



The National Demolition
Association Reports:

DEMOLITION...
The First Step Of Reconstruction

A Continuum Of Choice



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A Continuum of Choice

A report based on research conducted
by Gershman, Brickner & Bratton, Inc.

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Executive Summary

Deconstruction is nothing new to the demolition industry. Professional demolition contractors provide safe, efficient services for dismantling, materials recovery, and site clearance using deconstruction methods, as well as modern techniques and equipment. Deconstruction, or hand demolition, is the stage from which the professional demolition industry evolved decades ago.

A renewed interest in hand demolition, often coupled with social programs to provide entry level job training for high-risk individuals, is sometimes termed “deconstruction,” and is often promoted as an alternative to demolition.

While deconstruction proponents are largely interested in pre-WWII wood or timber framed buildings, demolition contractors successfully deal with all types of structures, routinely achieving rates of materials recovery of 80 to 90 percent more. In this report, case studies from the demolition industry profile the level of recovery (up to 100% for some projects) that can be achieved by comprehensive demolition service providers. These comprehensive demolition services are an essential first step of reconstruction.

Deconstruction projects typically take two to ten times longer than demolition efforts. They usually must be supported by full-service demolition contractors to, for example, provide concrete and foundation removal or hazardous materials management services. Building owners, developers, or public officials faced with the need to comply with tight timelines, meet stringent financing schedules or deal with difficult security issues are likely to find that many projects do not have the flexibility to accommodate a deconstruction alternative.

The health and safety regulations that apply to the demolition industry apply for deconstruction programs as well. For demolition contractors, worker and public safety are always among their top priorities. The industry provides rigorous, ongoing worker training programs that focus on structural safety, hazardous materials identification and management, equipment usage, personal safety, job-site communications, site-specific safety protocols and many, many other related topics. Trained, professional demolition crews reduce owner and contractor liability.

Demolition techniques are significantly influenced by the methods and materials used in construction. The National Demolition Association strongly encourages the construction industry to plan in advance for eventual disassembly - to design for deconstruction and embrace those innovations that will ultimately make our jobs more efficient, safe, and provide for the highest possible opportunities for materials reuse and recovery.

Preface

The National Demolition Association

Since 1972, the National Demolition Association has been a source of information about the demolition industry, helping to ensure that environmentally responsible and safe work practices are the standard by which the demolition industry is known.

Demolition has become a highly sophisticated business, requiring knowledge of mechanical and electrical systems, engineering, and complex DOT, OSHA, and EPA regulations. The industry is estimated to be a \$2.5 billion dollar business that encompasses services ranging from demolition consulting to interior strip out, plant dismantlement and residential and commercial demolition. The industry provides excavating services which include land clearing site work, residential and industrial facility demolition, bridge removal, and disaster response. Some companies handle the removal of hazardous waste and lead abatement. When asbestos is suspected or present, demolition contractors are available for consultation, as well as encapsulation and removal. Recycling and salvaging are a major part of the demolition contractor's business, representing 20 to 40 percent of some companies' revenues. Whenever possible, asphalt and concrete are recycled. Salvage operations may include lumber and timber, used building materials, steel, iron, precious metals, and historical salvaging. Other services performed by National Demolition Association contractors may include tank removal, yard storage, plant liquidations, industrial hauling, equipment hauling and renting, and construction. Michael R. Taylor, National Demolition Association Executive Director, adds, "Although many people think of implosion when they think of a building being demolished, more than 99 percent of demolition work is handled with specialized heavy demolition equipment, like hydraulic excavator with attachments such as grapples, shears, hammers, and concrete crushers or skilled manual techniques."ⁱ

As the recognized voice for the demolition industry, the National Demolition Association is often consulted for information about topics of current focus, concern, and significance. This white paper offers National Demolition Association's professional and experience-based insight to governmental decision-makers, building and site owners, developers, contractors, and others who are responsible for choosing appropriate site clearance methods and services (in this paper collectively referred to as owners). This National Demolition Association white paper has been prepared to help owners better understand the demolition process and its relationship to deconstruction, an approach that deserves consideration within a continuum of choices for comprehensive, safe, cost-effective, and environmentally responsible demolition services.

