INCREASING THE VOLUME OF USED BUILDING MATERIALS IN CANADIAN CONSTRUCTION

A Report to Assist Homeowners, Contractors, Building Officials
and Operators of Used Building Material Centres in Canada

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EXECUTIVE SUMMARY

The used building material industry has experienced rapid growth in North America over the last five years. Today, it encompasses private, for profit and private non-profit organizations involved in the reuse and recycle business. This report is based on an industry survey conducted by the Used Building Material Association (UBMA). Its purpose is to explore ways to increase deconstruction activity, specifically where it concerns the reuse of building materials. The report specifically highlights wood and wood-related materials, a type of inventory that appears to have the greatest potential for increased sales and supply. While many of the associations canvassed have recycling services as well, this report focuses on material reuse.

The survey found a number of issues that can influence the viability of the used building material market. Such issues include regulatory barriers, technical barriers, and marketplace barriers. On the positive side, effort is being spent on establishing links within the industry through use of Internet. Information sources include company listings, government programs, and material exchange opportunities.

The research for this project was conducted by two members of the UBMA: Jennifer Corson, president and co-owner of The Renovator's ReSource Inc. in Halifax, Nova Scotia; and Bob Sawatsky, president and owner of ReUze Building Centre in Scarborough, Ontario.

RÉSUMÉ

Le secteur des matériaux de construction usagés a connu un essor rapide en Amérique du Nord au cours des cinq dernières années. Aujourd'hui, il s'étend à des organismes privés à but lucratif et des organismes privés à but non lucratif qui s'occupent de réutilisation et de recyclage. Le présent rapport est fondé sur une enquête que la Used Building Material Association (UBMA) a menée auprès de l'industrie. Elle avait pour but d'explorer les moyens d'augmenter l'activité de déconstruction, surtout en ce qui concerne la réutilisation des matériaux de construction. Le rapport met précisément en évidence le bois et les matériaux connexes, soit le genre de stock qui semble offrir le plus de potentiel pour accroître les ventes et l'offre. Bien des associations sondées offrent également les services de recyclage, mais le présent rapport porte surtout sur la réutilisation des matériaux.

L'enquête a permis de découvrir un certain nombre d'enjeux qui risquent d'influer sur la viabilité du marché des matériaux de construction usagés. Il s'agit notamment des contraintes de la réglementation, d'obstacles techniques, et des obstacles du marché. Du côté favorable, on tente d'établir des liens avec l'industrie grâce à Internet. Les sources d'information s'entendent des répertoires des entreprises, des programmes gouvernementaux, ainsi que des possibilités d'échange de matériaux.

La présente recherche a été menée par deux membres de la UBMA : Jennifer Corson, présidente et copropriétaire de l'entreprise The Renovator's ReSource Inc. d'Halifax, en Nouvelle-Écosse, et de Bob Sawatsky, président et propriétaire du ReUze Building Centre situé à Scarborough, en Ontario.

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SECTION 1

INTRODUCTION

For generations, individuals and demolition companies have been salvaging and reusing building materials. Over the past few years, concerns about landfill volumes and costs have turned the salvage business into an emerging industrial sector. Through a growing roster of private, for-profit and private, non-profit facilities, the used building material industry has become firmly established throughout North America.

The growth of this industrial sector has led to the recent formation of the Used Building Materials Association (UBMA). This membership-based, non-profit organization represents companies and other organizations involved in the acquisition and redistribution of used building materials. For the first time, people in the industry have a vehicle for the exchange of information about their successes and challenges.

For example, at the UBMA Conference in Winnipeg in 1996, participants identified the difficulty of acquiring a consistent quality and quantity of "inventory" as the industry's barrier to growth. While most companies deconstruct homes and commercial buildings in response to a growing demand for product, they will need to develop new deconstruction methods and technologies in order to increase output. This report explores ways to increase the volume of deconstruction activity. The specific focus is on salvaged dimensional lumber and other building materials.

There are many benefits to increasing the overall volume of deconstruction activity. They include more jobs, less material going to landfill sites, the preservation of natural resources and historical architectural components, community development, tax revenue and the growth of associated businesses.

USED BUILDING MATERIALS ASSOCIATION

The UBMA represents for-profit and non-profit Canadian and U.S. companies and organizations that acquire and sell used building materials such as windows, doors and plumbing fixtures. It also represents companies that reprocess and recycle building materials such as concrete and asphalt.

Mission

UBMA's mission is to help companies gather and redistribute used building materials in a financially sustainable way. Specifically, its purpose is to:

- provide the opportunity for members to interact with and learn from each other;
- develop deconstruction standards, codes of practice or guidelines to improve profitability;
- develop educational material that will initiate or increase the efficiency of building material reuse and recycling companies;
- lobby governments for legislative change and participate in policy development;
- prepare articles and media releases to promote the industry;
- help develop and promote building material recycling and reprocessing technologies; and

- develop a vehicle for the exchange of information to help in redistributing and acquiring used building materials.

Objectives

The UBMA's objectives are to:

- provide leadership for the removal of barriers to building material reuse and recycling;
- increase the availability of used building materials for the building material reuse and recycling industry;
- Increase public, commercial and government purchases of used or recycled building materials;
- Develop standards, guidelines and other principles for the building material reuse and recycling industry; and
- provide guidance in setting up and operating building material reuse and recycling companies.

Who are the members of UBMA?

The membership of the UBMA includes several different types of companies. For example, many used building material outlets are independent, for-profit or non-profit organizations. The non-profit companies may be co-venture groups involving housing, employment or religious organizations. Others are offshoots of demolition companies that have formalized the off-site sales of demolition materials. Some of the members are both reuse and recycling companies that have large-scale equipment to crush or grind concrete, wood and asphalt. The survey on which this report is based included a representative sample of all of these companies from across North America. Appendix 1 provides survey results while Appendix 3 provides a listing of survey participants.

PROJECT PARAMETERS

The research for this project was conducted by two members of the UBMA: Jennifer Corson, president and co-owner of The Renovator's ReSource Inc. in Halifax, Nova Scotia; and Bob Sawatsky, president and owner of ReUze Building Centre in Scarborough, Ontario. The two owners run their operations in different regional and economic climates. They represent different types and volumes of customers, local economic marketplaces, access to materials (free or purchased), and type of supply available. These different markets and the results of our North American survey have resulted in a well-balanced report with inputs from a variety of regional operations.

Focus of the Project

While many UBMA members also have recycling facilities, this study focuses not on building material recycling but on the reuse of building materials. It also highlights wood and wood-related products, a type of inventory that appears to have the largest potential for increased sales and supply. With prices of virgin resources increasing and the demolition of older buildings continuing, reusing wood materials is financially wise.

CURRENT SOURCES OF INFORMATION

The used building material industry has experienced phenomenal growth over the last five years. The Renovator's ReSource Inc. was the first used building material business in the Metropolitan Halifax area in 1994; now there are five operations in the region. Government agencies, environmental associations, companies and the general public are all eager to learn how to make the best use of this valuable resource. As a result, new sources of information have been set up on the Internet. They provide company listings and addresses, information about government programs and material exchange opportunities.

One of the challenges associated with the industry's rapid growth has been the lack of a cross-referencing of information. Currently, there are some attempts to link existing Web sites to each other, so that anyone looking for information can find the source they are looking for.

Summary
With the rise of the conserver society, the used building material industry has experienced rapid growth in North America over the last five years. Today, it encompasses private, for profit and private non-profit organizations involved in the reuse and recycle business. This report is based on an industry survey conducted by the UBMA. Its purpose is to explore ways to increase deconstruction activity, specifically where it concerns the reuse of building materials. The report specifically highlights wood and wood-related materials, a type of inventory that appears to have the greatest potential for increased sales and supply. Also included in the Appendix 2 are a few relevant Web sites.

SECTION 2

MATERIAL RECLAMATION POTENTIAL

Running a used building material operation is like operating two businesses in one. On one hand, it includes recovering material from renovation, construction and demolition sites. On the other hand, it involves finding markets for the redistribution of materials. While the buying public is very supportive of any facility that stocks good materials at a fair price, challenge is in getting the inventory in the first place.

REGULATORY BARRIERS

Building Codes

Many standards, codes and rules in the industry function as barriers to the collection and redistribution of salvaged building products. For example, the National Building Code is inconsistently interpreted and enforced at the local level with respect to used dimensional lumber. Thirty-eight percent of respondents in the Deconstruction Industry Survey answered

"yes" when asked if their retail customers experience code-related problems with building codes when using old lumber. This result may be misleading. Many retail clients are either unaware that building codes apply to their projects, or they choose to ignore them.

Moreover, comments from respondents such as "municipal policies are unevenly enforced" and "there are unclear policies for the structural reuse of lumber" indicate that facility owners and managers, as well as their customers, are confused about the application of building codes. At the same time, facility staff often "state a Buyer Beware policy" and have "cautioned" customers. Clearly, the industry is aware of the confusion surrounding the application of building codes and is trying to help its clients deal with this barrier.

Water and Energy Conservation

Recent water- and energy-conservation regulations have created an interesting dilemma for managers of used building material facilities. Massive quantities of discarded fluorescent light fixtures and five-gallon flush toilets find their way into the resale market, even when replacement contracts clearly specify they are not to be reused. Most facility managers want to be part of the conserver society, yet the public is eager to buy these fixtures, some of which can be retrofitted to meet water- and energy-efficiency standards.

There is also the issue of environmental savings in terms of full life-cycle analysis and the concept of embodied energy. Although data are not yet available, it is important to consider the pros and cons of reusing a five-gallon flush toilet than replacing it because of the embodied energy costs, in terms of energy use, mining, manufacturing, transportation and disposal, associated with manufacturing the new toilet. This must be weighed against the potential environmental savings of treating and piping the water.

Contamination problems

In addition, regulatory barriers may diminish the economic viability of reselling used building materials if there is a contamination concern. Fifty-four percent of survey respondents indicated that many potentially salvageable building materials are contaminated to some degree. For example, asbestos, lead paint on windows and doors, PCB (polychlorinated biphenyl) in light-fixture ballasts, and treated lumber are all commonly found on the demolition and renovation job site. Regulations requiring the removal of lead paint create higher labour costs that can reduce the profitability of reclaiming useful, especially vintage, wood trim. At this point, it is unclear whether the increased costs make the effort financially worthwhile. It should be noted that some facilities remove lead paint as a matter of course while others do not.

Workers' Compensation

Another regulatory barrier is Workers' Compensation. For most people, finding an appropriate classification for home-based facilities is not a problem. But it appears that no Workers' Compensation classification applies for site deconstruction work, and the regulators seem indifferent to coming up with one.

Private Insurance Coverage
Companies often encounter a similar situation when trying to set up private insurance coverage for facilities and staff. This is an area where the used building material industry and public and private insurers could do a great deal of work, leading to a higher level of professionalism and more business for everyone. The Renovator's ReSource Inc. in Halifax is a good example. It proposed that only a small percentage of staff hours took place on deconstruction sites, and that the equipment used for deconstruction was much less dangerous than the heavy equipment used in traditional demolition. The result was a reduced Workers' Compensation rate, which was closer to typical retail operation rates.

