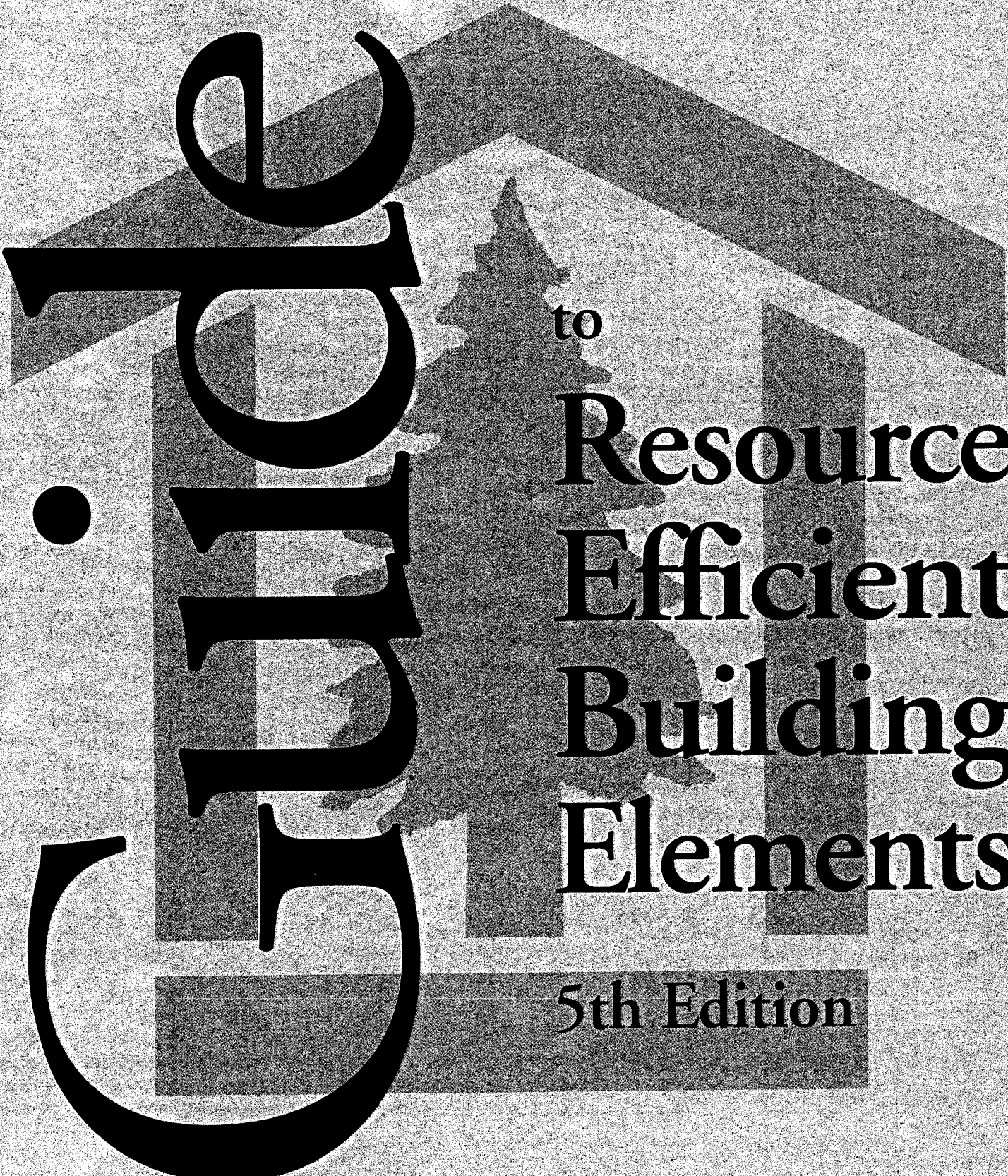


500-0838
702315
29428 PDF



Guide

to

Resource Efficient Building Elements

5th Edition

Center for Resourceful Building Technology

Center for Resourceful Building Technology



Fostering Efficient Resource Use

The Center for Resourceful Building Technology (CRET), founded in 1996, is a non-profit organization whose purpose is to educate the public on issues relating to housing and the environment, with particular emphasis on innovative building materials and technologies which place less stress on regional and global ecosystems.

Guide **to** **Resource Efficient Building Elements**

5th Edition
1995

Compiled and written by: Tracy Mumma
With: Laura Armstrong and Will Rex

Illustrations by: Kate Mullen



P.O. Box 100
Missoula, MT 59806
(406) 549-7678

Copyright© 1991, 1992, 1993, 1994, 1995 by:
the Center for Resourceful Building Technology.
No portion of this book may be reproduced without the express written consent of CRBT.
CRBT was incorporated as a 501(c) (3) non-profit corporation in July of 1993.

Adapted from a design by Arbor Vitae.

For additional copies of this Guide, contact CRBT. Quantity discounts are available.

Cover printed on 100% post-consumer waste recycled paper.
Interior printed on 20% post-consumer waste recycled paper.

Acknowledgments

CRBT wishes to acknowledge the support provided by South Wall Builders throughout the past five years, without which this endeavor could not have survived.

The writers and researchers at CRBT also wish to acknowledge the contributions of those who designed and compiled earlier editions of this guide: Steve Loken, Jim Coefield, Walter Spurling, Carol Price, Steve Mietz, and Stephanie Wyse.

Many people helped with the 5th edition, including Dawn Montanye, Steve Loken, Julee Taylor, Rod Miner and Tara Keairnes.

This fifth edition publication is made possible by a grant from the International Ecodevelopment Institute and Kinoshiro Taisetsu (KST), to whom we are deeply grateful.

Thank you also to our Board of Directors for your commitment of time and energy.

CRBT is a 501(c)(3) non-profit organization. Your tax-deductible donation will help us to continue our research, education and demonstration activities

Contents

Foreword	2
Introduction	3
Materials	
Foundations	7
Blocks	9
Form Systems	11
Foamed and Cellular Concretes	13
Fly Ash Suppliers for Concrete	14
Framing	16
Engineered Wood Framing	18
Panel Systems	22
Structural Insulated Panels	24
Honeycomb Panel and Core	30
Sheathing & Wallboard	31
Roofing	35
Exterior Siding & Trim	41
Insulation	45
Ventilation Baffles	47
Cellulose Insulation	47
Mineral Wool Insulation	49
Fiberglass Insulation	49
Foam Insulation	50
Other Insulation Products	51
Windows & Doors	53
Interior Finishes	57
Floor Coverings	60
Jute, Cork, Sisal, Coir & Linoleum	61
Ceramic Tile	61
Carpet	62
Carpet Pad and Floor Underlayment	62
Other Floorings	63
Salvaged Materials	66
Landscaping	72
Exterior Walkways	74
Recycled Plastic Lumber	75
Other	77
Miscellaneous	79
Resource Efficient Building	
Job-Site Recycling	82
Designing for Resource Efficiency	86
Space Efficiency	86
Energy Efficiency	87
Cost Efficiency	88
Summary of Resource Efficient Design Criteria	88
Indigenous Resources for Housing	90
Managing Resources	94
Forests and Timber	94
Agricultural Resources	97
Mineral Resources	98
Waste Resources	99
Energy	100
Additional Information Sources	102
ReCRAFT 90	104
CRBT Services	106
Manufacturer & Product Index	108

Foreword



Resource efficient building is a complex issue that must take into account the natural resources used to make building materials, as well as the energy required to process, transport and install these materials in structures. Building in a resource efficient manner involves not only materials, but also methods of design and construction that use less material, result in less waste, and create durable, functional homes, offices, factories and stores. The most resource efficient buildings are also appropriate for their locations, designed for a particular climate and built from regionally available materials.

The Center for Resourceful Building Technology has worked for the past five years to identify and promote the most resource efficient building technologies now available, in order to encourage stewardship of valuable natural resources. Our study has provided a palette of options from which appropriate building materials and methods can be selected. The Fifth Edition of the Guide to Resource Efficient Building Elements is the outgrowth of this study. The Guide is a tool that can be used to foster the use of regionally appropriate building materials and prevent waste. In this year's production of the Fifth Edition we are pleased to acknowledge the funding assistance of the International Ecodevelopment Institute and Kinoshiro Taisetsu (KST).

KST, under the leadership of Akira Yamaguchi, is an innovative home building company in Hokkaido, Japan. The KST Natural Housing System created a bioregionally adapted total system of natural design, materials and construction, developed from four generations of Yamaguchi family experience with natural resource products. KST has developed its own methods of resource efficient construction to realize the "3R's" through home building. KST, through its Mandala philosophy, honors Japanese experiences and traditions of thousands of years in Hokkaido. These building methods have been vastly technologically modernized, and emphasize the use of natural wood. The design of KST houses is the product of mankind and nature, and embodies the response of KST designers to the certainty of heavy snow and the likelihood of earthquakes as much as to the needs of the inhabitants. Through its practice of bioregionalism, and research development based on a vertical marketing management system, KST has been striving for 45 years to be a company that is kind to nature, humankind, and the community. Mr. Yamaguchi's interest in furthering the cause of sustainable building also led him to form the International Ecodevelopment Institute, a not-for-profit organization dedicated to the advancement of sustainable technologies and ecological planning in northern bioregions.

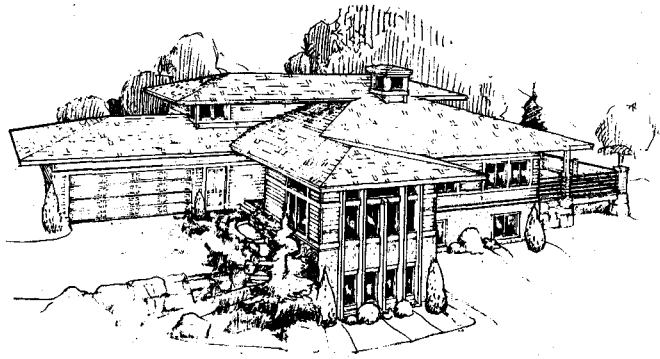
Throughout this book, you will learn more about a number of different technological approaches to resource efficient building. CRBT is cooperating with the most innovative and advanced building practitioners, both within the United States and internationally, to define and promote resource efficient building. An increasing number of people are involved in work in this field, and are finding new ways to implement the strategy of "Reduce, Reuse, Recycle" in building construction. Although our ideas and actions may differ, our concern for the environment is shared.

The International Ecodevelopment Institute and KST share our environmental concerns, and their contribution to this publication demonstrates their commitment. CRBT is grateful for the support of the International Ecodevelopment Institute and KST in the production of this publication. We hope that this book will encourage other organizations and individuals to join in our mutual efforts to practice resource efficient construction.

Steve Loken
President, CRBT

Introduction

Resources for Building the Future



A Consumption Portrait

Every new building or remodeling job has an environmental impact. Both construction and continued operation of buildings require tremendous quantities of material resources and energy. Throughout the history of civilization, the size and number of buildings have grown virtually unchecked, fueled by seemingly plentiful natural resources and cheap energy supplies. Today the situation is beginning to change. The housing demand of a rapidly-increasing world population is taxing the planet's natural resource base, and the materials traditionally used for building are becoming less accessible and more expensive. The same is true of the non-renewable energy supplies that have powered construction for the past hundred years.

Meanwhile some of the costs of historical energy and resource consumption are becoming apparent. Less than 3% of the virgin old growth forest in the United States remains uncut, and global forest cover is disappearing at an unprecedented rate. Mine sites, processing areas and dumps across the United States have been declared Superfund sites; locations contaminated with toxins that require extensive remediation efforts. In many locations air quality is declining, and global concentrations of atmospheric carbon dioxide are rising. At the same time, builders are experiencing rising materials and disposal costs, and are concerned about the quality of wood available for building.

The authors of this book, the staff of the Center for Resourceful Building Technology, believe that people can begin to address these problems by examining and changing conventional patterns of building. By designing buildings in a manner that minimizes environmental impact, and constructing them from components that make an efficient use of resources, the building industry and its customers can take immediate and practical steps to provide shelter for the next century, while preserving the environment and extending the resource base into the future.

For the past five years, the non-profit Center for Resourceful Building Technology (CRBT) has worked to educate the public on a variety of issues relating to housing and the environment, with particular emphasis on innovative building materials and technologies which place less stress on regional and global ecosystems.

This publication is an outgrowth of that effort, and is a continuing project of CRBT. Research is ongoing, and a new edition of this Guide is issued yearly to provide current information on the rapidly-evolving field of building material technology.