Introduction

It's a popular misconception that demolition is nothing more than knocking down a structure and hauling the debris to a landfill. That assumption is wrong on many counts, for the following reasons:

- *First, the process of planning for and completing a demolition project is far more thorough and complex than simple knockdown.*
- *Second, demolition contractors are masters of recovering economically valuable materials and minimizing need for disposal. On many projects, 80-90% of the structure is salvaged for reuse or recycling - cost savings that go straight to an owner's bottom line.*

Advocates of hand demolition, often-termed “deconstruction,” claim that conventional demolition is wasteful and that a labor-intensive approach can be more economical and socially beneficial. Owners are finding this so-called “new” method is a choice they are urged to embrace whenever demolition is required.

The National Demolition Association believes deconstruction is one option on a continuum of choices for owners, to be considered against cost, time, security, safety, social goals, and other factors that effect decisions about the choice best suited to the circumstances.

National Demolition Association hopes that this paper will provide owners with a better understanding of the comprehensive nature of professional demolition services, information about the extent to which the demolition industry aggressively pursues recovery of materials of value, and some of the factors which can be helpful in understanding and evaluating the deconstruction concept and how it relates to the demolition industry as a whole.

When a structure requires partial or total demolition, a demolition contractor meets that need - professionally, economically, efficiently, and safely - with services that are the first step of reconstruction.

Deconstruction a “New” Option for Owners

Deconstruction is really what demolition contractors do, do well, and have been doing for decades - safely and efficiently, meeting owners' needs for dismantling, materials recovery, and structural removal. However, in recent years, the term “deconstruction” has become associated with a movement that is focused on hand demolition of a select fraction of structures, commonly coupling that effort with social service and job training goals.

...deconstruction is the process of carefully dismantling a building in order to salvage components for reuse and recycling...deconstruction is labor intensive, low-tech...ⁱ

Is deconstruction an option for all types of structures?

No. Only certain types of buildings are considered to be good candidates for deconstruction methods. Deconstruction advocates have identified the technique as best suited for smaller wood or timber-framed structures; especially housing stock built before World War II; buildings with high-value materials, such as architectural features, rare woods, timbers, fixtures; and buildings without large quantities of painted wood.

The demolition industry's experience is in agreement that high-value materials increase potential recovery value. Demolition professionals are adept at dismantling, salvaging, and reusing such materials whether the project involves large or small structures.

Nearly all paint used before World War II contains lead. Hence, older buildings with large quantities of painted wood have a higher potential for requiring lead abatement activity and a lower desirability from a materials recovery perspective. Among the nation's residential structures in 1990, less than 20% were constructed prior to 1940ⁱⁱⁱ. Obviously, over time, these older homes will represent a smaller and smaller fraction of the nation's total housing stock and a declining supply for deconstruction efforts.

How much additional time does deconstruction take?

There is no hard and fast rule, as every job is different. However, deconstruction advocates estimate that deconstruction “takes longer (anywhere from two to 10 times longer than demolition alone)”^{iv}.

In an era of low unemployment, what labor pool is available for labor-intensive deconstruction programs?

Deconstruction proponents view deconstruction as “reverse carpentry” and, as such, an opportunity for development of job training programs to teach construction trade skills, to the homeless, high-risk youth, and others who are unemployed. Such programs typically have sponsorship from either a non-profit organization or governmental agency.

Although modern construction skills differ markedly from those associated with the older buildings being dismantled, the premise advocates set forth is that deconstruction programs can provide foundation skills useful to those seeking construction employment. Traditional apprenticeship programs or on-the-job training with professional contractors offer more directly focused opportunities to learn modern contraction techniques.