Although some used building material proponents encourage more government regulation to promote conservation and business growth, it is not a widespread industry behaviour. The reason is likely a combination of the spirit of free enterprise, a working schedule that rarely allows for business development and a lack of awareness of what new and meaningful regulations could mean to business owners.

TECHNICAL BARRIERS

Job-site Practices
"Technical barrier" is difficult to define. Modern deconstruction is firmly based on an age-old tradition of building material salvage. Yet, it is evolving in size, knowledge and technological sophistication. For example, For an experienced and motivated deconstructor, the general rule is the older a building, the better. Older buildings and homes were held together by nails, screws and other fasteners, which are much easier to pry apart than more modern adhesives and other bonding agents. The latter, while outperforming their predecessors, make salvage difficult.

Kitchen cabinets used to be nailed or screwed to a wood stud wall. When their box structure is strong enough, prying, unscrewing and cutting around stripped screwheads with a holesaw works well. But with the advent of multiple-unit condominiums and apartments with dividing and partition walls made of poured concrete, cabinets have been fastened using powerful and piercing ramset guns. The installation is fast, but the removal is slow and much more difficult. This is frustrating as cabinetry is a popular item for resale.

Other job-site practices that are problematic to material reclamation include:

- nailing rather than screwing door and window jams to rough stud openings, since it requires a more damaging prying motion to remove;
- nailing rather than screwing steel enameled bathtubs to wall studs over the mounting flange;
- using flathead rather than Robertson screws in hinge hardware;
- using a compression nailer with the power setting too high, resulting in the nail being set too deeply (and prying apart even more difficult); and
- the use of caulking to seal storm windows to frames.

Tools and Time
The traditional tools used to pry and coax building materials apart do a reasonable job; the problem is time. The used building material deconstruction foreman works to a tight timeline and budget, and new deconstruction tools would make his staff more productive. Pneumatic tools are great for speeding up framing, but taking that framing apart 20 years later would go much faster if the manufacturer who made the compression nailer would also make a compression de-nailer.

Another technical barrier is matching up salvaged lumber to new, smaller-dimensioned stud lumber. Furring out takes time and more materials. A replaning facility for salvaged lumber would allow for matching old and new dimensions.

Rapid Demolition
As commercial buildings age and become obsolete, property owners often choose complete demolition to prepare for future redevelopment of the property and to reduce property and business taxes. Although this practice creates the potential for major material reclamation, the timing of the process can be a barrier. Many municipalities reduce the tax only after the building has been completely removed. To the property manager, this means rapid demolition. To the used building material facility manager, it means tight, if not impossible, schedules for deconstruction. The end result is most often an empty lot waiting for a new use and an empty feeling in the stomach of the facility owner when the deconstruction results in the recovery of only a tiny fraction of the materials.

Scheduling Deconstruction
Another practice in commercial property management that is a major barrier to material recovery is the restriction of deconstruction activity in partially occupied buildings to off hours. While this is understandable for demolition, which is noisy and disruptive, deconstruction is a far more gentle and less invasive procedure. Yet the same rules usually apply for deconstruction as demolition. This practice dramatically restricts the volumes and types of materials salvaged from a commercial site.

MARKETPLACE BARRIERS

It is hard to find a facility owner or manager who is disappointed with the enthusiasm of the marketplace for good-quality used building materials. Not only is market demand high, but there appears to be no end to the public's willingness to support professional facilities. This is occurring at a time when the North American economy is strong, and renovation spending has not only outstripped new construction but reaches new records every year.

The Measurement of Volume
Because the challenge for facility operators is to find the best quantity and quality of used materials, most marketplace barriers exist in terms of supply. One such barrier is the measurement of the volume of used building materials collected and redistributed. The accepted methods of measurement have always been weight and volume. While they still apply, the growth in the number and sophistication of used building material facilities has changed the vocabulary of measurement. For example, one facility owner/manager saw his revenues grow

even as he pursued a policy of acquiring used inventory that weighed less and took up less space. This inventory has more dollar value per pound and per cubic foot than his earlier stock.

Tipping Fees

For some time, it has been assumed that tipping fees and restrictions on which materials can be dumped at transfer stations or landfill sites encourage waste recovery. For many in the industry, lower tipping fees are a barrier. In southern Ontario, where the majority of construction and demolition waste is dumped across the border in the United States (because of cheaper tip fees), companies that generate waste have little motivation to pursue new forms of waste reduction such as working with a used building material facility. This is true in many parts of North America.

Exchange of Industry Information

Until recently, there has been no exchange of professional information in the industry. Without this firm foundation of support, new industrial activity will move ahead slowly. With the establishment of professional organizations such as the UBMA and the Construction Material Recycling Association (CMRA), the development of the industry is accelerating as trends and operating practices are shared openly among dozens, if not hundreds, of facilities.

Whose Waste Is It?

Another barrier derives from the question "whose waste is it?" The tendering and job-letting procedure says the general contractor, not the building owner, is responsible for the waste. When the building owner takes responsibility for the waste, building material salvage will become more widely practiced and more profitable for the building owner. An example is the Best Value Tendering Process in Canada's Department of National Defence. When a major demolition of an Armed Forces Base is planned, the priority for material handling is reuse, recycle and, as a final resort, dispose. This is a key change for those in the demolition business. To win a project bid, they must meet the reuse and recycle standards. This requirement has led to new relationships with used building material facilities across Canada. A similar process is under way in the United States.

Timing the Inventory

Another challenge is matching the supply of materials with the demand. Facility managers are reluctant to acquire and stock materials on the chance of finding retail customers. The recognition of this inventory timing problem has led to facilities working together to share and trade inventory.

Taxes

Another impediment are the sales and value added taxes on the resale of used building materials. This questionable form of taxation pushes up prices, creates bad feelings with retail customers and is almost impossible to explain in the marketplace. Recently, one used building material facility owner in Vermont proposed the elimination of sales tax on donated used materials in that state. She did it by working closely with State legislators who supported the initiative. This development has been welcomed across North America, and is one that should be promoted to all levels of government.

Financing
While most small businesses experience difficulties in negotiating start-up or ongoing financing, it is even more of a problem for the used building materials industry. Because a significant portion of a facility's inventory is donated, the company's financial statement looks very different to a bank manager. A Profit and Loss Statement, for example, shows little or no Cost of Goods or Inventory Book Value; and this accounting anomaly is reflected in the bottom line. Business owners must explain this to their banks and form a special relationship with lenders in order to grow.

Reaching Out to New Building Material Suppliers
The idea of reusing doors and windows is anathema to the customer philosophy of the new building material retailing sector. These stores sell new and only new. This attitude is also widely held by manufacturers and suppliers of new building materials. Yet the buying public wants good used materials and is prepared to search them out in the marketplace. Therefore, an opportunity exists for new and used facility owners and managers to build a mutually beneficial relationship with these retailers.

Cultivating Architects and Designers
Finally, the architects and designers who make major decisions about a project's scope of work, material specification and waste handling are often reluctant to mention the use of salvaged materials to their clients. In addition, there is the tradition of building material and product representatives coming to their offices with samples. Used building material proponents need to forge a relationship with this community as well. However, there are notable exceptions to this tradition. Some projects are now being designed for the eventual reuse of materials and components—a promising sign.

Summary
While the is no shortage of people searching out good-quality used building materials, the industry's main challenge is in finding inventory and supplying it a price at which businesses can make a profit. Regulatory barriers including the inconsistent application of the National Building Code, water- and energy-conservation regulations and contamination as well as inadequate Workers' Compensation classifications and private insurance coverage can all affect the economic viability of reclamation projects. Other barriers include modern fastening practices, rapid demolition, tipping fees, inventory timing and getting financing. The section ends with a call to members of the industry to forge mutually beneficial relationships with new building material suppliers, architects and designers.

SECTION 3

LUMBER RECLAMATION POTENTIAL

Many factors influence the decision to reuse and recycle lumber and timber from renovation and demolition projects. They include regulatory and contractual challenges, labour and safety concerns, economics and the advantages and disadvantages of dismantling versus demolition.

Existing Conditions and Issues

In Canada, some 11 million tonnes of demolition waste are generated every year. Approximately 46 percent of that represents materials from wood-frame buildings. It is from this type of building structure that the largest volume of reusable materials can be recovered. Many such buildings have been made obsolete by advances in manufacturing processes. However, the used building material industry can not currently accommodate this volume of material.

In addition, there are a large number of wood-frame military buildings ready for demolition in Canada and the United States that could contribute a huge amount of lumber to the reuse and recycling streams. Many of these military buildings will be dismantled or demolished because it is illegal in the United States to spend federal tax dollars to maintain facilities that are surplus to the military's needs.

Scott Lantz and Robert Falk conducted a study of the dismantling of two U.S. military buildings containing well over a million bd. ft. of lumber. Their results and comments are used in this report.

The percentage of dimensional lumber and other wood products used in typical new residential construction varies greatly with different types of houses (i.e., full basement, wood-frame, brick cladding, and so on). A report on housing trends lists the following items found in a typical 1,700 sq. ft. (158 m^2) home.

9,726 bd. ft. lumber	3,016 sq. ft. (280.2 m^2) sheathing (roof, wall)
243 sq. ft. (22.6 m^2) sheathing	55 cu. yd. (45.1 m^3) concrete (poured/block)
3,016 sq. ft. (280.2 m^2) exterior finish	1,992 sq. ft. (185.1 m^2) roofing
2,500 sq. ft. (232.3 m^2) insulation	6,484 sq. ft. (602.4 m^2) gypsum wallboard
90 ft. (27.4 m) ducting	55 gal. (250.0 l) paint
302 lb. (137.0 kg) nails	750 ft. (228.6 m) copper wiring
280 ft. (85.3 m) copper piping	100 copper fittings
170 ft. (51.8 m) plastic waste-line piping	70 plastic fittings
12 windows	10 interior doors
4 exterior doors	1 sliding glass door
2 tubs or 1 tub plus shower	2 toilets
3 sinks	15 kitchen cabinets

Senes Consultants, "C/D Waste in Canada", 1993.
National Association of Home Builders Research Center (Baltimore, 1991).

It is interesting to note the amount of lumber available from the first three lines of the summary (lumber and sheathing). Depending on the era in which the home was built, the two categories of sheathing may be unsalvageable for reuse. However, this material is a prime candidate for wood-recycling facilities.

The following factors should be considered when deciding whether to dismantle a structure:

- the condition, dimensions and species of wood;
- the type and number of fasteners per wood member;
- where the lumber is used in the building (beneath layers of flooring, and so on);
- the cost of labour;
- the time period allowed for dismantling a building;
- the building height and site configuration; and
- the time allowed to store materials on site.

The decision to proceed with the project is arrived at by weighing these factors in accessing, processing and transporting the material against the potential sales of the reusable material.

