Outer bars and center bars must be straight. Check corners and attachments points of the center bar.

### **Lanyard Inspection**

1. Hardware:
2. Snaps: Inspect for hook and eye distortions, cracks, corrosion or pitted surfaces. Inspect latch and keeper spring/lock.
3. Thimbles: Edges of thimble must be free of sharp edges, distortions or cracks.
4. Steel lanyard: Check for cuts, frayed areas or unusual wear patterns.
5. Web lanyards: Check for swelling, discoloration, cracks, and charring from heat/chemical damage.
6. Rope lanyard: Check for fuzzy, worn, broken, or cut fibers.

### **Findings/Recommendations**

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***Hazard Evaluation and Code of Safe Practices for General Work Areas and Specific Job Safety Classes***

General Area of Specific Job Safety Class: \_\_\_\_\_

Date Prepared: \_\_\_\_\_

Prepared By: \_\_\_\_\_

Description of Job/Task	Potential Safety/Health Hazards	Code of Safe Practices
	Falls due to improper fall protection equipment.	Employees will only use fall protection equipment that is approved for the task.
	Falls due to improper use of fall protection equipment.	Employees will follow all safety rules/guidelines established by the company with respect to the use of fall protection equipment.
	Falls due to the use of fall protection equipment that is frayed, distorted, cracked or cut.	Employees are to inspect all fall protection equipment for damage prior to each use.
	Falls due to the use of improper tie-off points.	Employees using fall protection equipment must tie off only at approved points.
	Injuries/falls due as a result of slipping on wet surfaces.	Employees will only wear approved footwear and use caution when working on wet surfaces.
	Injuries/falls due to slip/trip hazards	Employees will keep worksite clean and orderly. All equipment will be properly stored when not in use.

## ***Forklift Pre-Operational Checklist***

Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

<b>Pre-Operation Inspection<sup>***</sup></b>	<b>Sun</b>	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>	<b>Fri</b>	<b>Sat</b>
Date							
Battery water/vent caps							
Battery connectors							
Check for leaks							
Tires and wheels							
Carriage							
Forks							
Mast							
Lights							
Horn							
Cage and seat							
Fire extinguisher							
Parking brake and alarm							
Brake operation							
Hydraulic controls							
Speed and direction controls							
Steering controls							

Report any problems and/or unsafe conditions to department supervisor when discovered. All lift trucks are to be inspected daily before use.

<b>Additional Comments:</b>	<b>Problem(s) Reported To</b>

<sup>\*\*\*</sup> Operator must initial after checking off each item in "Pre-Operation Inspection" section.

Appendix E

Life Expectancy of Household Components

<b>Life Expectancy of Household Components</b>	
<b>Appliances</b>	<b>Life in years</b>
Compactors	10
Dishwashers	10
Dryers	14
Disposal	10
Freezers, compact	12
Freezers, standard	16
Microwave ovens	11
Electric ranges	17
Gas ranges	19
Gas ovens	14
Refrigerators, compact	14
Refrigerators, standard	17
Washers, automatic and compact	13
Exhaust fans	20
<i>Source: Appliance Statistical Review, April 1990</i>	
<b>Bathrooms</b>	<b>Life in years</b>
Cast iron bathtubs	50
Fiberglass bathtub and showers	10-15
Shower doors, average quality	25
Toilets	50
<i>Sources: Neil Kelly Designers, Thompson House of Kitchens and Bath</i>	
<b>Cabinetry</b>	<b>Life in years</b>
Kitchen cabinets	15-20
Medicine cabinets and bath vanities	20
<i>Sources: Kitchen Cabinet Manufacturers Association, Neil Kelly Designers</i>	
<b>Closet systems</b>	<b>Life in years</b>
Closet shelves	Lifetime
<b>Countertops</b>	<b>Life in years</b>
Laminate	10-15
Ceramic tile, high-grade installation	Lifetime
Wood/butcher block	20+
Granite	20+

*Sources: AFP Associates of Western Plastics, Ceramic Tile Institute of America*

<b>Doors</b>	<b>Life in years</b>
Screen	25-50
Interior, hollow core	Less than 30
Interior, solid core	30-lifetime
Exterior, protected overhang	80-100
Exterior, unprotected and exposed	25-30
Folding	30-lifetime
Garage doors	20-50
Garage door opener	10