The benefits of deconstruction program's entry-level job training efforts may be laudable gains in helping persons become employable, but these benefits do not accrue to the project itself. Hence, the added costs to support such human resource efforts must either be defrayed through outside funding sources or added to the owner's bottom-line expenses. Including job training as a primary objective for a deconstruction project interjects a social goal (entry-level job training for high-risk persons) into a field where it has not been a traditional focus.

Simultaneously attempting to accomplish significant demolition activities and educate untrained personnel is a combination that could jeopardize worker and public safety. Professional demolition contractors engage in continuous safety training programs for their skilled work crews. Contractors maintain health and safety records on employees, and commonly complete baseline health checks prior to and after job completion. Many companies require random drug testing to further ensure worker safety.

The National Demolition Association provides extensive safety training resources, equipment training, information about lead, asbestos, and other hazards potentially found at demolition sites. Competence in structural safety is also necessary to safeguard workers, the public, and to prevent property damage. *The National Demolition Association's Demolition Safety Manual*⁶, developed in cooperation with OSHA, is one example of the association's excellent resources regarding the complexity of demolition and the reasons why well-trained personnel, with thorough safety training and understanding of hazardous materials requirements, are essential for a safe job site. This kind of professional competence reduces contractor and owner liabilities, and enhances worker and public safety.

Is deconstruction a substitution for demolition?

No. Materials for the Future, one of the leaders of the deconstruction movement, notes: "Few buildings can be totally removed through deconstruction. Demolition is required for such things as foundations, concrete walls and floors, and other concrete building materials."^{vi}

Does deconstruction cost less?

There is scant data available for "apples-to-apples" comparison. Many deconstruction programs are currently supported through various public grants and subsidies.

Although deconstruction advocates claim lower costs, some examples would indicate otherwise. A frequently referenced deconstruction project at the Presidio in San Francisco, California dismantled three buildings at a total cost, reported by the California Waste Management Board, of \$250,000. Industry experts estimate that a typical demolition project achieving similar site-clearance objectives and comparable levels would typically cost much less—approximately \$50,000.

With professional demolition contractors, the value of recovered material reduces owner's net cost for comprehensive, start-to-finish services. In contrast, the economics of deconstruction often rely on monies from sale of recovered materials to offset abnormally high labor expenses. As a result, deconstruction projects that require assistance from a demolition contractor to deal with foundations, asbestos abatement, underground tanks, or other demolition services are likely to present higher net costs to owners. For many projects, time is more precious commodity than direct cost, and may dictate whether there is adequate flexibility to consider deconstruction as an option. Demolition contractors' prices commonly reflect cost of insurance, bonding, permit fees, regulatory compliance, safety training, inventory storage, and other factors that do not appear to be consistently reflected in cited pilot studies of deconstruction's merits and costs.

Does deconstruction result in higher levels of recovery?

For deconstruction and demolition contractors alike, an item isn't economical to salvage if the cost to recover it exceeds its marketable value and/or avoided disposal cost.

For any project, the level of recovery hypothetically achievable is usually far greater than owners can afford, either in cost or time. Findings associated with highly publicized deconstruction of four buildings dismantled as part of the Fort Ord decommissioning, noted that total recovery achieved was 90% but that a level of 75% could have been achieved at half the cost^{vii} and likely a much shorter timeline.

Deconstruction advocates argue that the technique results in higher percentage of materials recovery, but admit that it commonly requires professional demolition assistance for completion of the job. Profiled National Demolition Association case studies indicate that the demolition industry is routinely achieving levels of materials recovery that match or exceed those claimed for deconstruction.

In some instances, deconstruction proponents urge that materials be recovered and stored even if a ready market cannot be identified. If this approach is adopted, transportation and storage then become additional costs added to a project's bottom line and owner's costs.

Are deconstruction projects subject to the same safety and hazardous materials requirements as traditional demolition contracts?

Yes. Demolition contractors are experts with respect to lead abatement, underground tanks, asbestos removal, PUBs, structural safety, and other hazards. These requirements cannot be waived in favor of a deconstruction program. OSHA requirements, worker safety, site security, and public safety are paramount issues for the demolition industry - issues that apply to deconstruction sites as well. Costs and planning for deconstruction projects need to reflect such concerns..