Species and Condition of Wood

The market for large volumes of hardwood is well established in Canada and the United States. Woods such as cherry, walnut, maple and oak fetch prices of $1,000-$1,200 per 1,000 bd. ft. Some softwoods, such as Douglas fir, heartpine and yellow pine, also have established markets. Dealers buy in quantities of 1,000 bd. ft. and usually arrange and pay for the transportation costs.

This type of market alleviates the interim storage and transportation problems for the seller because the lumber can usually be loaded directly from the site. The difficulty lies with less popular softwoods such as hemlock and spruce. These species have been used in structural applications in the majority of buildings in Eastern Canada for the past 150 years. It is usually first- and second- generation lumber with better qualities than the current product. However, finding a buyer for this material is still a problem. Other factors that affect the assigned grade and, consequently, the price paid for the lumber are the occurrence of holes, nails and fasteners, rot, mould and insect damage.

Foreign Objects

A variety of metallic and non-metallic foreign objects can be lodged in wood products. They are usually located near the surface, although metal from early fencing nails can be lodged near the heart of the lumber. The problem with foreign objects in the lumber is the safety hazard associated with milling, cutting or planing the piece. Many mills will not accept used lumber for remilling because of the cost of changing and sharpening blades.

Non-standard Sizing

Non-standard sizing is another characteristic of older wood-frame buildings. Local mills used to rough-saw or even hand-hew trees into approximate dimensions for joists and beams. As long as one surface (the top) was flat, the other faces need only be rough-sawn. Bark and wane can often be found on the structural members of many older buildings.

Hazardous Contamination

Lumber can come into contact with many substances in its lifetime. Because a large percentage of the lumber to be salvaged comes from military and industrial buildings, the following substances can be found on it (much of this can also be found in residential buildings as well):

- asbestos;
- PCB;
- mercury and cadmium fluorescent light fixtures;
- creosote, pentachlorophenol (PCP) and copper chromium arsenic (treated timber);
- lead-based paint; and
- oils, finishes, varnishes and solvents.

Further study on the percentage of material lost due to contamination is needed. Other uses for contaminated lumber may include recovery for fuel or for remanufacture.

REGULATORY BARRIERS

Grading

The grading of used lumber is a recent activity. However, most lumber bureaus and wood councils have still not proposed methods of dealing with the increasing amount of this used material in the marketplace. The method currently used to assign allowable engineering properties to timbers (lumber greater than 4 in. in thickness) is visual grading. Visual grading is based on the premise that the growth characteristics of timber can be seen and judged by the eye. Characteristics such as knot size, knot location, slope-of-grain, and degree of checking are used to sort the lumber into visual stress grades. The visual grading of all dimensional lumber equal to or less than 4 in. thick is standardized for all species. Therefore, the description of a given grade will be the same regardless of species. Grade descriptions for timbers, however, are not standardized.

Visual grading for reclaimed timbers is difficult because the timber might contain internal decay, insect damage or have a painted surface. For these reasons, some graders are not willing to inspect used timbers. In addition, old timbers are often given a lesser grade to limit the liability of the grader. However, many used timbers were cut from old-growth forests and have higher density, fewer knots, and are of better quality than currently produced lumber.

Jim Kneaper of the West Coast Lumber Inspection Bureau (WCLIB) has stated that the WCLIB issues certificates and sometimes gradestamps if the lumber in question contains the characteristics of and is within the grade limitations of the desired grade. This service costs US$10 in addition to the fee of US$300 per day (plus expenses) for lumber grading. This process works best when all the lumber is destined for one project or one sale since each piece is either tagged or hammer-branded with a code documented on the certificate. Therefore, grading lumber for sales within a used building materials retail outlet can be problematic.

Robert H. Falk and Scott F. Lantz. "Feasibility of Recycling Timber from Military Industrial Buildings," Forest Products Society, Proceedings No. 7286 (Madison, 1996).

The WCLIB has devised a method to grade lumber which contains holes, notches or rot. If a timber has a bolt hole, the hole can be of equal size to the comparable allowable knot within the grade. If a timber has a notch, the notch can be equal to or less than half the size of the comparable allowable knot. If a timber has rot, the same guide used for downgrading new lumber with surface rot is used.

One of the WCLIB members is G.R. Plume and Associates, a used building material operation in Bellingham, Washington. The owner, Gordon Plume, has been concerned with the issue of lumber grading for years. He thinks he can be more successful selling wood to his customers if proper lumber grading procedures are in place. Specifically, he considers how holes and notches affect grades and has been a strong proponent of the current WCLIB methods.

His operation has a bandsaw mill and custom woodworking shop where the majority of the wood he uses is salvaged. Since the company does not have a dismantling crew, it purchases material from salvage firms. His staff then use handheld metal detectors and planers with high-speed quality steel blades to clean the surfaces of the old lumber.

Plume believes that the materials he buys should be classified in three ways:

1. species specific (e.g., more defined than spruce-pine-fir ratings);
2. the slope of grain (whether greater or less than 1 in 10 to meet #1 standards); and
3. the condition of the wood (painted, stained or oil-coated).

This grading can then be passed along to the customer as a way to create confidence in the product being purchased.

The WCLIB has graded some used lumber. However, as noted in the minutes of the American National Grade Rule (NGR) subcommittee meeting of March 11, 1997, opinions on the practice differ. The minutes state:

> a discussion took place about the design properties of recycled lumber and it was noted that the Forest Products Laboratory (FPL) had some limited preliminary data concerning this issue. Mr. Shelley cautioned the group that the FPL data was from a small sample and that the data had not been thoroughly reviewed. Mr. Loy noted that SPIB will certify the lumber to NGR visual grades but will not certify the design properties. Mr. Hanneman indicated that WWPA does not permit recycled lumber to be gradestamped to NGR grades.

Because Canada uses the NGR mandate, this activity in the United States should be of great interest to the affiliated lumber bureaus and wood councils in Canada.

Mechanical grading of 2-in.-thick lumber combines a direct measurement of the lumber modulus of elasticity (MOE) with a visual assessment to sort the individual pieces into mechanical grades. Robert Falk suggests that this system grades lumber more precisely than visual grading and allows more grades to be distinguished. Unfortunately, a mechanical grading system does not exist for new or reclaimed timbers. Currently, Falk and the Forests Products Laboratory (FPL) in Madison, Wisconsin, are initiating a series of tests to establish a mechanical grading system for new timbers. These studies use stress-wave techniques to measure MOE. This technique might

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Minutes of the National Grade Lumber Authority (NGLA) NGR Subcommittee Meeting, March 11, 1997, p. 44.

also be able to detect internal defects and decay. The logical next step would be a study on reclaimed timber.

Liability Issues
Since there are only a few methods for grading lumber and still fewer methods for ensuring there are no hazardous foreign objects or chemical substances on the surface, the operation owner has little control over liability for the item. This is inadequate for both the operation owner and the consumer. In the survey, when asked if they provide any statements that guarantee the state or quality of the merchandise, many operators of used building material stores responded that it is a "buyer beware" situation.

Labour Costs
Labour costs can be a barrier, especially in Quebec, where all labour on construction sites is unionized. These high labour costs can prohibit the labour-intensive process of dismantling. In the United States, all construction projects must comply with the Davis-Bacon Act (40 USC 276a) or the Service Contract Act which require that the prevailing wages are union wages. However, the Service Contract Act, section 37.301, also says that when there is no further planned Federal construction or improvement on the site, the payment of a minimum wage vs. the Davis-Bacon "prevailing" wage, applies. Therefore, under the Service Contract Act the labour portion of a dismantling contract is much less expensive.

TECHNICAL BARRIERS

The time required to fully dismantle a wood-frame building is approximately four to five times longer than traditional demolition. This is due to many reasons, including:

- the careful removal of components in large, unsplit units from building;
- the work is done mostly by hand without large equipment;
- the careful packing and packaging of material for transportation; and
- the processing of material on-site prior to transportation (i.e., de-nailing).

These factors affect the amount of time a dismantling crew spends on the site.

Another technical barrier is the ability or inability to remove the material in resaleable condition. All foreign objects such as nails and fasteners must be removed from the material prior to resale.

Historical Factors
The key to providing the greatest value of inventory is to provide the material in its best possible condition. That requires understanding how a building's components are assembled and installed in order to remove them without damage. For example, recognizing the type of fasteners used in the construction of a building can help indicate the likelihood of successful recovery of the material. Up to the mid-18th Century, fasteners were largely hand-forged. During the mid-18th Century, the machinery for cutting larger, heavier material (nails, spikes and pins) was developed. Until the mid-1950s, these simple fasteners (nails, screws and bolts) were the main type used in wood-frame construction. Since the 1950s, the improved manufacturing of fasteners

(a nail machine can make 2,000 nails a minute from steel wire) and the development of tools like the power-nailer or gang-nailer has limited the profitable reuse of wood components.

In addition, the use of other fasteners, such as glue and staples, limits the potential for salvaging material. Since the 1950s, there has also been a change from solid material to composite material for substrate surfaces like sheathing, subflooring and cabinetry. These surfaces, if attached with glue, staples or by power-nailers, are almost impossible to salvage in good condition. Appendix 4 provides a summary of typical construction nail and screw types.

Removal Techniques

The key issue in removing foreign objects from timber is doing it without compromising the integrity and value of the wood. Often, old nails break as they are being removed, or the body of the nail is hard to remove without drilling or chiselling, leaving holes and notches in the product.

Techniques for removing foreign objects from lumber are often accompanied by increased processing costs. They include visual inspection or magnetic detection with a handheld or mechanically driven sensor. Most of these detectors can locate a metal object within 7-8 in. (17.8-20.3 cm) of the surface. Most beams and posts do not exceed 14-16 in. (32.6-40.6 cm) in depth, so a detector can locate an object from one side or the other. Once this detection has been done, the lumber can be cut knowing where the metal object is located. However, this is not a guaranteed process. Metal objects embedded in large timbers can be small, or they can be missed if the scanning process isn't thorough.

Reconnx, a private company owned by Jon X. Giltner in Boulder, Colorado, is presently researching and developing tools for the building reuse industry. Giltner is a structural engineer and founder of ReSource 2000, a non-profit building material store in Boulder. He designs and tests dismantling tools for wood-frame structures. One tool currently being tested is a handheld automatic nail-removing device. This tool, which is at the prototype stage, is based on models currently in use in the Japanese construction industry.

The second item Reconnx is developing is a finger-jointing system that can be used on-site for timbers of all sizes. This system uses available, unreusable (small dimension) wood, which it finger-joints into larger, reusable members. It is also in the prototype phase.