*Sources: Wayne Dalton Corporation, National Wood Window and Door Association, Raynor Garage Doors*

<b>Electrical</b>	<b>Life in years</b>
Copper wiring, copper plated, copper clad aluminum, and bare copper	100+
Armored cable (BX)	Lifetime
Conduit	Lifetime

*Source: Jesse Aronstein, Engineering Consultant*

<b>Finishes used for waterproofing</b>	<b>Life in years</b>
Paint, plaster, and stucco	3-5
Sealer, silicone, and waxes	1-5

*Source: Brick Institute of America Floors*

<b>Floors</b>	<b>Life in years</b>
Oak or pine	Lifetime
Slate flagstone	Lifetime
Vinyl sheet or tile	20-30
Terrazzo	Lifetime
Carpeting (depends on installation, amount of traffic, and quality of carpet)	11
Marble (depends on installation, thickness of marble, and amount of traffic)	Lifetime+

<b>Footings and foundation</b>	<b>Life in years</b>
Poured footings and foundations	200
Concrete block	100
Cement	50
Waterproofing, bituminous coating	10
Termite proofing (may have shorter life in damp climates)	5

*Source: WR Grace and Company*

<b>Heating, ventilation and air conditioning (HVAC)</b>	<b>Life in years</b>
Central air conditioning unit (newer units should last longer)	15
Window unit	10
Air conditioner compressor	15
Humidifier	8
Electric water heater	14
Gas water heater (depends on type of water heater lining and quality of water)	11-13
Forced air furnaces, heat pump	15
Rooftop air conditioners	15
Boilers, hot water or steam (depends on quality of water)	30
Furnaces, gas- or oil-fired	18
Unit heaters, gas or electric	13
Radiant heaters, electric	10
Radiant heaters, hot water or steam	25
Baseboard systems	20
Diffusers, grilles, and registers	27
Induction and fan coil units	20
Dampers	20
Centrifugal fans	25
Axial fans	20
Ventilating roof-mounted fans	20
DX, water, and steam coils	20
Electric coils	15
Heat Exchangers, shell-and-tube	24
Molded insulation	20

Pumps, sump and well	10
Burners	21
<b>Home security appliances</b>	<b>Life in years</b>
Intrusion systems	14
Smoke detectors	12
Smoke/fire/intrusion systems	10
<b>Insulation</b>	<b>Life in years</b>
For foundations, roofs, ceilings, walls, and floors	Lifetime
<i>Sources: Insulation Contractors Association of America, North American Insulation Manufacturers Association</i>	
<b>Landscaping</b>	<b>Life in years</b>
Wooden decks	15
Brick and concrete patios	24
Tennis courts	10
Concrete walks	24
Gravel walks	4
Asphalt driveways	10
Swimming pools	18
Sprinkler systems	12
Fences	12
<i>Sources: Associated Landscape Contractors of America, Irrigation Association</i>	
<b>Masonry</b>	<b>Life in years</b>
Chimney, fireplace, and brick veneer	Lifetime
Brick and stone walls	100+
Stucco	Lifetime
<i>Sources: Brick Institute of America, Architectural Components, National Association of Brick Distributors, National Stone Association</i>	
<b>Millwork</b>	<b>Life in years</b>
Stairs, trim	50-100
Disappearing stairs	30-40



<b>Paints and stains</b>	<b>Life in years</b>
Exterior paint on wood, brick, and aluminum	7-10
Interior wall paint (depends on the acrylic content)	5-10
Interior trim and door paint	5-10
Wallpaper	7
<i>Sources: Finnaren and Haley, Glidden Company, The Wall Paper</i>	
<b>Plumbing</b>	<b>Life in years</b>
Waste piping, cast iron	75-100
Sinks, enamel steel	5-10
Sinks, enamel cast iron	25-30
Sinks, china	25-30
Faucets, low quality	13-15
Faucets, high quality	15-20
<i>Sources: American Concrete Pipe Association, Cast Iron Soil and Pipe Institute, Neil Kelly Designers, Thompson House of Kitchens and Baths</i>	
<b>Roofing</b>	<b>Life in years</b>
Asphalt and wood shingles and shakes	15-30
Tile (depends on quality of tile and climate)	50
Slate (depends on grade)	50-100
Sheet metal (depends on gauge of metal and quality of fastening and application)	20-50+
Built-up roofing, asphalt	12-25
Built-up roofing, coal and tar	12-30
Asphalt composition shingle	15-30
Asphalt overlag	25-35
<i>Source: National Roofing Contractors Association</i>	
<b>Rough structure</b>	<b>Life in years</b>
Basement floor systems	Lifetime
Framing, exterior and interior walls	Lifetime
<i>Source: NAHB Research Foundation</i>	