About this book

The first section of this book contains contact information for manufacturers of resource efficient and recycled building materials. Chapters are arranged by building component, and each chapter opens with a discussion of the state of available technology. Chapters also contain contact information for the national manufacturers of recycled and resource efficient products, along with a brief description of the products

and their availability. Readers can contact the listed manufacturer to locate distributors and obtain pricing information for their individual locations.

Readers who wish to learn more about resource efficient building design, whole-building recycling, alternative methods of building, resource management and waste reduction can find more information and additional references in the second section of the book. Readers who are interested in further research can contact one of the authors or organizations in the "Additional Information" section, or CRBT.

Every effort is made to ensure that the information included in this book is accurate and timely. Due to the nature of the industry, however, change is rapid and continual. If you find outdated information please alert us so that we can correct the problem and more effectively serve all the environmentally-aware builders, homeowners, manufacturers and designers who rely on this reference.

Determining Resource Efficiency of Building Materials

The products listed in this book have been determined to be more resource efficient than conventional building materials. How can the resource efficiency of a product be assessed? The Center for Resourceful Building Technology has developed the Resource Efficiency Equation to provide criteria by which to evaluate building materials. The criteria of the equation have been used to assess the products included in this book. We also include the equation itself, so that readers can use it to determine relative resource efficiency of products in a particular application, or can apply it to determine for themselves the resource efficiency of products not included here. Decisionmakers must set priorities, and recognize that the most resource efficient products may not be the most practical or cost effective.

A picture of the true resource efficiency of a product emerges only from a comprehensive assessment of the product's environmental impact. The criteria of the equation allow the cumulative total consumption caused by a product to be weighed relative to other products. This method prevents decisionmakers from being misled by claims of resource efficiency or "greenness" based upon fulfillment of a single criterion. Choice of a building material should include a consideration of the relative resource efficiency of the product's manufacture and use. Consequently, resource efficiency determinations consider the predicted very-long-term availability of all inputs to a product. This long-term availability is estimated by considering present practice and assumed advances in acquisition, efficiency and usage patterns.

Most building materials meet some of the criteria for resource efficiency but fall short in other categories. Only a few outstanding products have the potential to match closely every one of the criteria for resource efficiency. These criteria, then, represent both a goal to strive towards and a measure of the relative merits of currently available materials. By applying these criteria equally to all products in a class, the most resource efficient products currently available can be identified.

The Resource Efficiency Equation

Resource efficient building materials:

1. Make efficient use of limited natural resources

- + Preserve the resources, energy and labor invested in a product through longevity in application, and/or potential for reuse
- + Extend the resource base by using less material to achieve the same or better performance than other component configurations
- + Substitute a more-abundant for a less-abundant resource, and/or a renewable for a non-renewable material, and/or a recyclable for a non-recyclable material

- + Reduce cumulative environmental impacts of resource consumption:
 - air pollution and climate change and
 - water pollution and watershed damage and
 - habitat loss and loss of biodiversity

2. Demonstrate recyclability and/or renewability

- + Are made of reused or recycled constituents
- + Are readily recyclable through existing technologies and collection programs or are biodegradable
- + Are recoverable for recycling or reuse from their applied state (dismantleable)

3. Reduce energy use of buildings

- + Require comparatively low total lifetime energy inputs, including energy of:
 - Extraction and related land and water reclamation and
 - Processing and related pollution abatement and
 - Transportation and
 - Installation and
 - Lifetime maintenance and
 - Material recovery and recycling
- + Utilize a high proportion of lifetime energy inputs from renewable sources
- + Reduce the amount of operating energy a building will require

In addition, CRBT has identified a number of implementation criteria to consider for materials, as a check that they are not only resource efficient, but also practical. The most effective resource efficient materials:

1. Are monetarily affordable
2. Require labor time and skill level for installation comparable to or less than conventional products
3. Complement and substitute readily for existing building materials in design
4. Have an appearance acceptable to the consumer
5. Do not represent a health concern for installers or building occupants

The Challenge of Imperfect Information

The materials included in this Guide have been evaluated by the building technology staff of the Center for Resourceful Building Technology using the criteria listed above. Some materials meet the proposed criteria better than others. We have chosen to include a material option for each major construction application, even though in some cases no material is an especially resource efficient choice. In most cases we provide a variety of options for each application, recognizing that no two situations are exactly alike, and the best product choice for one building project is not necessarily the best choice for another.

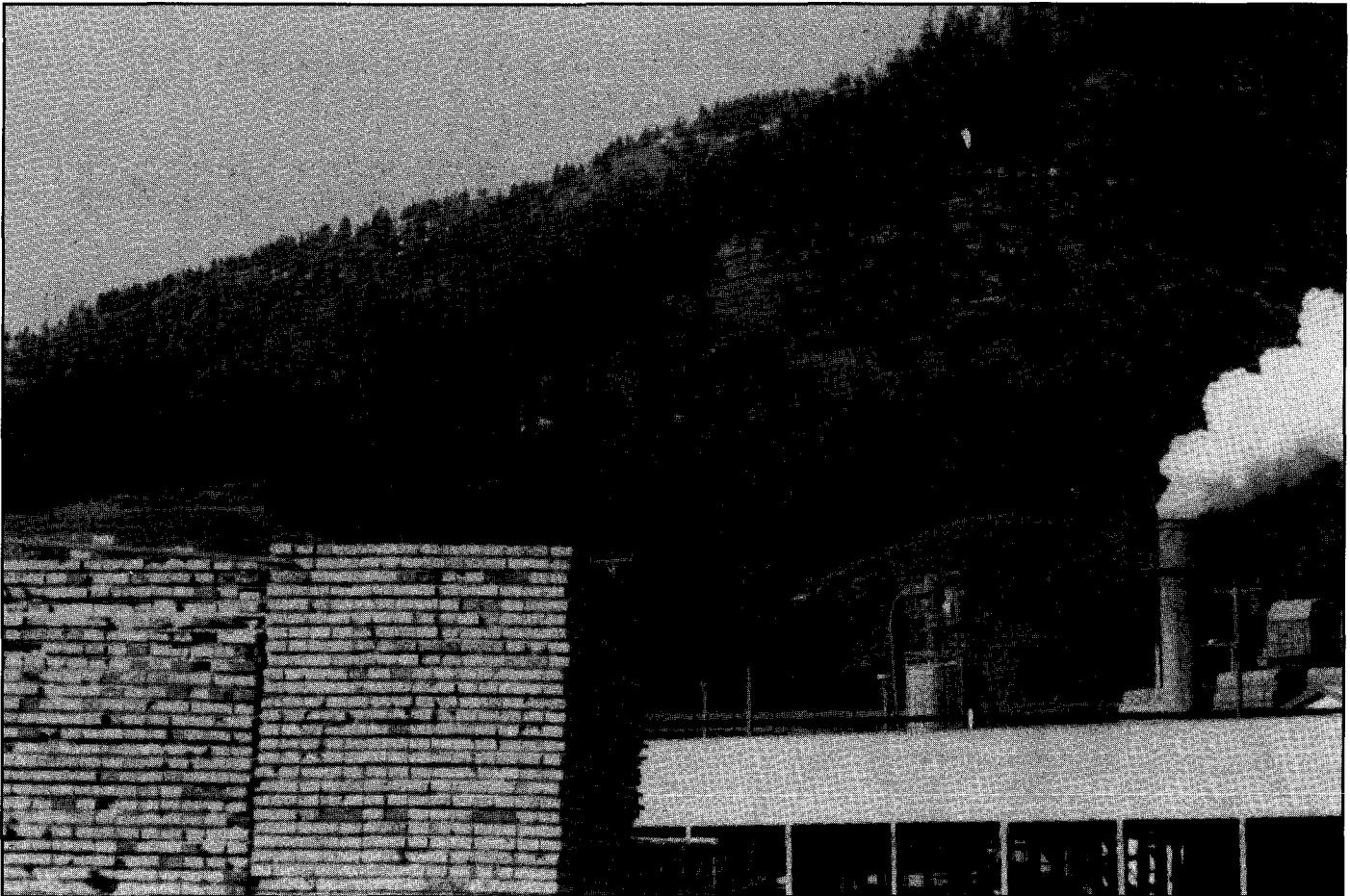
Evaluating building materials for resource efficiency is a complex and challenging endeavor. Sometimes not even the product manufacturer understands the full impact of resource extraction involved in making a product, and the embodied energy of materials is still a little-known quantification. Some materials and manufacturing processes are better understood than others, since highly complex processes require a long-view analysis for which very little information is available. The problem is compounded by the fact that the science of life-cycle analysis is still in its infancy, but already the subject of a great deal of controversy.

Given the present level of information on product manufacture and life-cycle, it may not be possible to evaluate the performance of a product relative to all of the criteria in the Resource Efficiency Equation.

Even so, this list of criteria encourages compilation of all available information; a process that reveals where the greatest gaps in current knowledge lie. Decisions are made based upon the best information available to us, and new information sometimes changes the result of previous evaluations. Synthesizing present information and uncovering areas for further research are important steps toward defining and identifying truly resource efficient building materials.

Reader Invitation

The Center for Resourceful Building Technology invites you to participate in resource efficient building by learning more about design, materials, and construction practices that promote resource preservation and prevent waste, and by implementing these ideas in your own building projects. We welcome comments, suggestions, and information on new building products. Please join us in fostering efficient resource use.

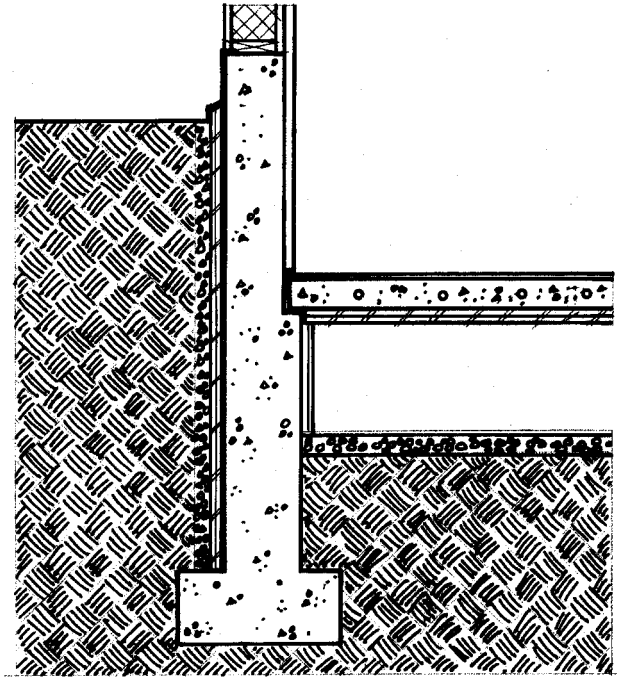


Foundations

Conventional American foundations use large amounts of concrete to achieve stability, strength, and weather and pest resistance. In addition to sand and gravel, typical concrete contains about 15% portland cement, which is very energy intensive to produce. To derive this energy, kilns that cook limestone, silica and clay to produce cement are burning increasing amounts of hazardous wastes or tires for fuel. According to the American Institute of Architects, fuels burned in kilns during the manufacture of cement produce approximately 8% of all carbon dioxide emissions created worldwide. Meanwhile, the Scrap Tire Management Council estimates that as many as 100 million tires per year could be burned in kilns by 1997. This is equivalent to forty percent of present annual U.S. tire production, although it is estimated that a national stockpile of perhaps two billion worn out tires exists.

The average American home uses 42 cubic yards of concrete in its construction. The demand for full basements or deep footings drives this figure higher for many homes. Consequently the foundation is a prime area for adopting building methods that reduce total material usage or substitute a more resource efficient material for portland cement. There are a number of options for reducing the amount of concrete used in foundations. A monolithic slab foundation or shallow insulated foundation can minimize the need for concrete because foundation footings need only be 12" deep in most cases. Slabs eliminate the need for floor framing material, as well. Insulated shallow foundations prevent frost heaving beneath heated buildings by capturing heat from the building and the earth that prevents the soil underneath the structure from freezing. Canadian thin wall technology, utilizing poured concrete walls that are 6" thick instead of the standard 8", is another means of reducing the total amount of concrete used in a foundation.

In addition, foundation material requirements can be lessened by using lightweight concrete, hollow cementitious blocks, or concrete-filled foam blocks below grade. These products improve the thermal efficiency of the foundation, and most can also be used to construct above-grade walls. The first section of this chapter lists concrete block systems. Depending on the system, the blocks may be filled with insulative inserts, concrete, or site-blown foam insulation. A few concrete block products contain expanded polystyrene pellets or waste wood chips to reduce the total concrete used and improve insulative value. Most of these technologies have well-understood engineering specifications and are readily approved by building code officials.