Remilling and Planing

Recently, softwood plank flooring has enjoyed increased sales. Softwood plank flooring is either reclaimed material from older buildings or remilled lumber from larger structural elements. The process of remilling timber into flooring requires the same initial procedures as mentioned above to locate metal objects. The timber then has its edges squared in either a bandsaw mill or a portable sawmill. Planks are usually marketed with a 3/4-1 in. (1.9-2.5 cm) thickness. The sawkerf and squaring of the timber loses upwards of 20 percent of the material. While squaring the edges of each plank loses an additional 10 per cent, it is worth it since it increases the value of the end product. Many companies in the Northeastern United Sates buy truckloads of timbers larger than 3 x 8 in. (7.6 x 20.3 cm) to be milled into flooring. In addition, the market for laminated veneer plank flooring on particle substrate is also a popular and efficient use of the wide plank flooring.

The expense of setting up a small sawmill operation may outweigh the value of the increased sales of large timbers produced. For example, in Nova Scotia, many older buildings were built with spruce structural members. While there is no established market for used spruce timber, the wood can be remilled to make quality plank flooring 9-12 in. (22.9 x 30.5 cm) wide. Here, the cost of milling the timber is offset by prices of $2-3 a sq. ft. Moreover, a portable bandsaw mill can eliminate the cost of setting up a permanent facility. The portable mill can be towed behind a half-ton vehicle and operated on location at a dismantling site. The cost for an average portable sawmill is approximately $10,000 plus taxes.

As mentioned earlier, one issue that needs to be considered is the choice of location for preparing wood products for resale. Such preparation involves separating components (gangnailed, flanked members) and removing all nails, screws, fasteners and foreign objects that hamper storage and sales. It also involves trimming the rough ends of the lumber. If dealing with smaller dimensions (i.e., t&g flooring) this is followed by bundling, identifying and stacking the material—operations that require a large area. Often, the total time required for such processing can equal the actual time required to dismantle the structure.

MARKETPLACE BARRIERS

Challenges on the supply side

The survey indicates that there is great interest and knowledge in the reclamation of wood products for resale. However, in many regions of North America, buildings destined for demolition are not of the right age or type that contains a great amount of salvageable lumber. The survey also indicates that building owners lack the time and interest to consider a reclamation approach. In addition, if the used building material operation is new to the region, a period of time must pass before owners and contractors realize the availability of used materials. Many regions of the country still do not have formal used building material centres.

Demand-side Factors

There are many reasons to promote the use of used timbers to customers. These include:

- current restrictions against harvesting high-quality, large old-growth timber;
- the general trend of increased prices for all new wood products;
- the demand for quality large timbers for use in exposed timber-frame construction; and
- the demand for specific species for dedicated use (e.g., Douglas fir for boat building).

On the other hand, there are barriers that serve to restrict the demand for used timber, including:

- the lack of grading stamps and standards (which often results in the downgrading of the material);
- the additional cost of grading lumber, if required;
- the lack of confidence in the quality of materials graded only by visual inspection;
- the lack of a consistent supply of used timber;

- the lack of awareness by owners of the potential value of used lumber, resulting in no attempt at recovery; and
- the potential danger when cutting and planing used timber.

Cost Competitiveness of Salvaged Lumber

Currently, there is no opportunity for salvaged 2 x 4 in. (5.1 x 10.2 cm) wood studs to compete with the new wood or metal studs. The labour and associated costs required to remove drywall, screws and nails are often higher than the potential retail price. This is especially true when the salvage company is responsible for the costs of disposal associated with wall material such as drywall, panelling and wood off-cuts. Ways of making the salvage of smaller-dimension lumber more cost-competitive could include wage-subsidy programs for labour, increasing disposal costs for lumber considered to be salvageable, and higher virgin lumber prices.

Another factor that affects the cost-competitiveness of salvaged lumber is the associated project cost. The labour cost for lifting, removing, de-nailing, bundling and packaging material is a large component of the total. If there is no time to process the material on-site then one of two scenarios can occur. Either a secondary location where processing can take place must be used (which increases the job costs because of higher transportation and location overhead), or the material must be brought back to the main facility for processing. This requires approximately 2,000 sq. ft. (185.8 m^2) of space separate from customer areas.

A third factor that can increase the project cost is the distance to and from the job site. The price for the material must cover the hourly wages paid to the crew for transportation time in addition to gas, meals, accommodation, equipment rentals and employment costs (i.e., Employment Insurance, Workers' Compensation and Canada Pension Plan).

Marketability of old Wood

Customers are sometimes reluctant to purchase wood that is dirty or marred. This is especially true of plank flooring, tongue-and-groove flooring, joists, beams and plywood. Customers in a Halifax-based operation state that buying a package of 20 sq. ft. (1.86 m^2) of hardwood flooring that has been trimmed, de-nailed and bundled is worth the increased cost when compared to buying a loose pile of nailed flooring. This is generally true for all material sold in a used building material outlet. The tidier the appearance of the old material, the more likely it is that a customer will buy it.

Focus on Local Markets

The research for this section of the study generally focused on lumber operations in Eastern Canada and the west coast of the United States. However, survey responses from across North America showed a wide variety of experience and restrictions that affect local marketplaces. The problems related to increasing technical capabilities and decreasing regulatory impediments should be addressed only in areas where the used lumber supply is established and the potential marketplace promising.

Summary

The lumber reclamation potential of many deconstruction projects is determined by a variety of regulatory, technical and marketplace factors. Other considerations include the species and

condition of the wood, non-standard sizing and the presence of foreign objects and hazardous contamination. The lack of industry-wide grading methods and standards, as well as the labour costs of dismantling, also serve as barriers to the marketability of salvaged wood. Some other major barriers are the need for cost-effective techniques and tools for removing foreign objects from lumber and for remilling and planing. In addition, the cost competitiveness of salvaged lumber and the marketability of old wood are key challenges faced by the specialists in the lumber reclamation and reuse business.

SECTION 4

CONCLUSIONS AND RECOMMENDATIONS

Considerable interest in promoting the industry exists among North American used building material store operators. The industry also needs more research and development and more educational tools to promote the reuse concept to the general public and to all levels of government. Within the industry, there is also a strong movement towards deconstruction and lumber salvage, which makes the sharing of information, techniques and experiences invaluable. Equally important is the need for the UBMA to lobby for regulatory change that will support the growth and future of this emerging sector.

The following is a summary of the proposed work which the authors feel is necessary to support the growth of the industry.

Education

- Develop a workshop on building material reuse. Deliver it to property managers at Canada Mortgage and Housing Corporation, the Canadian Home Builders' Association's Renovation Councils, building inspection officials, property management associations, architects and design groups.

- Develop a media package to inform the general public (specifically do-it-yourselfers) of the services available within the industry.

- Develop and update the UBMA Web site with a specific focus on a Material Exchange program.

- Promote building material salvage and reuse within all Canada Mortgage and Housing Corporation's owned and managed properties.

Deconstruction Techniques

- Develop and deliver deconstruction workshops at local and national events.

- Research and test tools currently being developed and patented specifically for the reuse industry.

- Coordinate case study information for distribution within UBMA's membership.

Regulation and Taxation

- Support UBMA to lobby for the national elimination of the Goods and Services Tax on the resale of all donated used building materials.

- Promote addendums to the National Building Code to clarify and broaden the use of salvaged materials.

- Liaise with Workers' Compensation Organizations to develop a clear and separate category for deconstruction site activity and associated retail functions.

Additional Research and Demonstration Projects

- Develop and test dimensional lumber replaning and finger-jointing technology (IRAP).

- Research quantities and percentages of hazardous materials in the marketplace. Develop a system to categorize and handle material safely.

- Document methods to effectively dismantle typical Canadian residential structures, with a particular focus on lumber salvage.

- Measure the true economic impact of used building material facilities including jobs created, revenues generated and material weights and volumes diverted from landfill for reuse.

- Research methods to calculate carbon doxide reduction. Measure the current and potential volumes of carbon dioxide that can be reduced by salvaging and reusing building materials in Canada.

The results of this study will be made available to the UBMA membership and to the participants in the survey.

APPENDIX 1

COPY OF THE INDUSTRY SURVEY AND RESULTS

The Used Building Material Association (UBMA) is a non-profit, membership-based organization that represents companies and groups in Canada and the United States that acquire and redistribute salvaged materials such as doors, windows, lumber, plumbing fixtures and a wide variety of other products that are too good to be thrown away. UBMA also represents companies that reprocess and recycle building materials such as asphalt and concrete.

In this Industry Survey, we want to explore if, how and why your company generates used building materials through the process of deconstruction. Your prompt and generous response to this survey will accomplish two things:

First, it will help the UBMA to assist our growing industry to increase the quantity and quality of the materials we handle. This is good for all of us.

Second, if you fill this survey out in full and on time, and are not currently a member of UBMA, we will discount your new membership by $50.

This survey is only one part of a larger research project called: Methods For Increasing the Volumes of Used Building Materials. The project is generously funded by Canada Mortgage and Housing Corporation (CMHC).

DECONSTRUCTION 1998

An Industry Survey

Brought to you by the Used Building Material Association
(http://ubma.pangea.ca)

Please return the completed survey by: April 30th, 1998 to:
ReUze Building Centre, 1210 Birchmount Road, Unit 1A, Toronto, Ontario, CANADA,
M1P 2C3.

Any questions, please contact: Bob Sawatsky, ReUze Building Centre,
416-750-4000, FAX 416-750-4343, email reuze@istar.ca

Company: _____

Contact name: _____

Location: _____

Address: _____

City: _____ Prov/State: _____

Country: _____ Postal Code: _____

Phone #: _____ FAX #: _____

Email: _____ Web Site: _____

1. Calculated by dollar sales, what is the approximate percentage breakdown of your overall inventory?

doors	13.6 %
windows	13.0 %
cabinets/millwork	14.5 %
plumbing fixtures	8.8 %
masonry	3.6 %
paints/finishes	3.7 %
lumber/wood	24.9 %
other	17.9 %
TOTAL	100%

2. What percentage of your inventory is used? 72.6 %

3. What percentage is new? 27.4 %

4. When picking up from job sites, or accepting items dropped off at your facility, does your company purchase used materials? _____ yes
61% no

5. What percentage of your used inventory is dropped off at your facility? 100 %

6. How much of your used inventory do you pick up from job sites? 100 %

7. What percentage of your used inventory is generated through on site deconstruction? 38.3 %

8. Do you pay salvage fees to gain access to deconstruction sites? 62% yes _____ no

9. Of all of your typical deconstruction sites, which percentage are:

a/	residential				46 %
b/	private				54 %
	industrial	____%	government	____%	
	commercial	____%	institutional	____%	
		TOTAL			100%

10. Who is your typical deconstruction customer?

homeowner	22 %
property owner	31 %
general contractor	10 %
sub-trade	0 %
demolition contractor	4 %
property manager	8 %
other _____	25 %
TOTAL	100%

11. What is the average number of field staff you use per deconstruction project?

full time	3.3
part time	13

12. Is it feasible in your region to deconstruct? Briefly explain:
All but one survey participant clearly indicated that deconstruction is feasible. Comments consistently cited lack of time and logistical access to projects. Some noteworthy responses:

"We have a concerned community which is willing to pay for our services."

"Very few older buildings being demolished in our area."

We search out "older buildings or those with some extra value."