<b>Shutters</b>	<b>Life in years</b>
Wood, interior	Lifetime
Wood, exterior (depends on weather conditions)	4-5
Vinyl plastic, exterior	7-8
Aluminum, interior	35-50
Aluminum, exterior	3-5
<i>Sources: A.C. Shutters, Inc., Alcoa Building Products, American Heritage Shutters</i>	

<b>Siding</b>	<b>Life in years</b>
Gutters and downspouts	30
Siding, wood (depends on maintenance)	10-100
Siding, steel	50-Lifetime
Siding, aluminum	20-50
Siding, vinyl	50
<i>Sources: Alcoa Building Products, Alside, Inc., Vinyl Siding Institute</i>	
<b>Walls and window treatments</b>	<b>Life in years</b>
Drywall and plaster	30-70
Ceramic tile, high grade installation	Lifetime
<i>Sources: Association of Wall and Ceiling Industries International, Ceramic Tile Institute of America</i>	
<b>Windows</b>	<b>Life in years</b>
Window glazing	20
Wood casement	20-50
Aluminum and vinyl casement	20-30
Screen	25-50
<i>Sources: Best Built Products, Optimum Window Manufacturing, Safety Glazing Certification Council, Screen Manufacturers Association</i>	

Appendix F  
Deconstruction Industry Responses

Name: Matthew Reynolds

Position: Consultant

Company or organization name: Resource Management Group Inc.

Phone number: 510-582-5954

E-mail address: matthew@cadanoche.com

Proposed guidelines for:

Building Assessment:

- Owner must seek professional deconstruction estimate to determine the worthiness of the building.  
*Agree, but should.*
- Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure  
*Agree, but should.*
- Determine the function(s) that the structure used for during last years.  
*Agree.*
- Owner must provide reports regarding any renovation or maintenance activities done to the structure.  
*Agree, but should.*

Permit Procedure:

- Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.  
*Agree, but should.*
- Deconstruction professionals should educate policy makers about deconstruction benefits.  
*Agree.*
- Deconstruction must be included in building codes and regulations gradually.  
*Agree, but should.*
- Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations  
*Agree.*

- Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.  
*Agree.*
- The percentage of materials that must be reused or recycled by demolition industry should be increased gradually.  
(e.g. 2003 20%, 2004 30%)  
*Agree.*

#### Planning for Deconstruction:

- Construction org. or contractors must plan ahead to avoid delay  
*Agree.*
- Keep your company or org. updated about new tool and equipment, which may ease the deconstruction process.  
*Agree.*
- New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.  
*Agree.*
- Deconstruction companies and org. must encourage workers to learn new deconstruction techniques.  
*Agree, but should.*
- Deconstruction companies and org. must give incentives to workers with high production rates.  
*Agree, but should.*

#### Workers' Training:

- Deconstruction companies and org must provide training workshops periodically.  
*Agree, but should.*
- Deconstruction companies and org. must inform worker with the new health and safety regulations.  
*Agree, but should.*
- Universities and education institutes must include deconstruction in their curriculums.  
*Agree, but should.*

- Deconstruction companies and org. must encourage workers to be creative.  
*Agree, but should.*

#### Projects Funding:

- Deconstruction org. must ask for government funds to help overcome deconstruction cost.  
*Agree, but should.*
- Deconstruction companies and org. should encourage owners to donate buildings materials planned for demolition.  
*Agree.*
- Deconstruction companies and org. must seek for volunteer work force.  
*Agree, but should.*
- Deconstruction companies and org. should establish their own resale centers and use the revenue to fund other projects.  
*Agree.*