The average American home uses 42 cubic yards of concrete in its construction, due to the demand for full basements or deep footings.

The foundation is a prime area for adopting methods that reduce total material usage or substitute of a more resource efficient material for concrete.

The second section of this chapter lists systems that employ lightweight interlocking foam blocks or foam sheets as forms. In most of these systems rebar is laid in place in hollow block cores, and concrete is poured into the cores to create an insulated concrete lattice wall. The blocks come in different sizes and styles, depending on the system, and can be used for foundations or above-grade walls. Both form systems and block inserts made from expanded or extruded polystyrene provide dramatically higher thermal efficiencies than a solid concrete foundation or wall, though R-value may vary greatly from system to system. This is at least partially due to the fact that there are several different methods of measuring and calculating R-value, and the Federal Trade Commission has no standard method requirement that applies to wall systems.

Permanent foam formworks are derived from fossil fuel, and foam insulations require a great deal of energy to manufacture. The composite formed by the foam and concrete fill could be difficult to recycle when the building is demolished or remodeled, but might be reused in place. These considerations should be part of the decision to use an insulated formwork system.

In any foundation using ready-mix concrete, one resource that can be put to good use is fly ash from coal-fired power plants. The



Electric Power Research Institute reports that over 75 million tons of fly ash are produced in this country each year. In standard practice this fly ash can be used as a replacement for 15% to 35% of the cement in the concrete mix by weight, depending on the type of fly ash and the application. Results of preliminary experiments demonstrate that fly ash may be successfully substituted for an even greater proportion of the cement, up to 100%. Fly ash can also provide part of the fine aggregate needed in the concrete. Fly ash adds strength and durability to the final concrete product, and reduces materials costs. Concrete containing fly ash cures more slowly than traditional concrete but is easy to work with and provides a slightly smoother finish. Coal fly ash has routinely been used in concrete since the 1960s, and recent studies show that wood fly ash also shows promise as a cement substitute. Fly ash suppliers are listed in the last section of this chapter.

Autoclaved cellular concrete (ACC) technology has great potential for reducing the amount of concrete used in block or panels, while increasing the thermal resistance of an 8-inch wall to as much as five times that of concrete alone. In ACC, small amounts of aluminum powder are added to a standard cement mix, or a mix containing fly ash. Hydrogen bubbles produced by chemical reaction expand the mass, creating a lightweight concrete. Concrete blocks are then steam cured to stabilize the cellular structure. This concrete provides a high strength-to-weight ratio and can be worked with ordinary tools. The ACC technology has been utilized in Europe for years, and is gradually becoming more available in the United States. Autoclaved cellular concrete and other types of foamed concrete products are listed in the third section of the chapter.

Blocks

Advanced Concrete Technologies Inc.

67 South Bedford Street

Burlington, MA 01803

Ph: (617) 229-5828

Fax: (617) 272-0558

Lightweight building system of stackable wall forms filled with reinforced concrete. Forms consist of wood fiber (chips approx. 1" long) and portland cement.

Applications:

The wood/cement blocks are dry-stacked (four courses at a time) and filled with concrete to form a structural wall.

Sizes:

Blocks are 9" wide, 12" high and 36" long.

Fire rating:

3-4 hour fire rating depending on wall design.

R-value:

From R-11 to R-19 depending on wall thickness.

Comments:

These wood/cement forms weigh 36 pounds per cubic foot and are resistant to frost. Interior and exterior finishes can be nailed directly to the wall face. ACT Inc. also provides equipment and technical support for establishing new production facilities.

Durisol Materials Limited

95 Frid St.

Hamilton, ON L8P 4M3

(905) 521-0999

Blocks made of portland cement containing mineralized wood particles, that stack together to act as forms for poured-in-place reinforced concrete load-bearing walls.

Applications:

Durisol makes wall and floor forms for low and high rise buildings, as well as precast roof panels.

Sizes:

Standard Durisol blocks are 300mm x 300mm x 20, 25 or 30cm. Corner blocks and other special forms available.

Fire rating:

Wall system has fire rating above four hours.

R-value:

R-value of the blocks is 1.4-1.45. An

insulative insert raises the value to 2.22-3.32.

Comments:

Blocks contain 78% recycled materials. The softwood aggregate is a by-product of the lumber industry, plus recycled waste wood. Blocks have freeze/thaw resistance.

Ener-Grid

6421 Box Springs Blvd.

Riverside, CA 92507

(909) 653-3346

Construction elements consisting of a mix of cement and recycled post-consumer styrene pellets. These 12" long block/beams are set in place with steel rods through the center cavities and then filled with concrete to create strong, fire-resistant walls. Blocks contain recycled Styrofoam. Scrap can potentially be recycled into future blocks.

Applications:

Can be built in many shapes, such as curved walls or bay windows, and can be cut out to form arched shapes and passages, with no form work necessary. Approved by ICBO for one and two-story structures in the U.S.

Sizes:

An average beam measures 16" x 14" x 12" long.

Fire Rating:

3 hours plus.

R-value:

R-30-33

Electrical wiring:

Not specified.

Comments:

Any type of finish such as paints, plasters, stucco, tile, and gypsum board, can be applied to the block surface.

Texas FASWALL

5025 Gessner, Suite C

Houston, TX 77041

(713) 466-5999

-or-

Midwest FASWALL

404 N. Forrest Ave.

Ottumwa, IA

(515) 682-1212

Wall system consisting of wood/concrete composite blocks that are stacked dry and filled with poured concrete to create exterior walls and foundations.

Applications:

Designed for load bearing and non-load bearing walls. After dry stacking, any required reinforcing steel is placed in the wall form cores before they are filled with concrete. May also be used for foundations, basements and work below grade.

Sizes:

Blocks are 12" x 12" x 9" or 12" wide.

Fire Rating:

The finished wall has a 4-hour rating.

R-value:

With 3" foam insert 12" wall is R-24.

Electrical wiring:

Surface grooves and outlet holes may be cut or drilled using a router. The wall form surface has sufficient depth to receive outlet boxes.

Comments:

This product mixes wood chips from old pallets with cement to create a lightweight yet strong and durable building material. FASWALL blocks require no mortar or adhesive for their joints. The system is resistant against rot, wood decay and frost damage. One cubic foot of FASWALL wood concrete weighs 36 pounds, and may be sawed, nailed and glued with standard carpenter's tools. The finished walls exhibit a high grade of elasticity in compressive, bending and tensile strength.

Insulated Masonry Systems Inc.

7234 East Shoeman Lane, Suite 1

Scottsdale, AZ 85251

(602) 970-0711

The IMSI Wall Block System combines a concrete block with expanded polystyrene (EPS) insulation inserts to create an insulative masonry wall.

Applications:

Stem walls and foundation walls.

Sizes:

Blocks are available in two sizes; 8" x 8" x 16" and 12" x 8" x 16".

Fire Rating:

2 to 4 hour ratings.

R-value:

8" width is R-19, 12" width is R-30.

Electrical Wiring:

Blocks have chases every 8" on the inside and outside faces.

Comments:

Termite and vermin proof, sound deadening, exterior and interior waterproof masonry surfaces and no infiltration of air or moisture.

Sparfil International Inc.

P.O. Box 270336
Tampa, FL 33668
(813) 963-3794

-or-

376 Watline Ave.

Mississauga, ON L4Z 1X2 Can.
(905) 507-1163

Sparfil® Wall System consisting of insulated cellular concrete blocks and a surface bonding cement. The blocks are a mixture of expanded polystyrene (EPS) beads (60% by volume), portland cement, sand, and chemical additives.

Applications:

Commercial and residential. The surface bonding cement is mixed with water and applied to both sides of dry-stacked Sparfil block walls to create a hard, durable finish that is airtight and waterproof.

Sizes:

Available in widths from 4" to 12" in 2 inch increments.

Fire Rating:

Up to 4 hour resistance. According to tests conducted by the U.S. Testing Company, the products of combustion from EPS are less toxic than those produced from an equal volume of wood.

R-value:

Up to R-33, depending on thickness.

Electrical wiring:

Not specified.

Comments:

finished wall provides energy efficiency with a slow thermal lag. The blocks are also available with their voids pre-filled with Rigid EPS inserts for maximum R-values. No need for vapor barrier. Provides sound insulation. Sparfil also uses fly-ash in the blocks.

Superior Walls of America, Ltd.

P.O. Box 427
Ephrata, PA 17522
(717) 626-WALL

Manufactured panel concrete stud walls with 7 1/2" deep insulation cavity.

Applications:

Used atop a monolithic footing, in conjunction with a reinforced bond beam to form insulated foundations.

Sizes:

Panels are custom designed to blueprints.

R-value:

R-5. Additional site-installed insulation can bring the wall to R-24.

Comments:

This wall system allows for a foundation that uses significantly less concrete than a poured-in-place foundation. However, the cost and energy of transporting the completed panels makes their use feasible only in parts of the Northeastern U.S. located near manufacturing facilities.

Superlite Block

4150 W. Turney
Phoenix, AZ 85019
(800) 366-7877,
(602) 352-3500

Integra® block wall system consisting of masonry units with a reduced center web, that may be open on both ends. Once constructed, walls are insulated with blown-in polyurethane foam.

Applications:

For load bearing and non-load bearing walls. Walls are post-tension vertically reinforced.

Sizes:

Blocks are available in 6" x 8" x 16", usually used for residential construction, and 8" x 8" x 16", for commercial uses. Blocks are available in architectural finishes including a variety of colors and textures.

Fire Rating:

6" blocks have a 1 hour rating;
8" blocks have a 2 hour rating.

R-value:

Measured by parallel path method with a temperature differential equation, 6" walls are R-23 and 8" walls are R-28.

Comments:

The Integra system seeks to minimize thermal bridging in a masonry block wall by using an H-shaped block with a reduced center web, and by avoiding rebar reinforcement. This increases the thermal efficiency of the wall.

ThermaLock Products, Inc.

162 Sweeney Street
North Tonawanda, NY 14120
Ph: (716) 695-6000
Fax: (716) 695-6685

Concrete masonry blocks comprised of two matching sides interlocked

with an insulative, serpentine shaped EPS insert which replaces the concrete webs found in conventional blocks. The inserts contain up to 30% recycled polystyrene.

Applications:

For masonry walls. The inserts are installed at the manufacturer and the assembled blocks come ready to use.

Sizes:

Available in 8", 10" and 12" thicknesses.

Fire rating:

An 8" ThermaLock™ Wall System has a 2 hour rating.

R-value:

8" = 15; 10" = 19; 12" = 24

Electrical wiring:

Not specified.

Comments:

The EPS inserts extend 3/8" from the top of the blocks and 3/16" from the sides so that after installation the system provides vertical and horizontal mortar joint insulation. The inserts are non-toxic, contain no formaldehyde, and do not use hydrofluorides in their production. ThermaLock™ walls exceed code requirements for load-bearing walls.

West Materials, Inc.

101 West Burnsville Parkway
Burnsville, MN 55337
Ph: (612)890-3152

Fax: (612) 890-9341

EnerBlock™ molded polystyrene inserts insulate the cores of concrete masonry units and between units horizontally and vertically.

Applications:

For use with standard block, or as a system including block.

Sizes:

In 1 1/4", 2", 2 1/2", or 4" inserts for use with 8", 10", or 12" masonry units.

Fire rating:

Flame spread 15, smoke developed 45-125.

R-value:

Varies with width of thermal barrier and block size.

Comments:

No CFC in manufacture. Closed cells contain only air. Units accept grouted reinforcing steel vertically and horizontally without losing continuity of insulation. Currently available in the upper Midwest.

Form Systems

3-10 Insulated Forms, L.P.

P.O. Box 46790
Omaha, NE 68128
(402) 592-7077

3-10 Polysteel Form® is a system of expanded polystyrene forms that interlock to create a continuous formwork. The forms become a permanent part of the complete building system providing insulative and sound deadening values.

Applications:

Foundation and above grade exterior and interior walls

Sizes:

8" high x 48" long x 10" wide. This produces a 6" reinforced concrete wall.