"...low desire in renovation community to reduce construction wastes."

"More people in (our community) are becoming recyclers every day, and with us being a non-profit organization they like to support us."

"...(our state) is far behind the nation in basic recycling programs, so deconstruction has not reached infancy yet."

13. How many vehicles does you company use for deconstruction?

owned/leased	_____	1/2 ton	____	3/4 ton	____ container ___
rented as needed	_____	cube	_____	flatbed	____

Responses were somewhat vague, but a total of 53 vehicles were owned, leased or rented with an average of 4 vehicles per company. Only 2 containers were used overall.

14. Can you describe the kinds of tools and equipment your company uses on its various deconstruction projects? (ie: crowbars,scaffold, generator, crane, forklift, reciprocating saws, nail pullers, etc.)

There were an enormous number of tools mentioned by those responding. They ranged from simple, non-powered handtools, to bulldozers and excavators. Deconstruction as an industrial activity takes a wide variety of forms.

15. Do you run into material contamination problems on site? 54% yes _____ no

16. If you answered yes, please briefly describe what kinds of contamination and how you deal with the problem: (ie: asbestos paper, asbestos tile, pcb light fixtures, lead paint, creosote, treated lumber).

Asbestos, PCBs and lead paint topped the list of responses. Most remediation was handled by sub-contracted professionals

17. How do you prepare your salvaged inventory for resale in your facility?
(check one or more)

remove imbedded nails and other fasteners	61 %
repair prior to display on sales floor	54 %
clean, wash, repaint	61 %
build demonstration display	38 %

How do you enter inventory into inventory system:

manual	46 %
computerized	38 %

18. Are you planning any improvements to your facility?

10 out of 13 said "yes," with some facilities planning to purchase a new location soon or make major renovations and changes to their layouts. Larger advertising spending was also planned

19. Why do your retail customers buy used materials from your company?
(check one or more)

23 %	facility location
91 %	price
61 %	environmental concern
54 %	experienced sales staff
77 %	you have unique inventory
8 %	other:

Price is far and away the most important reason for marketplace support of used building material facilities, with the special characteristics of inventory a strong second.

20. Do your retail customers have problems with building codes when they reuse materials purchased at your facility?

38 % yes
___ no

This is a lower level of concern than had been expected.

21. If you answered yes to the last question, please describe how:

Comments indicated a high level of concern on the part of owners and managers to caution their customers about code-related issues.

Pertinent comments:

"we run into situations where they have to get an engineer's stamp to reuse certain building materials."
"...because the code won't allow used material in new construction."
"unclear and unevenly applied policies create confusion."
"handrail heights and fire codes for fireplaces."

22. Is there a large retail demand for dimensional lumber? (check one or more)

2 x 4's	92 %	plywood	92 %
2 x 6's	85 %	4 x 4's	85 %
2 x 8, 10's	54 %	large timbers	61 %

23. If so, are you able to provide dimensional lumber through your deconstruction site work? Is there enough sales value in the salvaged lumber to make the site work worthwhile? Please describe briefly:

"labour costs too high, low profit margin"
"need more lumber"
"we easily sell all good used lumber, no problem"
"not worth the salvage effort"
"must be assessed on a project by project basis"
"my last deconstruction project salvaged 2 x 12 x 24 ft. and they were sold before they were off the truck"

These comments show the great range of enthusiasm that deconstructors have for salvaging dimensional wood products. Obviously, if removal costs are low enough in comparison to the resale value, then lumber will be made available to customers.

24. If you encounter large ungraded timbers during deconstruction, do you have any trouble selling them? Please explain:

Approximately half of survey participants do encounter timbers. This seems to correspond to the types of buildings that are generically found in their locations. Where available, most managers find a positive market demand, with some code concerns.

25. When you deconstruct, how do you deal with imbedded and protruding nails in the lumber? Do you use regular or specialized tools?

Most everyone does some level of nail removal. All those doing this type of removal were using simple handtools.

26. Would you consider improving deconstruction techniques through:

purchasing specialized tools	54 %
purchasing metal scanning equipment	23 %
attending training courses	46 %
reading literature	54 %
hiring specialized crew	54 %

The responses were strong enough to indicated the industry wants to improve its techniques for deconstruction

Your comments:

Ranged from wanting to see more research work in this field and wider information sharing to a general enthusiasm for this survey being mailed out to them.

Would you like to receive a copy of the project report? 100%

SURVEY ANALYSIS

Although a larger number of completed surveys would have been beneficial, the quality of responses was quite high. These are business people who are professional in their attitude and practices, who understand their markets, and who have relatively strong abilities to generate inventory and revenue from it.

The product blend is very wide with little or no specialization in one particular type of material. This is likely a direct result of market demand. With 25 percent of their inventory being new, managers are taking advantage of their existing customer base, adding value to each visit to their stores.

Paying or not paying for used inventory is an industry-wide debate. Over half of our participants do not pay. This is higher than in the past. It should be noted that when there is an associated cost of goods for used materials, the direct result is often higher retail prices to the end user.

Although every participant's company deconstructs, the value of materials generated in this manner is 38 per cent. This is lower than anticipated and may be attributed to high site labour costs and the payment of salvage fees—another contentious issue.

Deconstruction services are most often directly provided to those owning the property. This may indicate that the industry has yet to form stronger relationships with demolition and material-hauling firms. We may see more of this in the near future as used material businesses expand in response to market demand.

Response to Question 11 (number of field staff) was interesting. Thirteen responding stores employed a total of 170 full- and part-time deconstruction field staff for an average of 13 per company. Questions 13 and 14 also indicated how much money is being spent on equipment. We believe this just begins to show the actual economic strength of the used building material sector. More research work could be done to measure this.

Although material contamination is a problem recognized by many in the deconstruction field, a high level of professional judgment is being showed at how to effectively handle the situation.

Almost everyone is doing some sort of material preparation in the sales facility prior to resale. This type of labour tends to increase the floor value of stock but the actual remedial work is relatively simple. This suggests that a high level of skill in the deconstruction field produces a quality product that needs only a small degree of labour to get it ready for market.

APPENDIX 2 - Industry Information Sources

UBMA Web Site - http://ubma.pangea.ca

UBMA

Information

Members

Join

Exchange

Stores

Publications

Links

Comment

Email

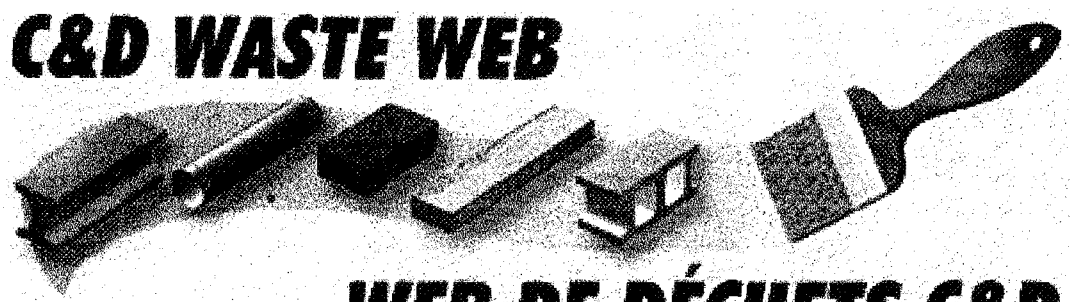
Used Building Materials Association

Information | Members | Join | Exchange | Stores | Publications | Links | Comment | Email

This site is best viewed with Netscape 3 or higher.

Last updated 28 November, 1997

C&D WASTE WEB



WEB DE DÉCHETS C&D

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The buttons lead you to each of the sections of the C&D Waste Web. The Service Directory is fully searchable and contains over 300 entries from across Canada.

If you wish to have your business included in the directory, go to the Submit page and fill out the form located there. This site is updated regularly.

The following agencies have provided funding for the creation, promotion and maintenance of this site:

- Philip Services Corp.

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Environment Canada / Environnement Canada

- Public Works and Government Services Canada
- Environment Canada
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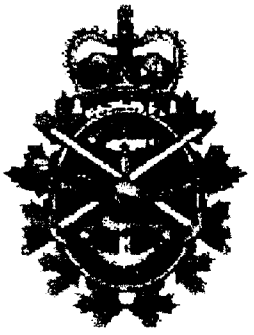
- Department of National Defence
- Ontario Realty Corporation



National Défense
Defence nationale

PSC
PHILIP SERVICES
CORP.

Ontario Société
Realty immobilière
Corporation de l'Ontario

C&D WASTE WEB

WEB DE DÉCHETS C&D

Reference Documents

There is no doubt that our environment has changed, but more importantly so have our attitudes. Minimizing the environmental impacts of construction, renovation, and demolition projects requires new approaches in planning, design, material selection, techniques and the regulatory approvals process. The development of these new approaches has been supported by various levels of government and by private industry and trade associations.

This section contains information on various reference documents that have been developed to provide support and encouragement for building practitioners that wish to learn more about green construction techniques and C&D waste diversion.

The following is a list of construction and demolition waste documents that are currently available on the C&D Waste Web:

- **Regulations**
  A guide to Environmental Legislation affecting the Ontario Construction Industry 

  The purpose of the guide is to provide a helpful reference on environmental legislation (ie. acts, regulations and guidelines) for use by those involved in construction, demolition and renovation activities (construction industry management and employees, contractors, site superintendents, developers, estimators and consultants) in Ontario. The guide will increase the level of awareness of environmental legislation and provide a "checklist" of environmental requirements.

  3Rs Regulations 102/94 and 103/94

  Regulation 102/94 sets out the requirements for large IC&I establishments to develop waste audits and workplans. 103/94 requires large IC&I establishments to implement source-separation programs.
- **Documents**

  3Rs Code Of Practice

  In January 1993 members of the Ontario Construction Industry developed a 3Rs Code of Practice that addresses waste management within their industry. This Code was not developed as an industry standard, rather it was intended to provide members of the industry with a starting point for reduction, reuse and recycling activities.

  Designing With The Environment

  Designing With The Environment was facilitated by the Ontario Ministry of the Environment's Waste Reduction Office in 1992. The Guide addresses environmental responsibility during the planning and specification of built environments. Suggestions are provided for concientious reduction of construction and demolition waste along with issues related to material selection and

building processes.

Guideline for Use at Contaminated Sites in Ontario - June 1996

This document provides guidance on cleaning up and/or redeveloping contaminated property in Ontario. This is essential information for developers & demolition contractors.

- **Specifications**

  National Master Green Specifications

  The National Master Specification was developed to provide a standardized framework for the development of construction, demolition and renovation specifications within the Canadian Federal Government and the private sector. Division 2 contains demolition specifications, three which have been 'greened'.

  - Division 2-Sitework 02060- Demolition
  - Division 2 - Sitework 02070 - Sitework Demolition And Removal
  - Division 2-Sitework 02071- Demolition [Short Form]

- **Reports**
  - Green Renovation Guide

Waste Management Update #4

by NAHB Research Center

Deconstruction

Each year, as many as 100,000 residential buildings are demolished in the United States. This represents more than 8 million tons of wood, plaster and drywall, metals, masonry, and other building materials, most of which will end up in local landfills.