#### Feasibility Study:

- Deconstruction companies and org. must survey the used building materials market demands.  
*Agree, but should.*
- Deconstruction companies and org. should use technology to estimate the value of recovered materials. (Computer software)  
*Agree.*
- Deconstruction companies and org. must be aware of the cost to remove hazardous materials.  
*Agree, but should.*

#### Site Security:

- Warning signs must be posted in all sides of the project fence to avoid public interference.  
*Agree.*
- Security personnel must be available all the time to ensure job site security.  
*Agree.*

- Any security violation must be reported directly to the management.  
*Agree.*

#### **Workers' Safety:**

- Safety guidelines must be posted on site to be available in emergencies.  
*Agree.*
- Workers health and accidents insurance must be valid all the times.  
*Agree.*
- Schedule workers routine health check.  
*Agree.*
- In case of injury, workers must know how to seek medical health.  
*Agree.*

#### **Materials' Safety:**

- Workers must know that each damaged material means lost of money.  
*Agree.*
- Workers must use designated tools for each material.  
*Agree.*
- Any recovered material must be removed to designated area.  
*Agree.*
- In case of difficulty to disassemble any material, worker must seek professional help.  
*Agree.*
- Job site must be clear from recovered materials.  
*Agree.*

#### **On-Site Sale:**

- Deconstruction companies and org. must contact buyers in advance.  
*Agree, but should.*
- Deconstruction companies and org. may advertise in local newspapers about recovered materials.  
*Agree.*

- Policy makers should modified on-site sale regulations.  
*Agree.*
- Site manager must give clear access to buyer's trucks.  
*Agree, but should.*
- Designated loading area must be easily accessible to avoid interference with workers.  
*Agree, but should.*

#### On-Site Storage:

- On-site storage is an essential step in any deconstruction project.  
*Agree.*
- On-site storage must be lockable to avoid theft.  
*Agree.*
- All materials on storage must be sorted according to its description.  
*Agree, but should.*
- Storage personnel must schedule materials transportation to resale centers.  
*Agree, but should.*

#### Transportation of Materials:

- Maximum care must be taken when loading recovered materials.  
*Agree, but should.*
- Workers must report any damaged materials before disposing them.  
*Agree, but should.*
- Form include each material description, size, condition must be filled during loading.  
*Agree, but should.*
- Any damage during transportation must be reported. (Insurance)  
*Agree, but should.*

#### Resale Centers:

- The number of resale centers is very low nation wide.  
*Agree.*



- Recovered materials prices are relatively higher than expected.  
*Agree.*
- Resale centers must educate the public about the benefits of using recovered materials.  
*Agree, but should.*
- Most of the materials in resale centers are not useable.  
*Agree.*
- Most of the resale centers are for-profit.  
*Agree.*
- Resale centers must participate in deconstruction process.  
*Agree, but should.*

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 Green Goat  
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Proposed guidelines for:

Building Assessment

Owner must seek professional deconstruction estimate to determine the worthiness of the building.

*Disagree. All buildings are worthy. A deconstruction methodology will help MOST projects at the very least break even.*

Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure

*Disagree. The demolition company should be able to assess the stability of the structure. The owner may or may not have a complete history of renovations.*

Determine the function(s) that the structure used for during last years.

*Disagree. More important to have a copy of the plans, which will speak to use much better than anecdotal information*

Owner must provide reports regarding any renovation or maintenance activities done to the structure.

*Disagree. That is a lot to ask of someone who will be paying to take down the structure!*

## Permit Procedure

Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.

*Agree (somewhat) ... they already give tax breaks for building materials donated to BMRC, Habitat for Humanity, or other non-profits.*

Deconstruction professionals should educate policy makers about deconstruction benefits.

*Agree. Absolutely. Everyone in every industry needs to be their own advocate, and this is no different.*

Deconstruction must be included in building codes and regulations gradually.

*Agree.*

Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations

*Agree. This is already happening in Massachusetts (I'm part of a subcommittee proposing regulation wording to the Dept of Env Protection)*

Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.

*N/A. It needs to be a part of the spec for the project, or it won't get done. Most demo contractors already know about recycling markets. 'Reuse' doesn't mean anything to a demo contractor, unless they're a part of a construction company who has the project for rebuilding the same site.*

The percentage of materials that must be reused or recycled by demolition industry should be increased gradually.