Deconstruction proposals for direct marketing of materials to the public from project sites appear to merit investigation of liability issues, both with respect to OSHA requirements and product and general liability.

Is deconstruction only about removal of old buildings?

No. Deconstruction is also about the future. Advance planning for eventual structural disassembly - design for deconstruction - is a concept that can help standardize industry practices, improve efficiency, enhance site safety, and dramatically increase recovery rates for interior renovations as well as structural removal. It's a concept the National Demolition Association wholeheartedly supports and encourages the construction industry to develop and implement.

Case Studies

The six projects profiled below are all *for-profit* efforts which reflect the demolition industry's capacity to efficiently use an array of techniques—from hand demolition to high-tech processing—to achieve a very high fraction of recovery of materials of value. All the projects were completed within the past several years and were selected to profile the range of building types commonly encountered by the full-service demolition industry. They represent deconstruction projects at a scale typical of the industry.^{viii National}

Sears Catalogue Warehouse, Chicago, Illinois

National Demolition Association Contractor	Brandenburg Industrial Service Company-Chicago, IL.
Project Description	<p>The Sears Catalogue Warehouse on Chicago's West Side is reported to have been the largest timber-framed building ever built. Built in 1906, the former Sears & Roebuck national headquarters was a 9-story, 3 million SF timber and brick structure.</p> <p>Asbestos abatement and the removal of more than 37,000 PCB-containing ballasts were necessary.</p> <p>The cleared site made room for the Homan Square Project, a development of 600 new apartments, townhouses, and single-family homes.</p> <p>Through this project, the for-profit contractor also significantly assisted the start-up of an MBE firm which employed 25 local residents to assist materials reclamation and recovery.</p>
Recovery Achieved	<p>The building dismantled consisted of approximately 23 million bricks and more than 12 million board feet of lumber, including 7.5 million board feet of beams and decking.</p> <p>The wood was primarily long leaf yellow pine, much of which dated back 200 years to its harvesting. The wood was sold to The Joinery Company of Tarboro, NC and used in various projects, including restoration of a 16th century tavern in historical Williamsburg, VA. Virtually all 23 million Chicago common-style bricks were reused. The 14-story clock tower was saved as a historic landmark.</p>

Demolition of the world's largest timber-framed building produced millions of board feet of lumber available for a host of new uses.



Wood at Sears Building before demolition

Sears Building beams ready for recycling



Sears Building wood reuse

Northwest Motor Inn, Crystal Lake, Illinois

National Demolition Association Contractor	CornerStone Material Recovery-Ringwood, IL
Project Description	The project entailed dismantling a 30,000 SF single story "L" shaped hotel, built on a concrete slab with face brick.
Recovery Achieved	<p>900 roofing system wood rafters (20-foot span, make up of 2 X 10 foot planks of 1-foot centers) were removed by the new site owner for reuse. All 65 metal I-beams were sold on-site or recovered for later use.</p> <p>Sign posts from the old hotel and sign panels were sold, and the old hotel windows were taken to the contractor's warehouse for reuse.</p> <p>Soffit and face brick from around windows and air conditioners was recovered. Some 1/2-inch plywood was removed for reuse.</p> <p>Concrete block partitions, walls, footings, slab, and sidewalks were crushed for reuse.</p> <p>Reinforcing bar and embedded piping was salvaged, and all the swimming pool water filter tanks were sold for scrap value.</p>