Deconstruction is a new term to describe an old process--the selective dismantling or removal of materials from buildings before, or instead of, demolition. Typically, when a building reaches the end of its useful life, heavy equipment is brought in to demolish the structure. All parts of the structure are rendered into rubble--a varied mix of wood, masonry, metals, and other materials. In some cases, particularly with large concrete and steel buildings, raw materials may be processed and recycled. For most light-frame residential buildings, the demolition waste ends up in either a municipal or construction and demolition landfill.

It is possible to salvage building components, keeping the higher value of materials for reuse. Wood flooring, raised panel doors, ornate interior and exterior trim, electrical and plumbing fixtures, even framing and bricks can have salvage value of up to 75% of the item's original value. Add to this value the avoided disposal costs and a question arises: Can relatively low-skilled deconstruction labor dismantle a building more cost-effectively than heavy equipment can demolish it?

DECONSTRUCTION CASE STUDIES

The Whole House Recycling Project. In 1993 in Portland, Oregon an architect and a local demolition firm combined forces to document the economics of dismantling a 1,280 square foot, two-story house. They found that the hand labor required to dismantle the building for salvage was competitive with the cost of conventional demolition. In addition, the following salvage values and reduced disposal costs resulted in net income of $4,500. While high tipping fees and well-established end use markets in Portland may make this a special example, the results suggest that deconstruction can be a viable alternative to conventional demolition.

Salvaged Item	% value of retail
Framing Lumber	40
T&G Siding	50
Doors	30
Brick	55

Ft. McCoy Barracks. The Directorate of Public Works (DPW) for the Army's Ft. McCoy in Wisconsin developed a way to deconstruct many of the buildings that they slated for demolition at a fraction of the cost of conventional demolition. A service-type contract was written to permit local individuals to submit sealed, no-minimum bids for building material salvage. The DPW removed hazardous materials from the buildings prior to contract winners coming on site to salvage framing, sheathing, and flooring. The Army provided dumpsters for disposal, a site safety program, basic asbestos and lead paint training, and final site clearance and grading.

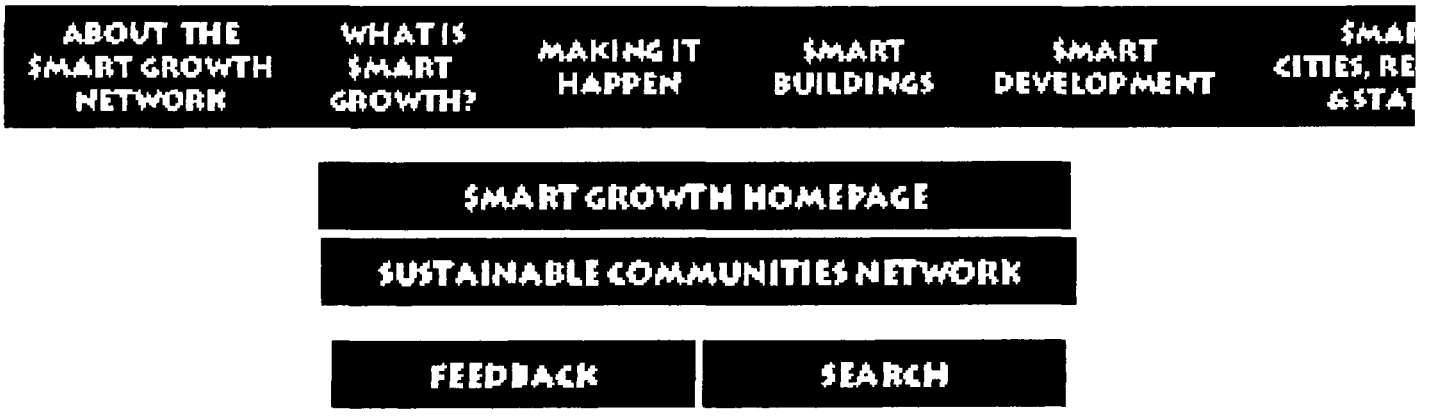
Recovery rates are averaging 85%, the Army DPW is incurring costs of $2 per square foot (compared to the $20 per square foot that some Army installations are facing), and the deconstruction crews have built houses, hunting cabins, garages, sheds, and even two churches out of the salvaged building materials.

ISSUES

Despite these and many other success stories, there are key issues to be addressed as deconstruction is explored

- ***Rules of thumb.*** Are there general principles to be used in determining how and when to employ deconstruction?
- ***Time.*** How much more time will deconstruction generally take than demolition?
- ***Lead and asbestos.*** Do these materials need to be handled any differently for deconstruction than they would be for conventional demolition?
- ***Worker compensation and general liability.*** How will insurance companies evaluate deconstruction activities?
- ***Grading stamps.*** Will local building inspectors accept salvaged framing materials in equal substitution for new framing--if framing lacks a stamp, how easily can the framing be regraded?
- ***Markets.*** How are salvaged building material markets located or created?

Many of these issues are being investigated as part of a pilot deconstruction project being conducted by the Research Center in Baltimore, Maryland. The results of this project will be available in the fall of 1997.



URL: http://www.smartgrowth.org/

$mart Growth Network
in partnership with the ***Sustainable Communities Network (SCN)***
Revised October 18, 1997

Webmaster: info@smartgrowth.org

APPENDIX 3

LIST OF SURVEY PARTICIPANTS

The following is a complete list of firms that received surveys to fill out. In total, 43 copies were mailed using the current membership list of the UBMA. Thirteen completed surveys were received.

Canadian Contacts (21)

Centre Recupermat,
Entrepot 1709, Ave Lavoie,
Chicoutimi, Quebec
Canada, G7H 5G4
contact: Cristiane Ouimet
ph: 418-696-2036 FAX: 418-696-1654

CMHA Restore,
8 - 6th Street,
Brandon, Manitoba,
Canada, R7A 3N1
contact: Garry Daught
ph: 204-728-2227 FAX: 204-727-5425
(survey response received)

D. Litchfield & Co. Ltd.,
3040 Westwood Street,
Port Coquitlam, British Columbia,
Canada, V3C 3L7
contact: Corinne Fulton
ph: 604-522-1736 FAX: 604-944-1674

Habitat Restore,
75 Archibald Street,
Winnipeg, Manitoba,
Canada, R2J 0V7
ph: 204-233-5160 FAX: 204-233-5198

Habitat Restore,
1865 Provincial Road,
Windsor, Ontario,
Canada, N9A 6J3
contact: Mike Dinchik
ph: 519-254-5851

Happy Harry's Used Building Materials,
125 61st Avenue Southeast,
Calgary, Alberta,
Canada, T2H 0R4
contact: Ray Banville
ph: 403-255-9505 FAX: 403-253-8700

Happy Harry's Used Building Materials,
5044 45th Street,
Red Deer, Alberta,
Canada, T4N 1K9
contact: Jody Brett
ph: 403-343-1818 FAX: 403-253-8700

Happy Harry's Used Building Materials,
20 Wright Avenue,
Halifax, Nova Scotia,
Canada, B0N 2Z0
contact: Jim Canning
ph: 902-468-2319 FAX: 902-468-3666

Happy Harry's Used Building Materials,
120 Norfinch Drive,
Toronto, Ontario,
Canada.
ph: 739-1726

National Building Supplies,
22903 HWY 48, RR #1,
Sutton, Ontario,
Canada, L0E 1R0
contact: Dan Sedore
ph: 905-473-3462

Paragon Industries,
Box 16, Grp 525,
RR #5, Winnipeg, Manitoba,
Canada, R2C 2Z2
contact: Dave McNicholl
ph: 204-224-3238 FAX: 204-224-4547
(survey response received)

RBM Supplies,
P.O. Box 756,
Yellowknife, NWT,
Canada, X1A 2N6
contact: Wanda Penner
ph: 403-873-2737 FAX: 403-920-4665

ReUze Building Centre,
1210 Birchmount Road, Unit 1A,
Scarborough, Ontario,
Canada, M1P 2C3
contact: Bob Sawatsky
ph: 416-750-4000 FAX: 416-750-4343
(survey response received)

Renovator's ReSource Inc.,
P.O. Box 36032,
Halifax, Nova Scotia,
Canada, B3J 3S9
contact: Jennifer Corson
ph: 902-429-3889 FAX: 902-425-6795
(survey response received)

Sunco Recycled Building Materials Ltd.,
5653 Wharf Rd., P.O. Box 1771,
Sechelt, British Columbia,
Canada, V0N 3A0
contact: Ron Jensen
ph: 604-885-8889 FAX: 604-885-2369
(survey response received)

Architectural Clearinghouse,
5920-103 St. NW,
Edmonton, Alberta,
Canada, T6H 2H6
contact: Don Erdmann
ph: 403-436-1222 FAX: 403-436-9345

Tony's New and Used Building Materials,
823 12th Street,
New Westminster, British Columbia,
Canada

All Around Demolition,
4912 Still Creek Avenue,
Burnaby, British Columbia,
Canada, V5C 4E4
ph: 604-299-2967

Mike's New and Used,
3871 River Road West,
Delta, British Columbia,
Canada, V4K 3N2
contact: Mike Owen

Okanagan Salvage Centre,
1135 Steven's Road,
Kelowna, British Columbia,
Canada, V1Z 2S8
contact: Doug Brown/Dave Dean
ph: 250-769-0055
(survey response received)

Evergreen Specialties,
4122 St. Paul's Avenue,
North Vancouver, British Columbia,
Canada, V7N 1T5
contact: Bruce Lindsay
ph: 604-988-8574
(survey response received)

American Contacts (22)

American Salvage Inc.,
9200 Northwest 27th Avenue,
Miami, Florida,
USA, 33147
contact: Terrance Waldren
ph: 305-691-2455 FAX: 305-691-0001

Americo Inc.,
P.O. Box 7,
McMechen, West Virginia,
USA, 26040
contact: Karen Grubb
ph: 304-232-1333

Allied Demolition Inc.,
P.O. Box 566,
Commerce City, Colorado,
USA, 80037
contact: Russ Hawkins
ph: 303-289-3366 FAX: 303-289-3543

Art Forms Ltd.,
P.O. Box 100141,
Denver, Colorado,
USA, 80250
contact: Al Smith
ph: 303-871-8536 FAX: 303-871-9052
(survey response received)

Bring Recycling
P.O. Box 885,
Eugene, Oregon,
USA, 97440-0885
contact: Brian Fuller
ph: 541-746-3023 FAX: 541-726-9894
(survey response received)

Building Materials Bank,
169 Lewiston Road,
Grey, Maine,
USA
contact: Kathleen Scott
ph: 207-657-2957 FAX: 207-657-5910

Building Resources,
701 Armador Street,
San Francisco, California,
USA, 94124
contact: Matthew Levesque
ph: 415-285-7814