(e.g. 2003 20%, 2004 30%)

*Disagree – the way to do it is to ban certain materials from landfills, going material by material according to stage of development of the market for that material.*

#### Planning for Deconstruction:

Construction org. or contractors must plan ahead to avoid delay

*Agree.*

Keep your company or org. updated about new tool and equipment, which may ease the deconstruction process.

*Agree.*

New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.

*Agree.*

Deconstruction companies and org. must encourage workers to learn new deconstruction techniques.

*Agree. Hard to disagree with some of these statements ... any company should teach new techniques to its employees. It makes the company more profitable (long term)!*

Deconstruction companies and org. must give incentives to workers with high production rates.

*Agree, but what does this have to do with deconstruction? All companies should reward good performance.*

#### Workers' Training:

Deconstruction companies and org must provide training workshops periodically.

*Disagree. But only because of the word 'must' ... SHOULD, and ... again ... this is a normal part of running any business, right?*

Deconstruction companies and org. must inform worker with the new health and safety regulations.

*Agree. This is a cost savings, ultimately ... the better your safety rating is, the better the pool of job candidates.*

Universities and education institutes must include deconstruction in their curriculums.  
*Agree*

Deconstruction companies and org. must encourage workers to be creative.

*Disagree. 'Creativity' is a strange word – sometimes creativity in methodology gets workers harmed ... creativity in finding markets for C&D debris, however, is always a good thing.*

#### Projects Funding:

Deconstruction org. must ask for government funds to help overcome deconstruction cost.

*Disagree. If done right, efficient labor practices coupled with updated technology minimize costs a lot faster than hanging out the possibility for a grant / subsidy.*

Deconstruction companies and org. should encourage owners to donate buildings planned for demolition.

*Disagree. Donate?? Maybe I don't understand your wording here, but no person in their right mind would simply give away real estate.*

Deconstruction companies and org. must seek for volunteer work force.

*Disagree. This would not work on union jobs.*

Deconstruction companies and org. should establish their own resale centers and use the revenue to fund other projects.

*Mixed – if they can afford to, that would be great, but it's really a completely separate line of business and may not make sense if there are already established resale centers in the region.*

#### Feasibility Study:

Deconstruction companies and org. must survey the used building materials market demands.

*Agree. Meaning ... find markets for the debris? Absolutely.*

Deconstruction companies and org. should use technology to estimate the value of recovered materials.

*Not sure what you mean. The values are determined by the regional markets. If there's a web site or something that can give price per ton, great.*

Deconstruction companies and org. must be aware of the cost to remove hazardous materials.

*Agree.*

**Site Security:**

Warning signs must be posted in all sides of the project fence to avoid public interference.

*Agree.*

Security personnel must be available all the time to ensure job site security.

*Agree. But 'security' can be managed by site supervisor too ... doesn't have to be a dedicated staffer.*

Any security violation must be reported directly to the management.

*Disagree. Depends how serious.*

**Workers' Safety:**

Safety guidelines must be posted on site to be available in emergencies.

*Agree.*

Workers health and accidents insurance must be valid all the times.

*Agree.*

Schedule workers routine health check.

*Disagree. Seems a bit like overkill.*

In case of injury, workers must know how to seek medical health.

*Agree.*

**Materials' Safety:**

Workers must know that each damaged material means lost of money.

*Agree.*

Workers must use designated tools for each material.

*Agree.*

Any recovered material must be removed to designated area.

*Agree.*

In case of difficulty to disassemble any material, worker must seek professional help.

*Disagree. Certain materials that don't have markets will be lumped together for disposal as mixed C&D ... not critical in that case.*

Job site must be clear from recovered materials.

*Agree.*

### On-Site Sale:

Deconstruction companies and org. must contact buyers in advance.

*Disagree. There isn't always the time ... it's a good idea, but more of an ideal.*

Deconstruction companies and org. may advertise in local newspapers about recovered materials.

*Agree.*

Policy makers should modified on-site sale regulations.

*Don't know what this means.*

Site manager must give clear access to buyer's trucks.

*Agree.*

Designated loading area must be easily accessible to avoid interference with workers.

*Agree.*

### On-Site Storage:

On-site storage is an essential step in any deconstruction project.