Most of Northwest Motor Inn was recycled by CornerStone Material Recovery



Even small projects generate salvageable amounts of recyclable materials

Metropolitan Airports Commission Parking Ramp, Minneapolis-St. Paul, Minnesota

National Demolition Association Contractor	Carl Bolander & Sons, Co. - St. Paul, MN
Project Description	The Project required removal of a one-level parking ramp to make room for a multi-level parking structure at the expanding airport. The structure was a 320,000 SF pre-cast concrete building with double "T" beams, columns, and spandrels.
Recovery Achieved	The project achieved an overall recovery rate of 100%. A commercial real estate group will reuse the precast components at a new office/warehouse being built 5 miles from the airport in Minneapolis, MN. The project involved dismantling the parking ramp in the same process as it was constructed. Each of the ramp's double T sections was disassembled (dimensions averaging 60 feet X 10 feet and each weighing approximately 29 tons). The sections were transported to a storage site for reassembly. The roof of the reassembled structure will serve as a parking location for tenants and visitors. Foundations and any damaged concrete pieces were crushed and recycled. All lighting was recovered for reuse, and all wiring and conduit was recycled.



Carl Bolander & Sons recovered the entire parking ramp at the Twin Cities Airport



Ramp's double T sections were disassembled, transported offsite and reassembled by Carl Bolander & Sons

Fort Vancouver Plywood Mill, Vancouver, Washington

National Demolition Association Contractor	Northwest Demolition and Dismantling - Wilsonville, OR
Project Description	The project involved the dismantlement and recovery of materials from the 300,000 SF Fort Vancouver Plywood Mill.
Recovery Achieved	<p>The project achieved a 98% (by weight) rate of reuse and recycling.</p> <p>Steel, tin, and other metals were marketed to 5 scrap metal processors.</p> <p>Over 300,000 board feet of resaw lumber was marketed to several lumberyards. Over 900 sheets of plywood and approximately 90 railroad ties were marketed to a local company. Wood which was non-marketable was ground into boiler fuel (hog fuel) for energy recovery.</p> <p>30,000 tons of concrete was crushed on-site for structural base.</p>



Northwest Demolition & Dismantling recovered over 300,000 board feet of lumber at Fort Vancouver Plywood Mill



30,000 tons of concrete was crushed onsite for reuse

Brooklyn Park Fitness Center, Brooklyn Park, Minnesota

National Demolition Association Contractor	Veit & Company-Rogers, MN
Project Description	The 56,760 SF Brooklyn Park Fitness Center was comprised of two structures on a concrete slab. The buildings were carefully deconstructed, in the reverse order of construction, with each piece lowered to the ground and salvaged for reassembly. The first building (230 feet X 132 feet) was a wood-frame structure with a clear-span truss system. The second building (220 feet X 120 feet) was steel-framed with a clear-span truss system and metal siding.
Recovery Achieved	Over 95% of the building components were reused or recycled. The wood and steel were reassembled for new buildings—a church in southern Minnesota and a sugar beet processing plant in North Dakota. The concrete, block, slab, and foundations were crushed and recycled for aggregate base.



Northwest Demolition & Dismantling recovered over 300,000 board feet of lumber at Fort Vancouver Plywood Mill



30,000 tons of concrete was crushed onsite for reuse

Demolition – a Thorough Job Start-to-Finish

Whether a structure needs interior demolition to ready a building for new uses or requires total structural removal to clear a site for new construction, the professional demolition contractor begins the project with a comprehensive series of site evaluation. Typical pre-bid steps include:

- A structural engineering evaluation which identifies optional methods for (and hazards associated with) taking the structure and its components apart efficiently and safely
- A utility survey which identifies connections requiring termination and specifies services needed during the project
- A hazardous materials survey which identifies materials necessitating special handling and worker training
- A safety analysis that incorporates both the structural and hazard information into a preliminary safety plan for the job, specifying additional equipment, training, and materials handling that will be necessary
- A top to bottom salvage evaluation that provides estimates of the marketable value of recoverable materials (for reuse or for recycling)-a step integral to minimizing the net costs for all projects