R-value:

R-22+

Comments:

These forms are lightweight, easy to handle, quick to assemble, fire resistant, and can be installed using unskilled labor. The 3-10 Polysteel Form uses 25-50% less concrete to provide a 50% stronger, fully insulated wall. No CFCs (chlorofluorocarbons) were used in the manufacture of this form. It also comes with an energy savings warranty that ensures that the total energy consumption to heat and cool the finished living area of a 3-10 Insulated Form home will be at least 70% less than the total energy

consumption to heat and cool a similar size traditionally constructed home.

AAB Building System

23314 Crenshaw Blvd., Suite 7
Torrance, CA 90505
Ph: (310) 539-2221
Fax: (310) 539-8872

Expanded polystyrene foam permanent formwork.

Applications:

For reinforced concrete walls, both below and above grade.

Sizes:

Standard unit 48" long, 11 1/2" wide and 16 3/4" high. Seven specialty units available for corners, ends, etc.

R-value:

R-26

Comments:

AAB blocks have a three hour fire rating when filled with concrete. The blocks include vapor/air barrier and strapping 8" on center for interior and exterior finishing.

AFM® Corporation

P.O. Box 246
Excelsior, MN 55331-0246
(800) 255-0176
(612) 474-0809

Diamond Snap-Form™ expanded polystyrene insulated concrete

forming system, using Perform Guard™ insulation with Diamond Snap-Tie™ every 12".

Applications:

Above- or below-grade walls.

Sizes:

Insulation in 1' x 8' sheets, prenotched at 1' intervals for ties. Factory cut 90° or 45° corners.

R-value:

Nominal R-20.

Comments:

Perform Guard insulation has an insect resistance warranty. All AFM licensed manufacturers listed in the Insulation chapter of this book also offer Diamond Snap-Forms.

American ConForm Industries, Inc.

1820 S. Santa Fe Street
Santa Ana, CA 92705
Ph: (714) 662-1100
(800)-CONFORM
Fax: (714) 662-0405

SmartBlock™ expanded polystyrene permanent modular formwork. Hollow foam blocks are filled with concrete.

Applications:

For plain or reinforced concrete foundations, interior or exterior walls.

Sizes:

Blocks are 40" long x 10 2/3" or 12 3/4" tall. Standard form width 10", variable width forms 3 3/4", 5 3/4", or 7 3/4".

Fire rating:

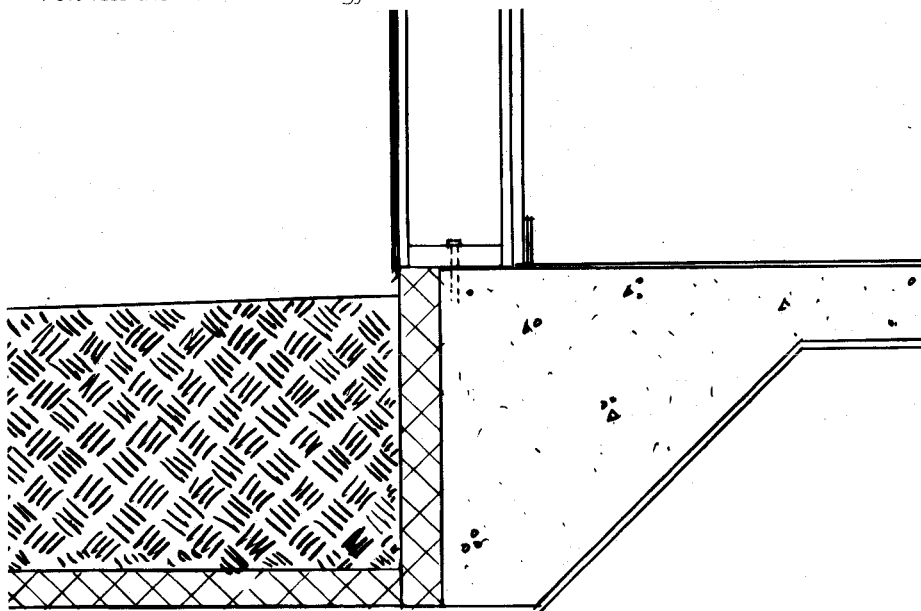
Flame Spread of 10

R-value:

R-17.6

Comments:

Up to 50% stronger than standard concrete. Will not deteriorate with age. No CFC released in manufacturing.



Core Form™

7245 West 116th Place, Suite 4
Broomfield, CO 80020-2955
(303) 460-1346

Expanded polystyrene foam block formwork.

Applications:

Foundations, wall systems, floor systems, and roof systems.

Sizes:

8" x 4' x 16'. Each block weighs 32 pounds.

R-value:

Up to R-30, depending on wall finish.

Comments:

This wall uses 2/3 less concrete than a conventional 8" poured foundation. Form blocks can be cut with a hot wire tool. Large blocks allow quick assembly.

EnerG Corp, Inc.

4203 W. Adams
Phoenix, AZ 85009
Ph: (602) 470-0223
Fax: (602) 438-7876

EnerGBlock Wall System consisting of interlocking polyurethane blocks which serve as forms and insulation for a poured concrete foundation. The design of the forms creates a waffle-like area that reduces the amount of concrete required in a wall.

Applications:

Walls and foundations.

Sizes and weight:

Each EnerGBlock is 8" x 8" x 16" and has a density of two pounds per ft³.

R-value:

R-50

Comments:

Special blocks serve as forms for horizontal bond beams and lintels. The polyurethane blocks can be finished on the interior with 1/2" gypsum wall board attached to wood or metal furring framing members. Compressive strength exceeds 15,000 pounds per square inch. Meets or exceeds all Uniform Building Codes. Provides excellent sound abatement.

Greenblock Company Ltd.

P.O. Box 749
Woodland Park, CO 80866
Ph: (719) 687-0645
Fax: (719) 687-7820

Expanded polystyrene foam permanent formwork with rebar supports molded in.

Applications

Below grade or above grade walls and commercial or industrial buildings.

Sizes:

Standard unit 1000mm x 250mm x 250mm. Corner, lintel, end and spacer units also available.

R-value:

R-22

Comments:

Flame retardant EPS, with no CFC or HCFC used in manufacture.

Insulform Inc.

P.O. Box 17533
Austin, TX 78760
(512) 376-7170

High density expanded polystyrene permanent foam formwork that is filled with concrete to form posts 8" on center or 24" on center.

Applications:

Commercial or residential construction, for exterior or interior walls, basement or above grade.

Sizes:

Standard block is 48" x 16" x 10" and weighs 4 pounds.

R-value:

R-35 with posts 8" on center and R-45 with posts 24" on center.

Comments:

Blocks interlock to form an airtight wall. Job-site waste can be reused as insulation. Manufacturer claims that product is unaffected by termites.

K & B Associates

P.O. Box 35605
Monte Sereno, CA 95030
(408) 395-3394, (800) 742-0862

E-Z Form is a system of expanded polystyrene forms that interlock to create a continuous formwork. The forms become a permanent part of the complete building system providing both insulative and sound deadening values. The design of the forms creates a waffle-like area that

reduces the amount of concrete in a wall.

Applications:

Foundation and above grade exterior and interior walls

Sizes:

8" high x 48" long x 10" wide. Produces a 6 1/2" reinforced concrete wall.

R-value:

R-18

Comments:

These forms are lightweight, easy to handle, quick to assemble, fire resistant, and can be installed using unskilled labor. The high insulative value of the polystyrene saves energy, while the 6 1/2" wall saves concrete.

Keeva International, Inc.

1854 N. Acacia St.
Mesa, AZ 85213
(602) 827-9894

Keeva™ form expanded polystyrene foam form system.

Applications:

The two styles of Keeva form allow creation of either vertical or horizontal concrete beams. The system serves as foundation or above-grade walls.

Sizes:

Blocks are 8" x 12" x 48".

R-value:

Nominal R-34; equivalent to wood wall R-25; in-wall R-20.

Comments:

Forms have interlocking tabs to self-align. Can be concrete filled for vertical beams 8" o.c., 16" o.c. or 24" o.c., depending on structural needs. 24" o.c. fill significantly reduces the amount of concrete used.

Lite-Form, Inc.

P.O. Box 774
Sioux City, IA 51102
Ph: (712) 252-3704
Fax: (712) 252-3259

Lightweight form system consisting of ties that join two sheets of foam together to create a lightweight insulating form system.

Applications:

Foundations, basement walls, stem walls, crawl spaces and retaining walls.

Sizes:

Each 4' x 8' form weighs under 20 lbs.

R-value:

R-20

Comments:

Weigh 10% as much as traditional wood forms. This system of ties can be used with any brand of extruded polystyrene board or two-pound bead board.

Reddi-Form® Inc.

250 Canal Road
Fairless Hills, PA 19030
(215) 295-8884

Lightweight, interlocking expanded polystyrene permanent forms for concrete walls.

Applications:

Foundations, basements, walls.

Sizes:

Blocks are 48" x 12" x 9.6" and come in corner form, closed corner form, and standard form.

R-value:

R-20

Comments:

No CFC or formaldehyde. Job site scrap can be recycled. There is a hotline for locating EPS collection centers.

UC Industries, Inc.

3 Century Dr.
Parsippany, NJ 07054
(800) 863-6767
(201) 267-1605

R-FORMS® insulated foundation formwork system using Foamular® extruded polystyrene insulation with thermoplastic ties.

Applications:

Used for above or below grade residential, commercial or industrial walls.

Sizes:

System uses standard 4' x 8' sheets of Foamular insulation with Space-R-Ty™ every 16 inches. Ties can be set for walls 4" to 10" wide.

R-value:

R-20

Comments:

Extruded polystyrene is particularly moisture resistant for below-grade uses.

W.A.M. Inc.

206 South Main
Maquoketa, IA 52060
Ph: (800) 523-2525
Fax: (319) 652-5475

I.C.E. Block™, a reinforced concrete wall system consisting of expanded polystyrene forms that remain in place after the concrete is poured.

Applications:

Above or below grade, from single family to multi-story.

Sizes:

Forms are 16" x 48" in widths of 9 1/4" or 11 1/4".

R-value:

R-22+

Comments:

This system has the potential to reduce job-site waste, as the forms are left in place to provide insulation. The permanent forms also allow for maximum concrete strength (due to slower curing time), reducing the volume of concrete necessary. No CFCs are used in the manufacture of these forms.

Woodless International, Inc.

1550 Jones Ave., Suite G
Idaho Falls, ID 83401
Ph: (208) 529-8373
Fax (208) 529-8374

Expanded polystyrene building forms with high-impact PVC plastic furring strips located at 12" centers contiguous through block for fastening interior and exterior wall coverings.

Applications:

For use in foundations and walls.

Sizes:

48" long x 11" wide, in 16", 32" or 48" heights. The 16" block weighs 7 pounds.

R-value:

R-30+

Comments:

Expanded with heat and steam. Stronger than conventional wood framing, and experiences little or no deterioration.

Foamed and Cellular Concretes

Durox Building Units Limited

Northumberland Road
Linford, Stanford-le-Hope
Essex SS17 0PY
England
(STD Code 0375) 673344

Autoclaved aerated concrete blocks and reinforced headers. Autoclaved cellular concrete products such as these may be used to meet both the structural and thermal design requirements of a structure.

Applications:

Blocks and headers are suitable for both loadbearing and non-loadbearing walls. Surfaces may be painted, plastered or dry lined.

Sizes:

Manufactured in metric sizes.

R-value:

A 4" Durox wall offers the same insulation value as a wall of 23" solid brickwork. Approximately R-5.

Density:

31 pounds per cubic foot; less than 1/4 the weight of normal concrete.

Fire rating:

Non-combustible. Meets the requirements for Class O surface spread of flame. The fire resistance of blocks, per 25mm (1") thickness, is one hour in non-loadbearing walls. Headers have a fire resistance of one hour.

Comments:

Blocks are easily sawn, drilled or chased with ordinary tools. Headers are reinforced with welded steel cages coated with a cement/latex compound. Vapor diffusion characteristics limit condensation during intermittent periods of high humidity. Ideal for earthquake resistant construction. Highly frost resistant. Durox recycles waste materials before and after the autoclaving process.

Hebel Corporation
 2305 Six Branches Drive
 Roswell, GA 30076
 Ph: (404) 552-8665
 Fax: (404) 552-8087

Autoclaved aerated concrete products, including components for walls, floors, roofs, and ceilings. Made from quartz sand, cement, lime, and an aluminum paste.

Applications:

Blocks are available for all wall and load bearing applications. Wall slabs are designed for load bearing and non load bearing walls. Roof and ceiling slabs are designed for flat or sloping roofs.