*Disagree. There may be an MRF available if the project is on the west coast.*

On-site storage must be lockable to avoid theft.

*Agree.*

All materials on storage must be sorted according to its description.

*Agree.*

Storage personnel must schedule materials transportation to resale centers.

*Disagree. Some times the markets will do their own pickup. Varies.*

### Transportation of Materials:

Maximum care must be taken when loading recovered materials.

*Agree.*

Workers must report any damaged materials before disposing them.

*Disagree. Only if it's going to be reused.*

Form include each material description, size, condition must be filled during loading.

*Agree.*

Any damage during transportation must be reported. (Insurance)

*Agree.*

### Resale Centers:

The number of resale centers is very low nation wide.

*Agree.*

Recovered materials prices are relatively higher than expected.

*Disagree. Not during a recession!!*

Resale centers must educate the public about the benefits of using recovered materials.

*Agree.*

Most of the materials in resale centers are not useable.

*Disagree.*

Most of the resale centers are for-profit.

*Not sure.*

Resale centers must participate in deconstruction process.

*Disagree. Different line of business.*

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E-mail Address: klsworking@yahoo.com

Organization or company name: Howard County Government

### Buildings Deconstruction Guidelines

Proposed guidelines for:	Response		Comment
	Agree	Disagree	
<b>Building Assessment</b>			
Owner must seek professional deconstruction estimate to determine the worthiness of the building.		x	
Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure	x		As far as I know
Determine the function(s) that the structure used for during last years.			Same as above
Owner must provide reports regarding any renovation or maintenance activities done to the structure.	x		As known
<b>Permit Procedures</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.	x		"Should Provide incentives, not Must
Deconstruction professionals should educate policy makers about deconstruction benefits.	x		
Deconstruction must be included in building codes and regulations gradually.	x		
Cities policy makers should contact deconstruction professionals to set deconstruction codes and regulations	x		
Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.	x		
The percentage of materials that must be reused or recycled by demolition industry	x		



should be increased gradually. (e.g. 2003 20%, 2004 30%)			
<b>Planning for Deconstruction</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Construction org. or contractors must plan ahead to avoid delay	x		
Keep your company or org. updated about new tool and equipment, which may ease the deconstruction process.	x		
New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.	x		
Deconstruction companies and org. must encourage workers to learn new deconstruction techniques.	x		
Deconstruction companies and org. must give incentives to workers with high production rates.	x		
<b>Workers Training</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Deconstruction companies and org must provide training workshops periodically.	x		
Deconstruction companies and org. must inform worker with the new health and safety regulations.	x		
Universities and education institutes must include deconstruction in their curriculums.	x		Should
Deconstruction companies and org. must encourage workers to be creative.	x		
<b>Projects Funding</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Deconstruction org. must ask for government funds to help overcome deconstruction cost.		x	Decon must find ways to compete on cost
Deconstruction companies and org. should encourage owners to donate buildings planned for demolition.	x		
Deconstruction companies and org. must seek for volunteer work force.	x		
Deconstruction companies and org. should establish their own resale centers and use the revenue to fund other projects.	x		
<b>Feasibility Study</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Deconstruction companies and org. must survey the used building materials market	x		

demands.			
Deconstruction companies and org. should use technology to estimate the value of recovered materials.	x		
Deconstruction companies and org. must be aware of the cost to remove hazardous materials.	x		
<b>Site Security</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Warning signs must be posted in all sides of the project fence to avoid public interference.	x		
Security personnel must be available all the time to ensure job site security.		x	Needs more thought to address liability concerns
Any security violation must be reported directly to the management.	x		
<b>Workers Safety</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Safety guidelines must be posted on site to be available in emergencies.	x		
Workers health and accidents insurance must be valid all the times.	x		
Schedule workers routine health check.	x		
In case of injury, workers must know how to seek medical health.	x		
<b>Materials Safety</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Workers must know that each damaged material means lost of money.	x		
Workers must use designated tools for each material.	x		
Any recovered material must be removed to designated area.	x		
In case of difficulty to disassemble any material, worker must seek professional help.	x		
Job site must be clear from recovered materials.		x	Depends on marketing and security plans
<b>On-Site Sale</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Deconstruction companies and org. must contact buyers in advance.	x		