A demolition contractor's bid reflects the firm's experience and professional judgment with respect to all these assessments, translated into estimated costs for labor and equipment needed for the job, hazardous materials or other specialty service needs, transport costs, disposal fees, insurance and bonding, and estimated value of materials which can be salvaged or recycled. Every item that can be sold, every ton of jobsite material that can economically be processed for another use, represents a recovery of value-savings that are passed back to owners, directly or in the form of a lower bid price. Demolition contractors have the best possible incentive to maximize recovery that results in lower costs and a higher likelihood of a winning bid. Demolition contractors are masters of efficient materials recovery. High-value materials suitable for refurbishing or reuse are removed and sold. The salvage industry has grown hand-in-hand with the demolition industry, and is a reliable outlet for architectural features, woodwork, lighting, and plumbing fixtures, etc. Rare items have established national markets, and there are strong regional markets for fixtures, used brick, decorative items, timbers, and other recoverable material.

Other materials that result from the demolition process have recycling value. Concrete is often processed on-site, while wood may be chipped or recovered at a construction waste and demolition debris processing facility. Recovery of ferrous and other metals for recycling are also common facets of professional demolition activity.

How much recovery is possible varies from job to job and place to place, reflecting quality of materials and availability of markets. How much can reasonably be achieved also depends on other factors such as time constraints and security issues. When owners have urgent needs to expedite site clearance, there may be unavoidable trade-offs between tight time schedules and the extent of recovery achievable. In demolition, the 80/20 rule often applies to time sensitive aspects of a job, i.e., 80% of achievable recovery can be accomplished with 20% of the time that would be needed to meet significantly higher recovery targets. Nevertheless, as the case studies presented illustrate, **demolition professionals commonly achieve very high levels of recovery.**

Conclusions

- **Deconstruction is what demolition contractors do-the demolition industry uses deconstruction methods as well as other techniques and equipment to provide safe and efficient services for dismantling, materials recovery and site clearance-the first step of reconstruction.**

- **Demolition contractors routinely achieve high rates of materials recovery in their projects.**

The National Demolition Association shares with deconstruction proponents an orientation toward seeking to recover and reuse as much material as can be economically reclaimed and reused from demolition efforts. Demolition contractors can often achieve recovery rates of 80-90% or more.

- **Deconstruction is rarely a stand-alone option for owners.**

Hand demolition projects usually require assistance from demolition contractors for removal of concrete and foundations, asbestos or lead-based paint abatement, management of PCB's, underground tanks, or other hazardous materials services.

- **Deconstruction can successfully encompass only a small proportion of demolition projects.**

Advocates of hand demolition methods are principally interested in pre-WWII wood frame or timber frame buildings. Demolition contractors on the other hand have the capacity to use many techniques to maximize recovery from all types of structures.

- **The social side of deconstruction programs pose new questions for owners. Owners should weigh deconstruction proposals against practical constraints on cost and time as well as compelling obligations to maintain worker and public safety.**

When deconstruction is being considered as a project option, it is imperative that service providers demonstrate their capacity to meet legal obligations to protect worker and public safety. Owners must assess whether timeline or security constraints allow the degree of flexibility necessary to accommodate a deconstruction approach.

- **The National Demolition Association encourages the construction industry to incorporate innovative design principles that anticipate eventual disassembly.**

Standardization of structural components, innovative fastening systems, and other innovations, all designed with advance planning for removal at the end of their useful life cycles, will dramatically enhance recovery efforts and at the same time increase our industry's efficiency and worker safety.

Footnotes

- i Taylor, Michael, Hard Hat News, October 4, 1996
- ii Leroux, K. and Seldman, N., Deconstruction: Salvaging Yesterdays for Tomorrow's Sustainable Communities. Materials for the Future, 1999, p.1.
- iii U.S. Bureau of the Census, Statistical Abstract s for 1990 Census.
- iv Leourx, K. and Seldman, N.p.11.
- v National Association of Demolition Contractors. Demolition Safety Manual. 1989
- vi Leroux, K. and Seldman, N. p.12.
- vii From research provided by Gershman, Brickner & Bratton, Inc., Fairfax, VA
- viii From research provided by Gershman, Brickner & Bratton, Inc., Fairfax, VA
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