Sizes:

Standard blocks are 20" long, 10" wide, and from 2" to 16" thick. Special sizes can be made upon request. Floor, roof and wall slabs available up to 20' long, 2' wide and from 4" to 12" thick.

Fire rating:

All products are inorganic and totally incombustible.

R-value:

Provides good thermal efficiency due to the many cells of encapsulated air.

Comments:

These products use less cement and are about one fifth the weight of traditional concrete. They can be sawn, drilled and worked using normal wood working tools. Products are not sensitive to frost and are dimensionally stable. Blocks are currently imported, but US production is scheduled to begin in 1995.

Mearl Corporation
 220 W. Westfield Avenue
 Roselle Park, NJ 07204
 (908) 245-9500

Mearlcrete foam liquid that is used to make cellular concrete and foamed concrete. This proprietary foaming agent is designed to be added to a cement mix on site or during precasting manufacturing processes.

Applications:

While used chiefly for industrial applications where light weight is desired, this technology can also be used in residential construction to create lightweight concrete suitable for load-bearing walls, floors, roofs, and foundations. Most commercial

concrete mixers can be used with Mearl's standard foam generators to mix their foam with a cement mix. The foam can also be used in the process of precasting columns and beams.

Sizes:

A 55 gallon drum of concentrated foaming agent can be aerated to produce more than 200 cubic yards of low density insulating cellular concrete at a dry density of 30 pounds per cubic foot.

Fire rating:

Mearlcrete Cellular Concrete is listed with the UL Fire Resistance Directory.

Density:

The density can be controlled over a range from 20 to 120 pounds per cubic foot.

Comments:

The quantity of foaming agent that is introduced into a given concrete mixture affects the density, strength, thermal conductivity and cost of the end product. When precast and cured at high steam pressures in an autoclave, the cellular concrete becomes chemically altered resulting in even greater strength ratings. This product is designed to be non-hazardous and non-polluting.

North American Cellular Concrete
 3 Regency Plaza, Suite #6
 Providence, RI 02903
 (401) 621-8108

Developing ACC products that utilize large quantities of fly-ash; in research and development stages.

Comments:

North American Cellular Concrete has been touring the country for the last two years with a mobile plant to demonstrate the production of ACC blocks from fly-ash.

Fly Ash Suppliers for Concrete

The availability and cost-effectiveness of using fly ash in concrete mixes will depend on local/regional supplies and transportation costs. Your local concrete ready-mix company can contact one of these distributors listed below to determine the feasibility of obtaining and using fly ash.

American Fly-Ash Co.
 1250 E. Diehl Rd., Suite 101
 Naperville, IL 60563
 (800) 323-5949

Bayou Ash, Inc.
 P.O. Box 66377
 Baton Rouge, LA 70896
 (800) 462-2968
 (504) 627-4242

Contech Admixtures
 8850 Wentworth Ave. South
 Bloomington, MN 55420
 (800) 352-2800
 (612) 884-0665

Gifford-Hill & Company, Inc.
 2515 McKinney Ave, 10th floor
 Dallas, TX 75201
 (214) 754-5546

Holnam, Inc.
 2001 Commonwealth Blvd. #303
 Ann Arbor, MI 48105
 (313) 663-1532

JTM Industries, Inc.
 1000 Cobb Place Blvd.
 Bldg. 400
 Kennesaw, GA 30144
 (404) 424-1900

Lafarge Corporation
 P.O. Box 324
 Dallas, TX 75221-0324
 (214) 934-7360

Mid-Atlantic Ash Co.
c/o Arundel Corp.
P.O. Box 4207
Salisbury, MD 21803
(410) 742-4645

**Midwest Fly Ash
& Materials, Inc.**
P.O. Box 3557
Sioux City, IA 51102
(712) 252-4049

Mineral Specialties, Inc.
Box 1563
Billings, MT 59103
(406) 656-2334

Monex Resources
45 NE Loop 410, Suite 700
San Antonio, TX 78216
(210) 349-4069
(800) 964-0951
Field divisions:
Auburndale, FL
Atlanta, GA
Greensboro, NC

National Minerals
855 Apollo Rd.
Egan, MN 55121
(612) 681-0470

Nebraska Ash Company
P.O. Box 80268
Lincoln, NE 68501
(402) 476-0127

Pozzolanic International
7525 SE 24th St.
Mercer Island, WA 98040
(800) 426-5171
(206) 232-9320

U.S. Ash Co.
2555 Weadock Hwy
Essexville, MI 48732
(517) 892-3521

Western Ash Company
P.O. Box 7360
Phoenix, AZ 85011
(602) 248-7946

Western Ash Company
4380 S. Syracuse St. #305
Denver, CO 80237
(800) 255-0663



Framing

Framing accounts for about 70% of the 11,000 board feet of lumber used in an average home, and over 90% of new homes built in the U.S. are wood framed. Until recently, good structural lumber has been hard to replace in applications such as wall and roof framing and floor spans. Wood performs well under tension or compression and, until recently, large solid-sawn dimension joists and rafters could be replaced only with steel or trusses made from smaller dimension lumber. Today a variety of engineered wood alternatives and new types of steel framing options are available to provide effective, efficient substitutes for solid wood framing. This chapter contains listings for engineered lumber products used in floor, roof and wall framing.

Throughout the past 200 years of home construction—from log homes through balloon framing to Western-style framing, then to the Arkansas house—builders and architects have made few concerted efforts to use wood more efficiently. During the 1980's, the attempt to create highly insulated "double" walls for energy efficiency actually created a greater demand for framing wood. Today, timber supplies do not consistently provide the straight, dimensionally stable heartwood lumber that builders value. The undependable quality and increasing cost of many traditional wood products is leading many builders to seek alternatives.

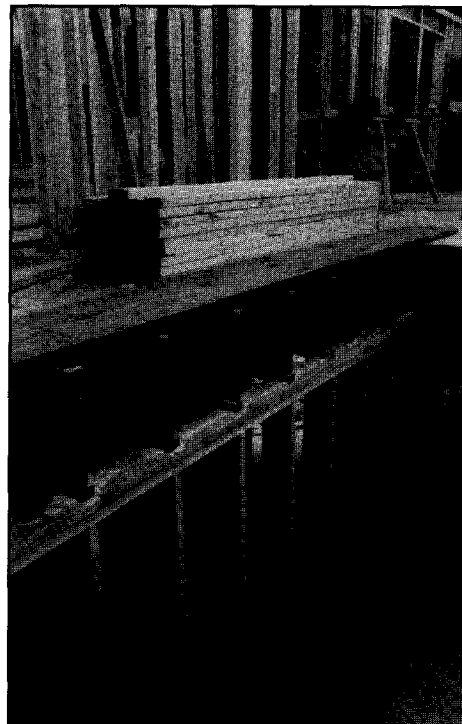
These alternatives are being provided by new technologies and products that no longer heavily depend upon a dwindling supply of large timber. They offer consistent performance, predictable quality, superior structural integrity, and less waste during construction. Glue-laminated beams, engineered I-joists, laminated veneer lumber and finger-jointed lumber are examples of available engineered wood products.

Many manufacturers are providing structural lumber milled from small trees and are adding value to smaller diameter second and third growth forest products, rather than following the old practice of milling large (and small) lumber from old-growth trees. Some engineered lumber products also make use of faster-

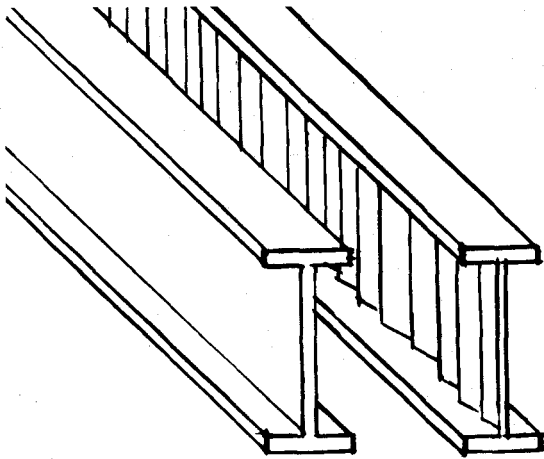
The movement towards a more efficient use of wood fiber continues with new technologies and products that no longer heavily depend upon the dwindling supply of large timber.

growing tree species formerly considered undesirable. In addition, the engineering technology that combines smaller pieces of wood allows for a far more complete and efficient utilization of each log that enters lumber mills. Lumber or wood fibers bonded with adhesives, heat and pressure compose a new generation of engineered lumber.

I-joists, like steel I-beams, are named for their shape. The vertical member or "web" of the "I" is usually made from oriented strand board or plywood, while the top and bottom "flanges" are made from solid sawn, finger-jointed or engineered lumber. Oriented strand board (OSB) consists of small wood chips (averaging 4" in length) derived from young, fast growing trees, instead of the larger spruce, pine, fir and imported trees required to manufacture plywood. I-joists



have a very high strength-to-weight ratio and provide structural support for floors and roofs, using just one-half the amount of wood fiber in a traditional solid sawn joist system.



Finger-jointed lumber provides a more efficient use of timber that is milled for dimensional lumber. Finger-jointing allows mills to combine short lengths of lumber, formerly scrapped or burned for fuel at the mill, into standard-length dimensional structural lumber for framing, truss fabrication, or I-joist flanges. Finger-jointed lumber is as strong as non-jointed lumber of the same grade, and resists stress, warping and twisting. It can be Machine Stress Rated to guarantee strength. Finger-jointed lumber is available in the product lines of major lumber companies, and should be carried by local lumber suppliers.

Manufactured laminated veneer lumber and laminated strand lumber efficiently use wood fiber by combining small pieces from second and third growth trees to create defect-free structural lumber. Laminated strand lumber uses wood fiber strips of around 12", longer than the chips used in OSB

production, and oriented lengthwise within the final product. Laminated veneer lumber stacks narrow veneers of wood to beam dimensions. Laminated veneer and laminated strand lumber are extremely strong, and are usually used for window and door headers or beams.

Glue-laminated lumber, while still dependent upon timber larger than that required for OSB or laminated veneer lumber, is a step towards more efficient utilization of timber resources. It puts into practice the theory of creating large beams from smaller pieces of standard-size lumber. Glue laminated lumber is engineered for consistency and it creates less waste at the job-site. New technology combines glue-laminated and laminated veneer lumber in a single structural component, or laminates fibers between layers of wood for added strength without added wood.

Some builders are looking to steel framing as an alternative to wood. Steel framing has been used in commercial construction for years, but light-gauge steel is just beginning to enter the residential framing market. Steel framing is durable, lightweight, insect resistant, and relatively stable in price. Standard steel contains approximately 50% recycled metal, and is also recyclable. Steel studs can also be reused in structural applications when a building is dismantled.

Some disadvantages of steel as a framing material are potential problems with condensation and the tremendous quantity of energy required for initial manufacture of the metal. In addition, steel is highly conductive, which increases potential for thermal bridging through exterior walls that can lead to heating and cooling inefficiency. Insulated exterior sheathing added to steel-framed walls can reduce heat transmission through studs and improve the thermal performance of walls. Studies on the thermal performance of steel walls are still being conducted by national testing organizations.

Steel studs are available in a variety of configurations and systems, from a number of manufacturers nationwide. The American Iron and Steel Institute offers a directory of steel stud manufacturers and framers through their "Steel in Home Construction" hotline at (800) 79STEEL. Steel framing should be utilized in designs that apply its structural characteristics to advantage, and not merely substituted into existing designs developed for wood framing. Use of residential steel framing is expected to increase in the coming years.

I-joists have a very high strength-to-weight ratio and provide structural support for floors and roofs. This uses one half the amount of wood fiber of traditional solid sawn joists.

Engineered Wood Framing

Alpine Structures Incorporated

P.O. Box 1006
Oxford, NC 27565
(800) 672-2326
(919) 693-6667

Advantage™ engineered wood products, including structural I-joists, engineered ASI headers, and Timbermax® laminated veneer lumber. The I-joists have sawn wood flanges and plywood or oriented strand board webs. ASI headers have the appearance of an I-joist with two extra OSB skins applied to each side to create a dimensional header without a solid core. These headers provide structural integrity with less wood than a solid header.

Applications:

I-joists are designed for roof and floor systems; headers and LVL are for a variety of structural needs.

Sizes:

LVL available in depths from 9 1/3" up to 18", in 1 3/4" or 3 1/2" thicknesses.

Wood species used:

Not specified.

Moisture content:

Not specified.

Comments:

ASI headers are designed for medium load carrying capacity.

Anthony Forest Products Co.