Deconstruction companies and org. may advertise in local newspapers about recovered materials.	x		
Policy makers should modified on-site sale regulations.	x		
Site manager must give clear access to buyer's trucks.	x		To designated areas only
Designated loading area must be easily accessible to avoid interference with workers.	x		
<b>On-Site Storage</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
On-site storage is an essential step in any deconstruction project.	x		
On-site storage must be lockable to avoid theft.	x		
All materials on storage must be sorted according to its description.	x		
Storage personnel must schedule materials transportation to resale centers.	x		
<b>Transportation of Materials</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
Maximum care must be taken when loading recovered materials.	x		
Workers must report any damaged materials before disposing them.	x		
Form include each material description, size, condition must be filled during loading.	x		
Any damage during transportation must be reported. (Insurance)	x		
<b>Resale Centers</b>	<b>Agree</b>	<b>Disagree</b>	<b>Comment</b>
The number of resale centers is very low nation wide.	x		
Recovered materials prices are relatively higher than expected.	x		
Resale centers must educate the public about the benefits of using recovered materials.	x		
Most of the materials in resale centers are not useable.	x		
Most of the resale centers are for-profit.	x		
Resale centers must participate in deconstruction process.	x		

**Name:** Nicole Tai

**Position:** Program Manager

**Company or org. name:** NY Wa\$teMatch

**Phone number:** 212-442-5219

**E-mail address:** nctai@att.net

**Proposed guidelines for:**

**Building Assessment:**

- Owner must seek professional deconstruction estimate to determine the worthiness of the building.  
Agree – this is important to bring deconstruction on-line in the same bidding process as demolition. This often enables them to compete with or complement demolition projects.
- ☐ Owner must specify the type(s) of activities conducted in previous years which may affect the stability of the structure  
Agree - this an important safety protocol to prevent accidents during deconstruction.
- Determine the function(s) that the structure used for during last years.  
Yes- This will help identify any potential toxic materials and could be a deciding factor in whether a deconstruction crew can take the job before a professional environmental risk firm has cleared the property.
- Owner must provide reports regarding any renovation or maintenance activities done to the structure.  
Agree – These will be useful in determining the value of materials, especially appliances and household equipment. In addition, new renovations will have other valuable materials such as kitchen furnishings, wood floors, and molding.

**Permitting Procedure:**

- Policy makers must give incentives to any individual intend to deconstruct or donate structure planned for demolition.  
Incentives should be provided to developers and individuals to promote deconstruction.
- Deconstruction professionals should educate policy makers about deconstruction benefits.  
Agree.
- Deconstruction must be included in building codes and regulations gradually.

The inclusion of used materials in construction is more relevant to building codes.  
Deconstruction needs to be addressed by unions in the local area.

- City policy makers should contact deconstruction professionals to set deconstruction codes and regulations  
Agree
- Deconstruction organizations should contact demolition contractors to encourage them to reuse or recycle building materials.  
If they have the time and charge for the service, otherwise they are providing a free service and will eventually put themselves out of business!
- The percentage of materials that must be reused or recycled by demolition industry should be increased gradually. (e.g. 2003 20%, 2004 30%)  
Agree

#### **Planning for Deconstruction:**

- Construction org. or contractors must plan ahead to avoid delay  
Agree – the key to successful deconstruction is to know the plan in advance, and provide everyone with all the information required to make the right decision based on the project.
- Keep your company or org. updated about new tool and equipment, which may ease the deconstruction process.  
Of course.
- New technology (e.g. computer programs) is very important tools in deconstruction planning and scheduling.  
Helpful – Agree.
- Deconstruction companies and org. must encourage workers to learn new deconstruction techniques.  
Agree
- Deconstruction companies and org. must give incentives to workers with high production rates.  
Agree – the incentives may vary from region to region depending upon the attitudes and culture of the area.

#### **Workers Training:**

- Deconstruction companies and org must provide training workshops periodically.  
Agree.
- Deconstruction companies and org. must inform worker with the new health and safety regulations.  
Agree.