City of Boulder,
P.O. Box 791,
1300 Canyon Blvd.,
Boulder, Colorado
USA, 80302
contact: Kara Dinhoffer

Construction Closet,
3127 East Adams Street,
Tucson, Arizona,
USA, 85716-3611
contact: Don Strauch
ph: 520-322-9557 FAX: 520-322-5864
(survey response received)

D & M Wrecking Company,
250 South 4th Street,
Kalamazoo, Michigan,
USA, 49009
contact; Lisa Minott
ph: 616-375-1313 FAX: 616-375-2767

First Saturday Construction Salvage,
R#3, Box 405,
Soencer, Indiana,
USA, 47460
contact: Mark Gerberding
ph: 812-876-6347
(survey response received)

Garbage Reincarnation,
P.O. Box 1375,
Santa Rosa, California,
USA, 95402
contact: Pavitra Crimmel
ph: 707-584-8666 FAX: 707-896-3427

Home Repair Services,
1200 Jefferson SE,
Grand Rapids, Michigan,
USA, 49507
contact: Robert Laarman
ph: 616-241-2601 FAX: 616-241-5151
(survey response received)

HBRDS,
3415 15th Street, Suite 102,
Washington, DC,
USA, 20032
contact: Leona Redman
ph: 202-574-4542 FAX: 202-574-3236

Hudgins & Company,
P.O. Box 93364,
Atlanta, Georgia,
USA, 30377
ph: 404-527-4304

MK Ferguson of Oak Ridge Co.,
P.O. Box 2011,
Oak Ridge, Tennessee,
USA, 37831-2011
contact: Jack Hay
ph: 423-574-3578 FAX: 423-241-5236
(survey response received)

Mountain Lumber Company,
P.O. Box 289,
Ruckersville, Virginia,
USA, 22968
contact: John Williams
ph: 804-985-3646 FAX: 804-985-4105

Second Use Building Materials,
23529 63rd Avenue SE,
Woodinville, Washington,
USA, 98077
contact: Roy Hunter
ph: 206-402-0961

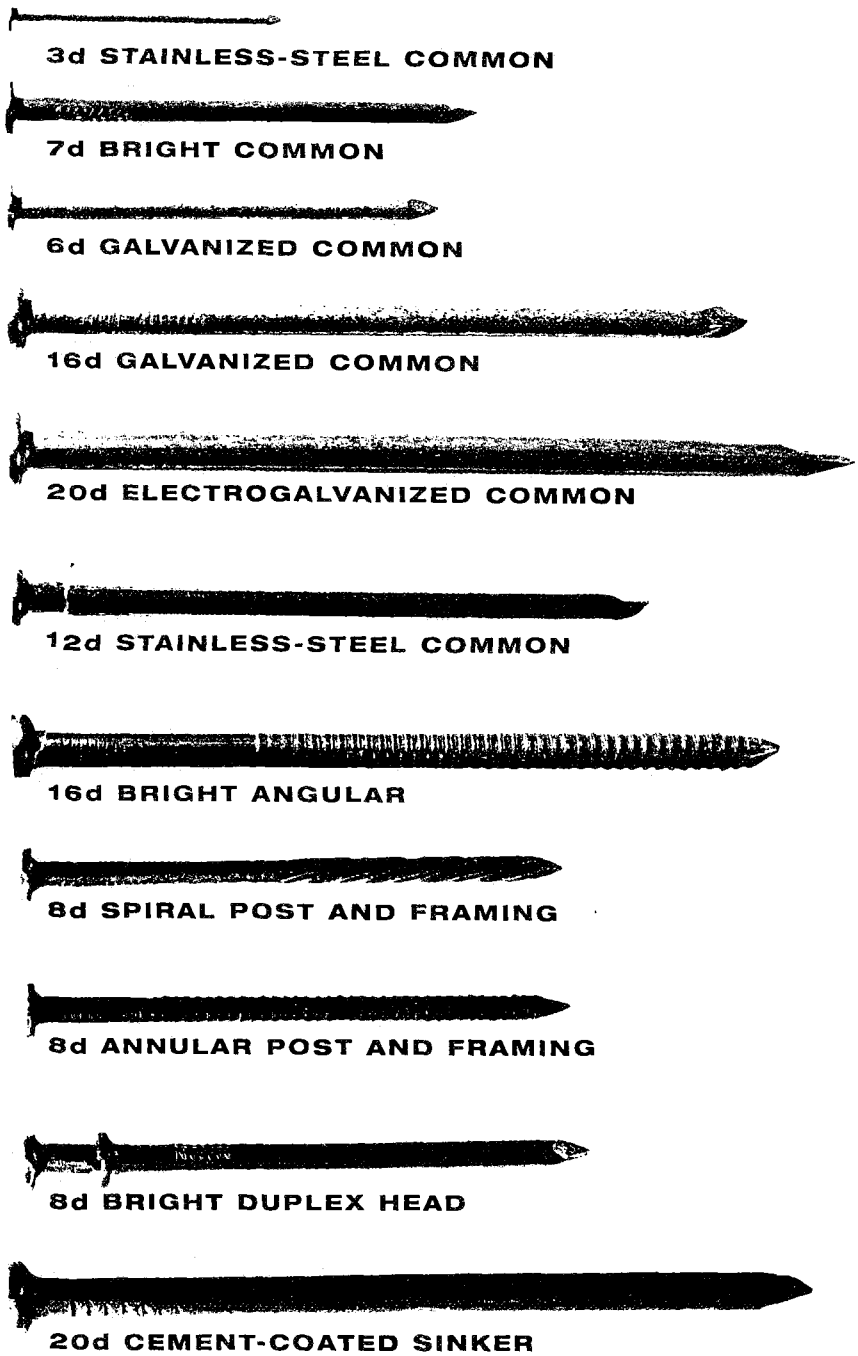
Terry, Ash, Simmons, Construction,
4419 West North Avenue,
Milwaukee, Wisconsin,
USA, 53212
contact: Herbert Simmons
ph: 414-265-0616

The Reuse Centre,
2216 East Lake Street,
Minneapolis, Minnesota,
USA, 55407
contact: Susan Gust
ph: 612-724-2608 FAX: 612-724-2288

Urban Ore Inc.,
6082 Raulston Avenue
Richmond, California,
USA, 94805
contact: Marylou VanDeventer
510-232-7724 FAX: 510-235-0198

Violette Used Brick Co. Inc.,
265 Meadow Road,
Farmington, Connecticut,
USA.
contact: Lance Violette

Appendix 4 - Fastener Listing



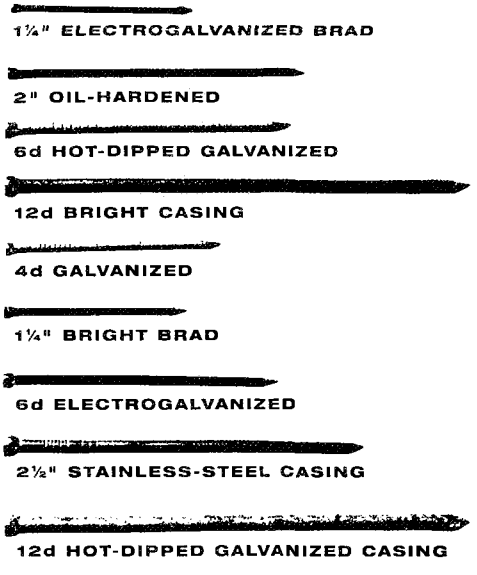
framing

These are the nails that make hammers ring as a house rises from foundation to ridge beam. Most framers rely on common nails, which are thick-headed and thick-shanked to withstand blows from 20-, 22- or even 28-ounce hammers. They also use cement-coated sinkers (some believe they go in easier and hold better) and unfinished 8d (2½-inch) nails. Ring-shanks provide maximum holding power and can speed construction where building codes permit two of them to replace three common nails. Galvanized or stainless-steel nails are used when there's risk of corrosion. Easily removed duplex or double-headed nails are popular for framing scaffolding.

This Old House

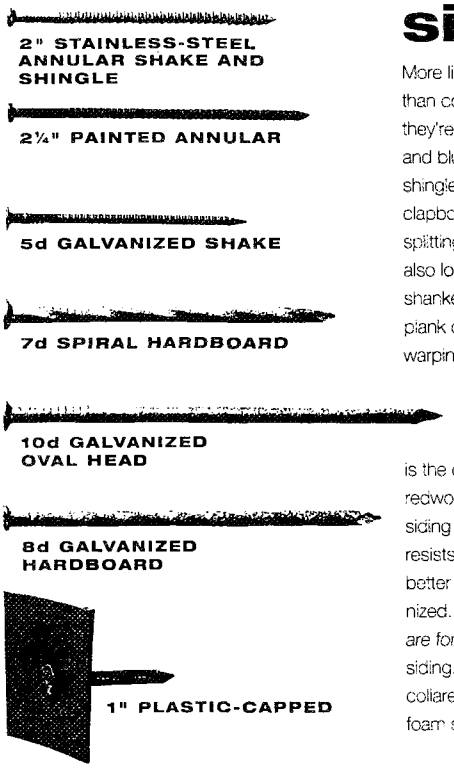
finish

Finish nails are among the lightweights of construction—and among the last driven—because their job is mainly fastening the moldings and trying to disappear. The vestigial heads are meant to be driven below the surface and puttied over. Tom Silva's tip: "If you try to drive them flush, you'll scar the wood. Drive them to head level, then sink them with a nailset." Casing nails are finish nails writ large. They're used for door and window frames and for exterior trim. Some are oil-hardened for use with hardwoods. Others are stainless or galvanized to inhibit rust. Bright or unfinished nails are for indoor use only. Smaller finish nails are called brads.



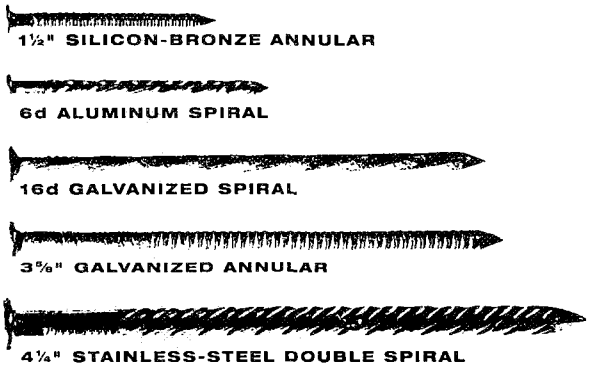
siding

More like box nails than commons, they're slender and blunt to keep shingles and clapboards from splitting. They're also long and ring-shanked to resist plank cupping and warping. Stainless is the choice for redwood and cedar siding because it resists corrosion better than galvanized. Spiral nails are for hardboard siding. Capped or collared nails anchor foam sheathing.



deck

Heavy double spirals are used to fasten framing, while lighter ring- and spiral-shank nails lock down planking. Rustproof stainless, bronze or tempered aluminum outperform galvanized. Tom Silva says, "Side-nailing planks to metal deck clips means you need never see any nail heads. And your deck will last longer."