P.O. Box 1877
El Dorado, AR 71730
(800) 221-2326

Power Beam™ laminated structural lumber, a composite made from high-strength lumber.

Applications:

Laminated structural lumber can be used for headers, floor or roof beams where engineered wood is required. LSL can substitute for LVL and PSL in many applications.

Sizes:

Available in 1 3/4", 3 1/2" and 5 1/2" widths, with depths from 7 1/4" to 18".

Moisture Content:

12% moisture.

Comments:

Beams have camber manufactured in. They are fire rated in the heavy timber category. Anthony Forest Products Power Beam products are also distributed by Georgia Pacific.

Boise Cascade Corporation

One Jefferson Square,
P.O. Box 50
Boise, ID 83728-0001
(800) 232-0788
(208) 384-7151

BCI™ I Joist consisting of a plywood web between laminated veneer lumber flanges. VERSA-LAM™ laminated veneer lumber.

Applications:

Headers; ridge, floor, and roof beams; roof rafters; floor joists.

Sizes:

I-joists are available in two flange widths of 1 3/4" or 2 5/16", and five depths from 9 1/2" to 20". Lengths up to 66'.

Wood species used:

Not specified.

Moisture content:

Not specified.

Comments:

Boise Cascade uses finger-joints in the webbing to provide greater shear capacity than I-joists with square-butt joints. BCI joists may be cantilevered up to a maximum of 2' when supporting roof loads, although reinforcement may be necessary.

Fiber Technology

P.O. Box 858
Drain, OR 97435
(503) 836-2026

Fiber reinforced plastic glu-lam beams (FiRP). FiRP strands are oriented in a layer of plastic that is laminated into the composite wood, to add strength while reducing the amount of wood used.

Applications:

Used for roofs and bridges at this time.

Comments:

This new product has just entered the market and is only being manufactured at one location to date. Glue used in lamination is phenol resorcinol. These beams are lighter than conventional glu-lams.

Georgia-Pacific

133 Peachtree St. N.E.
Atlanta, GA 30303
(404) 652-4000
(800) 447-2882

GP-Lam™ laminated veneer lumber beams and headers, Glulam beams, and Wood I Beam™ WI Series joists consisting of CDX plywood webs and machine stress rated 2" x 4" lumber. Wood I Beam™ GPI Series have OSB webs.

Applications:

GP-Lam and Glulams are used for beams and headers; door, window, stair and furniture components. Wood I Beams are designed for roof and floor systems.

Sizes:

GP-Lam is available in standard sizes, with depths for use with I-beams. Wood I Beams are 3 1/2" wide at flange, come in depths of 9 1/4" to 24", and lengths up to 48'. GPI Series come in depths 9 1/4" to 16" and lengths to 60'.

Wood species used:

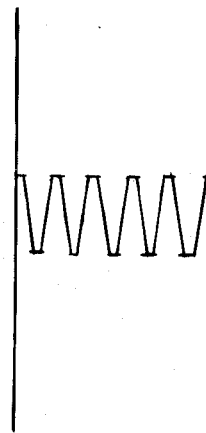
GP-Lam is made from Douglas fir. Wood I Beams have southern pine plywood webs and Douglas fir flanges.

Moisture content:

LVL is 7.5%.

Comments:

Accepted by BOCA and SBCCI major code authorities. LVL is available with standard veneer faces. Wood I Beam joists use as much as 55% less wood fiber than solid sawn joists. The I-joists provide more load bearing capacity per pound than solid sawn 2 x 10s or 2 x 12s, providing for longer unsupported spans and fewer total beams.



Jager Industries Inc.
 8835 MacLeod Trail S.W.
 Calgary, AB T2H 0M3 Canada
 (403) 259-0700

TTS WOOD I® joist and Super Joist™ consisting of a 3/8" oriented strand board web fitted into finger-jointed flanges. Super Joists flanges are #2 grade lumber, while flanges for TTS Wood I joists are machine stress rated.

Applications:

Floor and roof joists.

Sizes:

TTS Wood I joists come with 2 x 4 flanges, and are available in depths from 9 1/2" to 24". Super Joists come with 2 x 3 flanges, and are available in depths of 9 1/2" and 11 1/2". Both joists come in standard lumber lengths as well as custom lengths up to 52'.

Wood species used:

Spruce, pine and fir.

Moisture content:

Flanges have 19% or less.

Comments:

These joists are made from kiln-dried material to eliminate shrinkage and are supplied custom cut and delivered to the jobsite in bundles. All flange finger-joints are tension tested before final assembly. Both joists weigh considerably less than solid sawn 2 x 10s or 2 x 12s, yet won't twist, split, shrink, or warp.

Louisiana-Pacific
 111 S.W. 5th Ave.
 Portland, OR 97204
 (800) 999-9105,
 (503) 221-0800

Gang-Lam® LVL dimensional lumber with laminated southern pine veneers. Composite GNI™ Joists with Gang-Lam LVL flanges and OSB webs.

Applications:

Designed for floors and roofs.

Sizes:

Gang-Lam LVL is available in lengths up to 80' and a variety of depths. GNI Joists are available in standard 1 1/2" or 1 3/4" thicknesses (as well as custom thicknesses) in depths from 9 1/4" to 24", and lengths to 80'.

Wood species used:

Southern pine for flanges and aspen or Southern pine for OSB web.

Moisture content:

6 1/2% to 9% on flanges and LVL.

Comments:

Both products are easy to cut and nail, and are accepted by all major building codes. They provide more load bearing capacity than solid sawn lumber, and resist shrinking, twisting, splitting, warping, and crowning.

MiTek Industries, Inc.

P.O. Box 7359

St. Louis, MO 63177

(800) 325-8075

(314) 434-1200

Posi-Strut® open joist metal web trusses.

Applications:

For floor joists, roof rafters or roof purlins. At 24" spacing the Posi-Strut will substitute for solid wood joists spaced at 16".

Sizes:

3 1/2" wide top and bottom chords, in depths of 7 1/4", 9 1/4", 11 3/8" or 15 3/4". In lengths of 24' to 30'.

Wood species used:

Dense southern pine or Douglas fir. Webs are steel.

Moisture content:

Not specified.

Comments:

The deepest truss will accommodate up to 11" ducts between chords. Ends of trusses can be trimmed for exact fit. Chords can utilize short lengths of wood, which are butted with plates on each side. MiTek trusses are manufactured by licensed manufacturers.

Nascor Incorporated

1212 34th. Ave. S.E.

Calgary, AB T2G 1V7 Canada

Ph: (403) 243-8919

Fax: (403) 243-3417

Composite wood I-joists with standard lumber chords and OSB webs.

Applications:

Designed for floor joists and rafters.

Sizes:

Joists are available in 9 1/2", 11 7/8", 14", 16", and 18" heights in standard lengths up to 24'.

Comments:

Nascor also manufactures an insulated exterior wall system employing finger-jointed wood and

polystyrene studs, with expanded polystyrene infill panels. Polystyrene panels are available to fit with the I-joists in roof and floor applications. Nascor has many designs available for low-cost houses utilizing their wall system.

Open Joist 2000 Inc.

P.O. Box 2778

Plattsburg, NY 12901

(800) 263-7265

Open Joist 2000™ open web trusses with all-wood web.

Applications:

Can replace solid-sawn wood 2 x 10 or other open-web joists.

Sizes:

Chords are 2" x 3" or 2" x 4", with depths of 9 3/8", 13" or 16", available in one foot increments.

Wood species used:

Kiln-dried SPF #2 or MSR 2100 or 2400.

Moisture content:

Not specified.

Comments:

This wood truss system uses less energy to produce than some other engineered wood products, but uses more wood than metal web trusses, and larger pieces of wood than I-joists.

Rebel Building Components

P.O. Drawer 2286

Columbus, MS 39704

(800) 844-8281

(601) 327-7950

Trim Joist™ open metal-web joists with I-joist-shaped end that can be trimmed on site for custom fit.

Applications:

Floor joists.

Sizes:

3 1/2" wide chords, in depths of 11 1/4", 14", 16", or 18". Lengths from 4' to 30' available in 2-foot increments.

Wood species used:

2 x 4 young timber, not old-growth.

Moisture content:

Not specified.

Comments:

Strength of these engineered wood products allows for longer spans and wider spacing, that the company claims uses 12% less board feet of wood fiber than a conventional floor framing system.

Rosboro Lumber Co.

P.O. Box 20
 Springfield, OR 97477
 Ph: (503) 746-8411
 Fax: (503) 726-8919

Redi-Lam™ beams combine a top portion glu-lam beam with the extra strength of an LVL beam for the bottom portion. It is lighter and less expensive than an LVL, but as strong.

Applications:

For applications requiring extra load carrying capacity, in place of LVL or PSL beams.

Sizes:

In standard widths of 1 3/4", 3 1/2", 5 1/2", or 7", with optional camber.

Wood species used:

Second-generation Douglas fir.

Comments:

High grade compression and center core lams on top, with standard LVL extra high grade tension lam on the bottom. Stronger than a solid-sawn or standard glu-lam beam.

Standard Structures Inc.

P.O. Box K
 Santa Rosa, CA 95402
 (707) 544-2982

Variety of engineered wood products including ssl Joists, finger-jointed and laminated framing lumber. ssl Joists use kiln dried, machine stress rated flanges and an OSB web.

Applications:

Studs, floor joists, and rafters.

Sizes:

ssl Joist is available in 9 1/2", 12", 14" and 16" depths; tapered I's for roof applications available. Finger-jointed lumber is available in 2" x 6", 2" x 8", 2" x 10", and 2" x 12" dimensions in lengths up to 72'.

Wood species used:

Douglas fir and SPF.

Moisture content:

ssl Joist - less than 12%;
 Finger-jointed lumber - average 9%.

Comments:

According to Standard Structures, these I-joists help create "no squeak" floors.

Superior Wood Systems

P.O. Box 1208
 Superior, WI 54880
 Ph: (715) 392-1822
 Fax: (715) 392-3484

SWI-Joists with Machine Stress Rated (MSR) lumber flanges and OSB webs. SWII-Headers are pre-insulated with expanded polystyrene between two OSB webs, with MSR flanges.

Applications:

Joists for floors and roofs. Headers replace conventional lumber and plywood headers.

Sizes:

OSB is 7/16" thick. Joists have 2" x 2", 2" x 3", or 2" x 4" flanges, with depths from 9 1/4" to 20", and standard lengths to 48'. Headers have 2" x 4" or 2" x 6" widths, with depths of 7 1/4", 9 1/4", or 11 1/4".

Wood species used:

Not specified.

Moisture content:

Not specified.

Comments:

These products are dimensionally stable, and do not warp, twist, or shrink. Because they are pre-engineered there is less job site waste than with solid lumber. Headers are R-18.

Tecton Laminates Corp.

P.O. Box 587
 Hines, OR 97738
 Ph: (800) 678-2312
 Fax: (503) 573-6474

Tec-Lam™ laminated lumber beams and headers. TLI I-joists with LVL flanges and OSB webs. Tec-Board LVL components for industrial applications such as doors, windows and furniture.

Applications:

Beams and headers; I-joists for floors and roofs, and industrial components.

Sizes:

Tec-Lam beams and headers available in 1 1/2" to 3 1/2" widths and depths of 7 1/4" to 24" in lengths to 50'. TLI I-joists in depths of 9 1/4" to 24" in lengths to 60'.

Wood species used:

Douglas fir, hem-fir and lodgepole pine.

Moisture content:

11% or less.

Comments:

Tec-Lambeams and headers and TLI I-joists are accepted by all major code authorities. These products are stronger than traditional solid sawn lumber and use less raw materials to achieve consistent strength properties.

Timberweld

P.O. Box 21000
 Billings, MT 59104
 (406) 652-3600

Glue-laminated timbers.

Applications:

Engineered lumber including laminated timber trusses, beams, I-joists, open web joists and connections.

Sizes:

Products are available in a variety of grades, shapes and sizes, and can be custom-fabricated from plans.

Wood species used:

High-grade lumber in higher stressed tension and compression zones, and lower grades dispersed in lower stress zones.

Moisture content:

Not specified.

Comments:

Engineered wood products allow for a more efficient use of wood fiber than solid-sawn dimensional lumber. Some product lines exhibit more resource efficiency than other products which consume relatively more wood and energy.

Trus Joist MacMillan

P.O. Box 60
 Boise, ID 83707
 (800) 628-3997

A variety of engineered wood products including:

Parallam® parallel strand lumber beams, columns and headers. The manufacture of Parallam uses up to 60% more of a log than traditional sawmill methods.