- Universities and education institutes must include deconstruction in their curriculums. Not all, but an increase at those with construction, civil engineering and architecture programs would be useful
- Deconstruction companies and org. must encourage workers to be creative.  
Agree

### **Projects Funding:**

- Deconstruction org. must ask for government funds to help overcome deconstruction cost. Other structures do exist – but generally government start up funds are required
- Deconstruction companies and org. should encourage owners to donate buildings materials planned for demolition.  
Agree – if they have a non-profit status. Otherwise they should take the materials and use them as income in addition to the deconstruction bid. This will allow them to compete with the demolition firms
- Deconstruction companies and org. must seek for volunteer work force.  
Helpful if you have a volunteer driven organization – Not necessarily useful in all orgs - volunteers require a different type of management, and can slow down the process if an organization is not equipped to handle volunteers
- Deconstruction companies and org. should establish their own resale centers and use the revenue to fund other projects.  
Generally, this is a must –self-sufficiency can only be attained with retail centers, unless the company is both construction and deconstruction. But they still must do something with the materials!

### **Feasibility Study:**

- Deconstruction companies and org. must survey the used building materials market demands.  
Agree – there may be other organizations that have done this already so check before you do the work.
- Deconstruction companies and org. should use technology to estimate the value of recovered materials. (Computer software)  
  
If available
- Deconstruction companies and org. must be aware of the cost to remove hazardous materials. The homeowner/developer should hire an expert team to do hazmat work. It is helpful for the Deconstruction manager to be able to identify toxic materials before work on a project begins.

### **Site Security:**

- Warning signs must be posted in all sides of the project fence to avoid public interference.

Agree.

- Security personnel must be available all the time to ensure job site security.  
Depending upon the size of a job. Small jobs may choose to designate trained crew members to handle site security.
- Any security violation must be reported directly to the management.  
Agree – procedures for reporting incidents must be made clear to crew members.

#### **Workers Safety:**

- Safety guidelines must be posted on site to be available in emergencies.  
Agree
- Workers health and accidents insurance must be valid all the times.  
AGREE
- Schedule workers routine health check. - AGREE
- In case of injury, workers must know how to seek medical health.  
AGREE

#### **Materials Safety:**

- Workers must know that each damaged material means lost of money.  
Agree – it should be clear that the goal of deconstruction is recovery of the materials first, second to bring the building down.
- Workers must use designated tools for each material.  
AGREE
- Any recovered material must be removed to designated area.  
Agree – there must be a clear work staging area developed and understood before commencement of a job.
- In case of difficulty to disassemble any material, worker must seek professional help.  
Depending upon the value of a material. Otherwise, salvage for metal or wood would be fine if time and costs are reduced. Professionals cost a great deal of money.
- Job site must be clear from recovered materials.  
Same as above

#### **On-Site Sale:**

- Deconstruction companies and org. must contact buyers in advance.  
Buyers should be obtained before job is started if no retail yard exists.

- Deconstruction companies and org. may advertise in local newspapers about recovered materials.  
Sure
- Policy makers should modify on-site sale regulations.  
AGREE
- Site manager must give clear access to buyer's trucks.  
AGREE
- 
- Designated loading area must be easily accessible to avoid interference with workers.  
AGREE

#### **On-Site Storage:**

- On-site storage is an essential step in any deconstruction project.  
AGREE
- On-site storage must be lockable to avoid theft.  
AGREE – if material is valuable
- All materials on storage must be sorted according to its description.  
Agree
- Storage personnel must schedule materials transportation to resale centers.  
Agree

#### **Transportation of Materials:**

- Maximum care must be taken when loading recovered materials.  
Agree
- Workers must report any damaged materials before disposing them.  
Not necessarily – reporting can occur on the disposal end.
- Form include each material description, size, condition must be filled during loading.  
This can be done at the unloading site to save time.
- Any damage during transportation must be reported. (Insurance)  
To vehicles yes – to materials – no.

#### **Resale Centers:**

- The number of resale centers is very low nation wide.  
Agree
- Recovered materials prices are relatively higher than expected.  
Not sure what this question is asking



- Resale centers must educate the public about the benefits of using recovered materials.  
Agree
- Most of the materials in resale centers are not useable.  
Everything is useable – there just might not be the right people available
- Most of the resale centers are for-profit.  
Disagree – most are nonprofit.
- Resale centers must participate in deconstruction process.  
Disagree – not if they are connected to a landfill, or other material source. Urban Ore does not do Deconstruction.

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