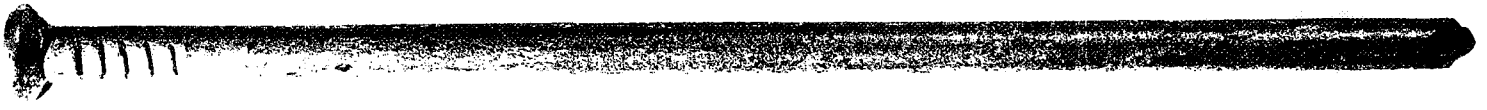


wrought

Blacksmiths hammered out these oldest of nails, used to armor doors. Square-sectioned and usually square-headed, some have diamond heads or large flat panheads the size of quarters.

spikes

These supernails, sometimes used by landscapers and timber framers, are 60d (6 inches) or longer. One monster is 135d (20/ inches); it has a shank / inches square and weighs 4.4 pounds.



roofing

1¾" GALVANIZED ANNULAR WITH SILICONE WASHER

1¼" COPPER SLATER'S

1¼" STAINLESS-STEEL ANNULAR

2" STAINLESS-STEEL ANNULAR WITH NEOPRENE WASHER

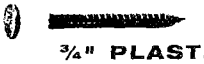
1" ELECTROGALVANIZED

1½" STAINLESS-STEEL SMOOTH SHANK

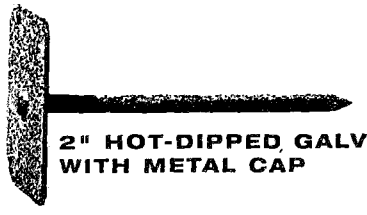
4" LEAD-HEAD

1¾" GALVANIZED WITH LEAD WASHER

8d GALVANIZED ASPHALT SHINGLE



¾" PLASTIC-CAPPED



2" HOT-DIPPED GALVANIZED WITH METAL CAP

These vary widely in style and design, but if you're lucky you'll never see them again after they're driven. Galvanized asphalt-shingle nails are short on length and life span because asphalt shingles are thin and themselves short-lived. Among galvanized nails, double hot-dipped is the antirust standard. Stainless outlasts all competitors, but on long-lived tile or slate roofs, copper is preferred because it is virtually corrosion-proof and easier to cut when making repairs. Lead-heads are extra long for driving through the high ribs of corrugated metal roofing, and the lead helps seal the hole. So do the lead and rubber washers or cushions on nails used on flat metal roofs or flashing. Capped nails have oversize plastic or metal washers to hold down roofing felt.

masonry

½" ELECTRO-GALVANIZED STUB

¾" GALVANIZED SMOOTH-SHANK STUB

1⅛" GALVANIZED SPIRAL-FLUTE STUB

1½" STRAIGHT FLUTE

2" SPIRAL FLUTE

All masonry nails are made of hardened steel for driving into "green" concrete, which hasn't set rock-hard. (In cured concrete, pilot holes must be drilled first.) A two-pound hand sledge is most often used. Masonry nails are brittle and can shatter, so wear goggles.

flooring

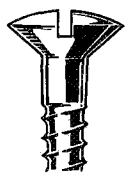
1¾" ANNULAR UNDERLAYMENT

2¼" OIL-HARDENED SPIRAL

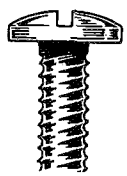
8d CUT NAIL

Ring-shanks pin down the underlayment, and spirals fasten the finish flooring when driven diagonally through the tongue (U.S. style) or the groove (French style). Cut nails are meant to be face-nailed through wide-plank country floors.

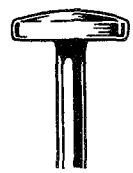
heads



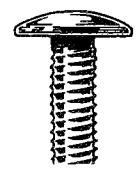
Oval
Used where appearance counts. Back bevel allows most of head to be countersunk.



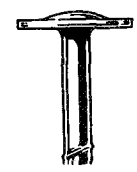
Round
Sits flush on surface. Used where countersinking is not practical or desired.



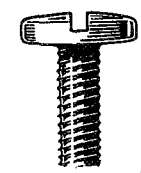
Pan
Wide head allows great clamping strength. Not very attractive, so usually used where not seen.



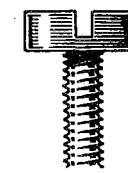
Truss
Similar to pan head, but lower profile makes it popular for furniture.



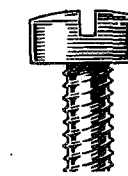
Integral washer
Wide head holds well even if shank hole is oversize to allow for adjustment.



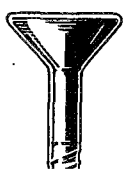
Binding
Thicker head than pan allows deeper slot. Often used in electrical work for good contact.



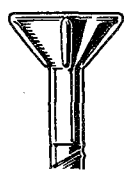
Cheese
Thick head allows deeper slot for increased driving power.



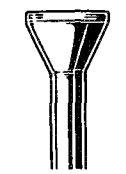
Fillister
Advantages of cheese head, but with slightly rounded top for better appearance.



Flat
Designed to be countersunk so top sits flush. For neat job, countersink must be predrilled.

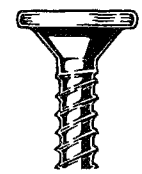


Flat with nibs
Ribs on back of head bore countersink, even in difficult materials like hardwoods.

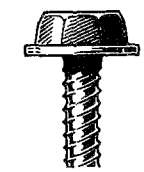


Trim head
Similar to finish nail but bigger. Used where large head would look ugly.

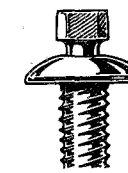
Bugle
Gentle curve on back allows head to sink itself into soft materials.



Wafer
Similar to bugle head, but wider and thicker. Good for soft materials.



Hexagonal
Wrench or driver grips entire head, allowing great torque. This one has built-in washer.

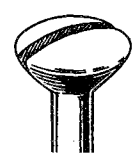


Break-off
Tamper resistant. Hex head is tightened with socket wrench, then snapped off.

Self-sealing
Built-in metal washer backed by neoprene layer seals against leaks.

drives

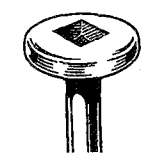
Every screw needs a way to be twisted in and, usually, out. Sometimes a wrench fits over the entire head. More often, the head has a recess into which a screwdriver can be fitted. Slotted heads came first but work worst because flat screwdrivers slip easily. Phillips drives were an improvement but still allow slippage. (In fact, they were designed to prevent overtightening of screws on aluminum aircraft.) Other designs give better control, sometimes in more ways than one: Tamper-resistant screws can't be removed without special screwdrivers that are often difficult to find.



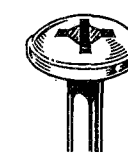
Slotted
Useful now mostly on antiques, where other options would look out of place.

Phillips
Cross-drive recess has tapered, flat-bottomed slots. Named for 1935 inventor, Henry M. Phillips.

Frearson
Lesser-known cross-drive, with less tapered slots. Also called Reed & Prince and "Type II."

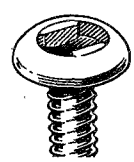


Square
Also known by name of its 1908 inventor, P.L. Robertson. Norm Abram's favorite drive.

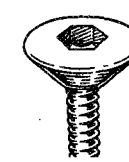


Combination
Accepts screwdrivers with either Phillips or square tips.

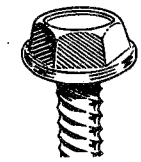
Torx
Sunburst recess has no taper. Popular in industry because drivers don't slip.



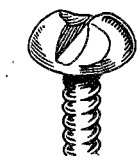
Clutch
Bow-tie recess is mostly found on mobile homes and in electric motors.



Hex recess
Found on headed and headless screws. Headless setscrews are adjusted with Allen wrenches.



Hexagonal
Wrench or driver grips entire head, allowing great torque.

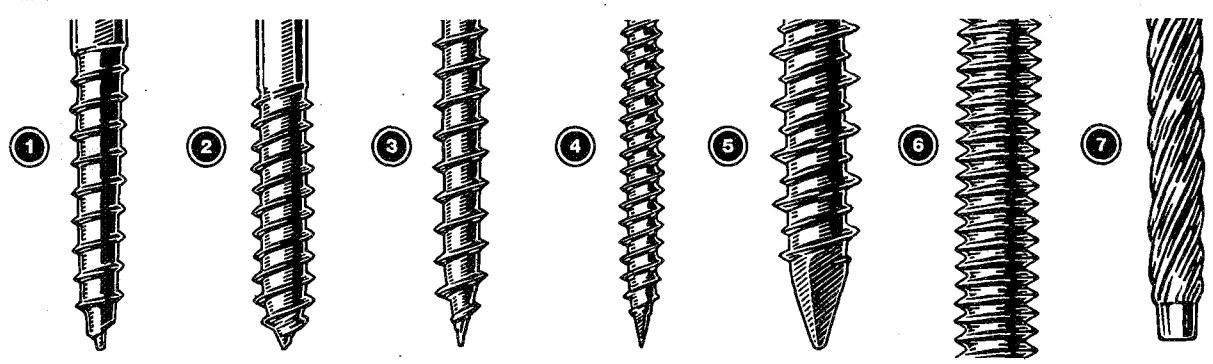


One-way
Tamper-resistant. Can be installed with regular screwdriver but removed only by special tool.

Pin-in-Head
Tamper-resistant design looks similar to Phillips drive, but pin blocks all but special tool.

Drilled spanner
Tamper-resistant. Can be used with magnetic drivers that grip the whole head.

threads



When choosing a thread, pay most attention to what works best in the underlying material, not what's being fastened to it. The goal is to maximize thread contact but minimize effort needed to turn the screw. **1 Cut thread** These relatively shallow threads, found on traditional wood screws, are cut on a lathe. They work well only if proper pilot holes have been drilled. **2 Rolled thread (fine)** These threads are pressed into the blank, so they extend beyond the shank. *No-waste manufacturing method actually creates stronger screws* because metal fibers aren't cut. Sharp, closely spaced threads are especially good for attaching things to thin metal because they allow more threads to be in contact. Also useful in hardwoods. **3 Coarse thread** Deep, widely spaced threads are especially good for holding mushy fibers such as those in softwood and particleboard. Wide spacing allows screw to drive in fast. This example has a single thread, or lead. **4 Double lead** Parallel threads work up the shank. These give the holding power of tightly spaced threads but require only half as many turns to be sunk home. For wood or metal, depending on depth and spacing of thread. **5 Hi-Lo thread** In this patented double-thread design, one thread is deeper than the other for easier driving and better holding. Common on concrete screws. **6 Machine screw** Fine, closely spaced threads hold better than other options for fastening into metal. But machine screws require a tapped hole (or a nut) because they cannot form mating threads. **7 Drive screw** Steep angle of threads allows fast insertion, usually with a hammer. Some have slots for easy removal; smooth-headed versions can only be drilled out.