Microllam™ laminated veneer lumber.

Silent Floor® I-joists with flanges of Microllam and webs of oriented strand board.

TimberStrand® laminated strand lumber rim board.

Applications:

Beams, columns, posts and headers.

I-joists for floors and roofs.
Timberstrand for light-duty headers
and rim boards.

Sizes:

Parallam PSL beams and headers
available in 1 3/4" to 7" widths in
depths from 9 1/4" to 18". Lengths
up to 66'. Microllam beams,
headers, and I-joists are 1 3/4" in
width, in depths from 5 1/2" to 18",
and lengths to 80'. Timberstrand
available in 1 1/4" or 3 1/2" widths
in depths from 9 1/2" to 16".

Wood species used:

Douglas fir, southern pine or
western hemlock. Timberstrand
made from aspen in Minnesota or
yellow poplar in Kentucky.

Moisture content:

11%.

Comments:

These products are stronger than
traditional lumber, allowing use of
less material in strong configurations.
Cut, drill and nail as conventional
lumber. Timberstrand is also used as
a core material for windows and
doors.

Truswal

1101 N. Great Southwest

Parkway

Arlington, TX 76011

Ph: (800) 521-9790

Fax: (817) 652-3079

SpaceJoist™ parallel chord trusses
with high-strength galvanized steel
deep-V webs.

Applications:

Rafters, studs, purlins, roofs or floors.

Sizes:

Clear span lengths up to 40', with a
variety of depths from 9 1/4" to
19 3/4".

Wood species used:

Southern pine or Douglas fir.

Moisture content:

Less than 19%.

Comments:

The open web design allows
placement of 12" or more of
insulation as well as electrical,
heating, and plumbing within depth
of trusses. Long clear span elimi-
nates the need for beams, columns,
and interior footings. Manufacture
of trusses uses 65% recycled steel in
webs, and can, but does not
necessarily, use finger-jointed
lumber. Trusses are available with
one hour fire rating.

Unadilla Laminated Products

32 Clifton St.

Unadilla, NY 13849

(607) 369-9341

Structural glue-laminated columns,
trusses, arches, purlins, and beams.

Applications:

Commercial and residential.

Sizes:

Beams, girders, and purlins are
available from under 3' x 6" to 10' x
49" or larger; arches from 6' on 12'
to over 14' on 12'.

Wood species used:

Southern pine and Douglas fir.

Moisture content:

Not specified.

Comments:

Engineered products made efficiently
using smaller diameter timber.

Willamette Industries**Engineered Wood Products**

P.O. Box 277

Saginaw, OR 97472

(503) 744-4664

WSI Joists™ consisting of machine
stress rated (MSR) lumber flanges
joined to oriented strand board web
using WSI patented finger joint.
Glue-laminated beams, columns and
headers.

Applications:

Floor and roof framing. Garage,
door, and window headers; roof
rafters; columns.

Sizes:

Depths from 8" to 32" in 2" incre-
ments. Tapered joists also available.
Glu-lams available in standard
dimensions in three finish grades.
Lengths to 130'. Custom sizes
available.

Wood species used:

Fir, larch, or southern pine.

Moisture content:

Not specified.

Comments:

WSI joists are designed to be used
under dry conditions in which the
moisture content of the joists will not
exceed 19%.
Large dimensional engineered
products are made efficiently using
smaller diameter timber. Camber
can be built into the beams. They
are fire resistant (1 hour fire rating),
dimensionally stable, store well
outside, and work well with I-beams.



Panel Systems

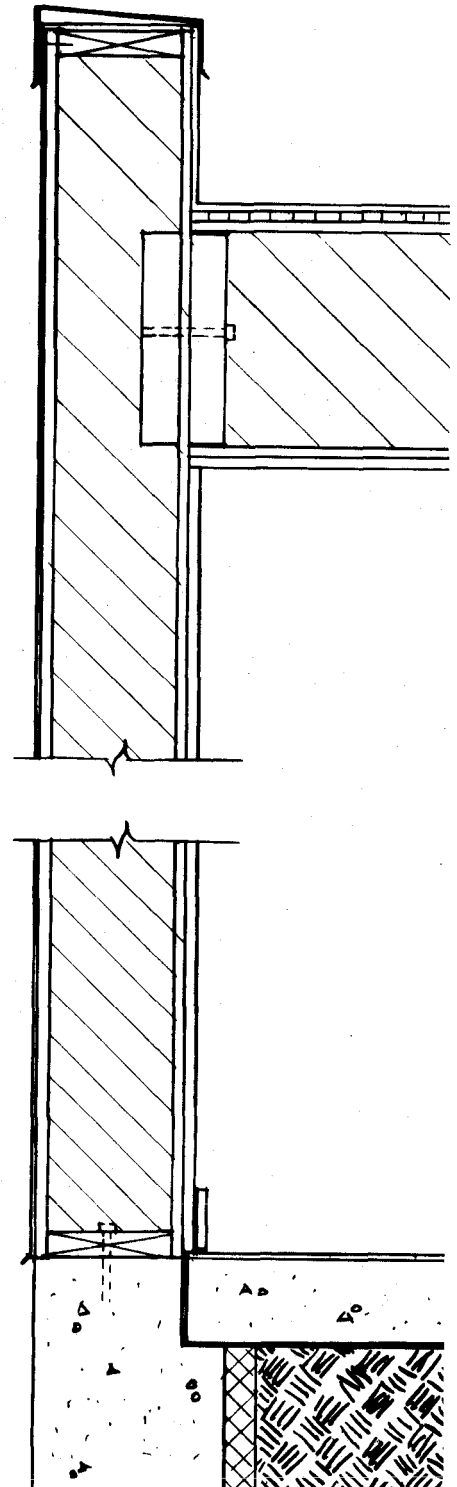
Structural insulated panel systems provide a material- and labor-saving alternative to traditional stick framed and insulated walls. Insulation within the panels is uninterrupted by studs, providing a thermally efficient wall. Structural insulated panels have been in use for over 30 years, and serve as an energy efficient, structural building system that is relatively simple to erect and thus reduces on-site labor time. Panel manufacturers can custom design panel systems from building project plans, and panels are generally delivered on site pre-cut and ready for installation. Structural insulated panels can be used in floors, walls or roofs.

The most common type of panel has an expanded polystyrene foam core, faced with oriented strand board (OSB) made from fast growing trees such as aspen and alder. The OSB skins distribute and carry the loading stresses of a structure, while the bonded foam core provides insulation and keeps the two skins aligned. Non-structural panels, such as those designed for use with timber framing, may be faced on one or both sides with drywall. The foam core in structural insulated panels may consist of expanded polystyrene (EPS) or isocyanurate or urethane foam, depending on the manufacturer. The higher initial R-value per inch of urethane may decline over time, unlike the R-value of EPS, which remains constant.

A few companies are making EPS panels with steel structural framework and no facing. Also listed in this chapter are two systems that employ expanded polystyrene panels and wood I-studs to create structural walls with a minimum of wood framing. A new company will begin producing structural insulated panels faced with OSB in which compressed straw, rather than foam, acts as insulation.

Structural insulated panels are a relatively resource efficient building component. The sheathings provide an efficient use of wood fiber while the foam core material is highly insulative. Testing by the Florida Solar Energy Center found that a house built with foam core panels had a heating energy savings of 12%-17% compared to a stud-frame house of equal size and R-value. Insulation is virtually continuous, and panels allow little air leakage.

An average wall section constructed of stress-skin panels contains 25 percent less wood than a similar wall framed with 2x4s placed 16" on-center. Panels can structurally cover large spans, requiring very little supplemental framing (such as sill plates and top plates).



Although the foam core is derived from a non-renewable resource, it is a relatively efficient use of this resource. One quart of an oil-refining byproduct is expanded to create forty quarts of EPS foam. Scrap can be recycled, and the EPS could potentially be recycled at the end of its useful life. Metal-framed panels eliminate the need for wood fiber skins altogether, and the metal frames have some recycled metal content.

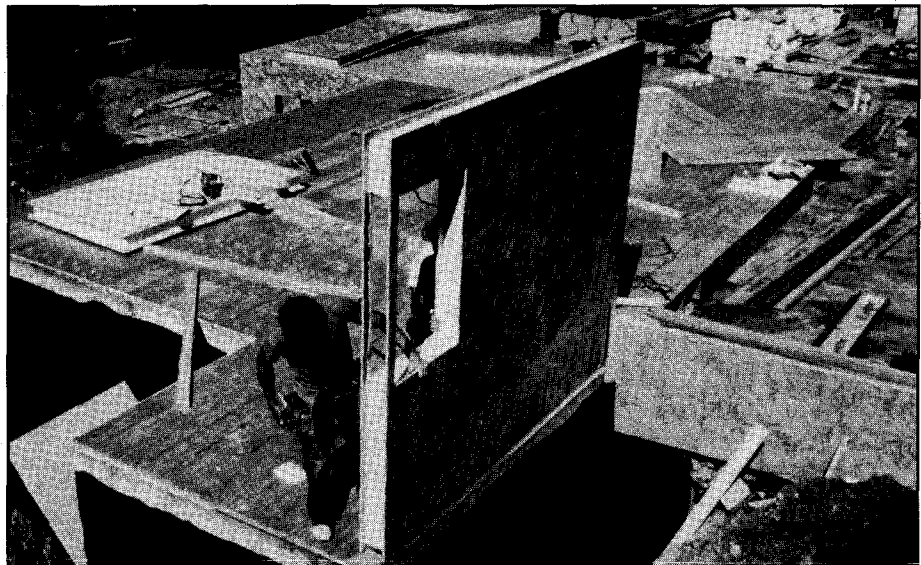
Panels can be joined in a number of different manners, depending on the system used by the manufacturer. Some panels connect with dimensional lumber or steel splines. One company uses recycled plastic studs to join panels. Other manufacturers use OSB splines in combination with expanding foam at panel seams. One company offers recycled plastic cam-lock systems that seal with expanding foam. Some panels join in a shiplap configuration, to prevent thermal bridges through the wall.

Pre-cut electrical chases are standard in some systems, but must be specially requested in others. Most panels require at least 1/2" interior gypsum drywall to meet fire codes. According to tests conducted by the U.S. Testing Company, the products of EPS combustion are less toxic than those produced from an equal volume of burning wood.

A different type of structural panel utilizes an interior structure of kraft paper in a honeycomb configuration. Originally developed for use in aeronautical engineering, honeycomb panels perform like multiple I-beams, with the facings performing as the flanges, which withstand bending loads, and the honeycomb acting as the web, which absorbs the shear loads placed on the panels. These panels can be laminated to virtually any skin material, and provide a very high strength-to-weight ratio. Honeycomb panels are an efficient use of material, as the average honeycomb core consists of 5% paper and 95% air. When faced with a material such as OSB, this honeycomb provides structural integrity that is suitable for a variety of wall, roof and floor applications. This technology is little used in the housing industry, despite its great potential, due to a lack of materials suppliers. A few honeycomb core and honeycomb panel manufacturers are listed in this chapter, although their primary business is not necessarily the manufacture of building products.

Structural panel systems provide a material and labor saving alternative to traditional two-by-four or two-by-six stick framing, and have been in use for over 30 years.

Stress-skin panels serve as an energy efficient, structural building system that is relatively simple to erect, reducing on-site labor time.



Structural Insulated Panels

Advanced Building Systems, Inc.

324 N. Bowen Rd.
Arlington, TX 76012
(800) TO-PANEL

Structural insulated expanded polystyrene foam-core building panels.

Applications:

Walls and roofs.

Sizes:

Foam core in 4 1/2", 6 1/2" or 8 1/2" thicknesses. Panels are 8' by up to 24'.

Fire Rating:

Interior surfaces must be covered by 1/2" gypsum wallboard to meet fire codes.

R-value:

4 1/2" panel is R-16, and 8 1/2" panel is R-31 at 75°.

Electrical wiring:

Not specified.

Comments:

Panel faces are 7/16" waferboard. No urea formaldehyde is used in these panels.

AFM Corporation

24000 W. Hwy. 7, #201
Shorewood, MN 55331
(612) 474-0809
(800) 255-0176

R-control® structural foam-core building panels consisting of a core of EPS bonded between two OSB facings.

Applications:

For walls and roofs.

Sizes:

Available in sizes from 4' x 8' to complete 8' x 28' wall and roof sections. Standard thicknesses are 3 1/2", 5 1/2", or 7 1/2". Ceiling and roof panels can be made to 11 1/2" thickness.

Fire Rating:

ASTM E 119 - 20 minute and 1 hour duration rating for roof, ceiling and wall construction. ICBO corner room burn - 15 minute thermal barrier verification test. ASTM E 108 - external fire propagation testing.

R-value:

Five standard core thicknesses

provide R-values from 14.88 to 44.71 at 75°.

Electrical Wiring:

Factory-cut electrical chases.

Comments:

Will not twist, warp or be subject to racking. EPS foam core contains no CFCs, HCFCs, or formaldehyde. Panels are listed by Underwriters Laboratories and come with a 20 year warranty on the R-value of the core material. These panels are not affected by moisture or temperature. R-value is stable for the life of the structure.

Associated Foam Manufacturers (AFM) includes the following franchised production facilities:

Advance Foam Plastics, Inc.

5250 North Sherman Street
Denver, CO 80216
(303) 297-3844

All American Foam Products

301 Eubank Southeast
Albuquerque, NM 87123
(505) 299-7653

Allied Foam Products, Inc.

1604 Athens Highway
Gainesville, GA 30503
(404) 536-7900
(800) 533-2613

Big Sky Insulations Inc.

15 Arden Drive
Belgrade, MT 59714
(406) 388-4146
(800) 766-3626

Branch River Foam Plastics

15 Thurber Boulevard
Smithfield, RI 02917
(401) 232-0270

Contour Products, Inc.

1418 Cow Palace Rd.
Newton, KS 67114
(316) 283-1100
(800) 835-2161

Insulated Building Systems

100 Powers Court
Sterling, VA 20166
(703) 450-4886

Marne Industries, Inc.

4580 Airwest Drive S.E.
Kentwood, MI 49512
(616) 698-2001

Mid-America Industries

RR 1, Box 101
Mead, NE 68041
(402) 624-6611

Pacemaker Plastics Co. Inc.

126 New Pace Road
Newcomerstown, OH 43832
(614) 498-4181
(800) 446-2188

Poly-Foam Inc.

116 Pine Street South
Lester Prairie, MN 55354
(612) 395-2551

Premier Building Systems

8939 South 190th St.
Kent, WA 98032
(206) 251-9277

Premier Building Systems

1155 Industrial Place
Dixon, CA 95620
(916) 753-4010
(800) 275-7086

Thermal Foams, Inc.

2101 Kenmore Ave.
Buffalo, NY 14207
(716) 874-6474
(800) 333-6267

Wisconsin EPS, Inc.

90 Trowbridge Drive
Fond du Lac, WI 54936
(414) 923-4146
(800) 236-5377

Agriboard Industries

P.O. Box 645
Fairfield, IA 52556
(515) 472-0363

Structural insulated panels with a core of strawboard between OSB faces. The plant is scheduled to begin production in 1995.

Applications:

Panels are marketed as a complete building package for pre-fabricated units.

Sizes:

Panels are 8 3/8" thick, in 48" widths and various lengths.

Fire Rating:

Tightly compressed straw is fire resistant due to density.

R-value:

Wall is R-26.

Electrical Wiring:

Not specified.

Comments:

These panels substitute the highly renewable resource of wheat straw for the petroleum-based foam usually used in structurally insulated panels. Straw is highly insulative, and is usually a waste by-product of agriculture.

tend to lose R-value over time. Cost effective for shipping to Alaska locations.

APC International

902 West Main St.
Auburn, WA 98001
(800) 745-2724
(206) 735-5709

System 3 insulated building panels with expanded polystyrene foam core.

Applications:

For use as floor, wall, roof or ceiling panels.

Sizes:

Core thicknesses of 3", 5", 7", 9", or 11" in sizes to 8' x 24'.

Fire Rating:

Meets ASTM E119 one hour fire wall test. Requires 1/2" gypsum wall-board on interior surfaces.

R-value:

Values from R-24 to R-56 depending on thickness and application.

Electrical Wiring:

Factory-formed electrical chase.

Comments:

Company claims no shrinkage, warping, twisting or cracking.

BARRIER System

P.O. Box 346
Canastota, NY 13032
(315) 697-7224

BARRIER System® of rigid, foil-faced polyisocyanurate insulation panels assembled on-site between engineered I-studs. The 2-inch thick foil-faced foam board is placed between studs, creating two dead air spaces within each stud cavity, providing both sound and thermal insulation. The I-studs use less timber than dimensional lumber, while the insulation panels are 40% recycled plastic and 100% recycled aluminum.

Applications:

Exterior walls.

Sizes:

I-studs are 7 1/4" wide and 9' long. Insulation panels are 2" thick.

Fire Rating:

Not specified.

R-value:

R-33.8

Electrical Wiring:

Allows installation of outlets without penetrating the insulation envelope.

Comments:

This system ensures 100% insulation coverage within a wall. Framing, insulation, vapor barrier, and building wrap are assembled in one step. The high R-value combines with low infiltration ratings to reduce energy consumption by 30% over conventional 2" x 6" wall construction. These building components resist warping, bending, and moisture absorption. Two dead air spaces within the panel provide sound abatement.

Eagle Panel Systems

P.O. Box 748
Florissant, MO 63032
(314) 653-0205
(800) 643-3786

Foam-core wall panels with 3 5/8" or 5 5/8" expanded polystyrene sandwiched between two structural 3/8" oriented strand board skins to create a 4" or 6" wall. One stud is contained in the center of each panel, or two studs spaced 16" o.c.

Applications:

Floors, walls and roofs. Panels are joined together with stud splines inserted in recess between panels, which combined with the integral panel studs, creates a 16" or 24" on-center stud system.

Sizes:

Basic panels are 4' x 8'. Available in lengths up to 24', in thicknesses of 4", 6" and 8".

Fire Rating:

Meets 1 hour fire standards. According to tests conducted by the U.S. Testing Company, the products of combustion from EPS are less toxic than those produced from an equal volume of wood.

R-value:

R-17 to R-33. These panels provide excellent protection against air infiltration.

Electrical Wiring:

Wiring chases are located 24" o.c. vertically (and optional horizontal 13" off floor.)

Comments:

This technology developed from concepts used in the commercial refrigeration industry. Brick or any other exterior finish can be installed on site.

Alchem Inc.

3617 Strawberry Rd.
Anchorage, AK 99502-7111
(907) 243-2177

Structural insulated panels with urethane foam core and OSB face, or other material on face.

Applications:

Floor, wall, roof and foundation panels, including framed or unframed panels, or framed panels with thermal break.

Sizes:

Panels are available with core thicknesses of 3 1/2", 5 1/2" or 7 1/2".

Fire Rating:

Class I foam; ICBO testing completed.

R-value:

3 1/2" panel is R-27.75, 5 1/2" is R-43.6 and 7 1/2" is R-57.49.

Electrical Wiring:

Not specified.

Comments:

Panels join with tongue and groove, shiplap or spline joints. Tested panels showed good aged R-values, unlike most urethane foams, which

Enercept, Inc.

3100 9th Ave. S.E.
Watertown, SD 57201
(605) 882-2222

Enercept super-insulated building system offers basement panels, above grade wall panels, roof panels, and support beams in one package. Panels are expanded polystyrene laminated to various sheathing materials.

Applications:

Panels combine exterior sheathing, insulation and framing.

Sizes:

Wall panels have 5 5/8" EPS core, roof panels have 7 3/8" EPS core.

Fire Rating:

Flame spread of EPS is rated 5. Panels are considered combustible.

R-value:

Comparable to a traditional house of R-40.

Electrical Wiring:

Passageways are predesigned and provided by the factory.

Comments:

Panels are perimeter nailed to prevent delamination. The system is several times as strong as conventional 2 x 6 construction, and eliminates 75% of thermal shorts in walls and roof.

FischerSips™

1843 Northwestern Parkway
Louisville, KY 40203
(502) 778-5577

FischerSips structural insulated panels with expanded polystyrene foam core and OSB faces.

Applications:

Walls and roofs.

Sizes:

Foam cores in 3 5/8", 5 5/8" and 7 3/8" thicknesses, in sizes from 4' x 8' to 8' x 24'.

Fire Rating:

Not specified.

R-value:

Not specified.

Electrical Wiring:

Factory precut chase is an option.

Comments:

FischerSips has done extensive testing of thermal performance of houses built with their panels, and can provide energy savings calculations.

Foam Laminates of Vermont

P.O. Box 102
Hinesburg, VT 05461
(802) 453-4438

Structural insulated panel with expanded polystyrene core. Panels have a waferboard exterior face and a gypsum wallboard interior face, and are designed for use with post and beam construction.

Applications:

Wall, ceiling or roof panels, in structural or non-structural styles.

Sizes:

Foam cores in thicknesses of 3 5/8", 5 5/8", or 7 3/8", with panel sizes 4' x 8', 4' x 9' and 4' x 10-16'.

Fire Rating:

Not specified.

R-value:

Not specified.

Electrical Wiring:

Electrical chases optional.

Comments:

Panels join with interlocking tongue and groove, or with double OSB splines.

Futurebilt, Inc.

A-104 Plaza del Sol
Wimberley, TX 78676
(512) 847-5721

Structural insulated panels consisting of a core of expanded polystyrene laminated between two skins of structural waferboard.

Applications:

Floors, walls, and roofs.

Sizes:

Available in sizes from 4' x 8' to 8' x 28', fabricated for construction, in thicknesses of 4 1/2", 6 1/2", 8 1/4", 10 1/4" and 11 1/4".

Fire Rating:

Not specified.

R-value:

R-15 through R-45 depending on thickness of core.

Electrical Wiring:

A standard 1" x 1" chase for wiring is provided either horizontally or vertically.

Comments:

These panels will not twist, warp, or be subject to racking. The labor time required to "dry-in" a building shell is greatly reduced. Panels contain no urea formaldehyde or CFCs.

Harmony Exchange

Route 2 Box 843
Boone, NC 28607
(704) 264-2314

Stress-skin panels with EPS block sandwiched between OSB or gypsum facings.

Applications:

Floor, wall, or roof panels.

Sizes:

4' x 8' to 4' x 24' and 8' x 8' to 8' x 24', in core thicknesses 3 5/8" to 9 3/8"

Fire Rating:

Not specified.

R-value:

R-18 to R-40 depending on core thickness. EPS foam is R-4.17 per inch.

Comments:

This company carries a wide variety of wood products, including glue-laminated beams. A few selections on their product line are resource efficient.

Homasote Company

P.O. Box 7240
West Trenton, NJ 08628-0240
(800) 257-9491
(609) 883-3300

TUPS™ stress-skin panels designed as an insulated structural load-bearing roof system. These panels have a bottom surface of 440 Homasote board, top surface of 1/2" Homasote nail base board, and a core of isocyanurate foam. Top and bottom plies are made from 100% recycled newsprint cellulose.

Applications:

Most types of finish roofing materials can be applied directly to TUPS panels.

Sizes:

4' x 8', 10' and 12' lengths.

Fire Rating:

Isocyanurate foam has a flame spread - 50 and smoke developed - 205; Homasote substrate has a Class C flame spread rating.

R-value:

4" thickness R-20.6; 5" R-29.0.

Comments:

Also available with a bottom surface of UL Class "A" rated NCFR board for superior fire protection. All panels have tongue and groove joints along the long edges. TUPS panels provide good dimensional stability (no more than 2% change).

Insulspan

Structural insulated panels with OSB face and expanded polystyrene cores, made by licensed manufacturers across the United States.

Applications:

Wall and roof panels. Some companies offer both structural panels and non-load bearing panels.

Sizes:

Core thicknesses of 3 5/8", 5 5/8", 7 3/8" and 9 3/8".

Fire Rating:

Fire resistance rating of 60 minutes with interior gypsum board finish.

R-value:

R-17 to R-40, depending on panel thickness.

Electrical Wiring:

Factory-installed wiring chase.

Insulspan includes the following licensed production facilities:

Engineered Panel Technologies

P.O. Box 120427
Nashville, TN 37212
(615) 254-1381

Foam Products Corporation

2525 Adie Rd.
Maryland Heights, MO 63043
(314) 739-8100

North American Panel Systems, Inc.

RD 1 Box 56B
Westmoreland, NH 03467
(603) 352-9994

Ursa Structural Systems, Inc.

Big Pasco Industrial Park, Bld. T1-79 Bay 2
Pasco, WA 99301
(800) 577-6560
(509) 547-9503

Insteel Construction Systems Inc.

2610 Sidney Lanier Dr.
Brunswick, GA 31525
(800) 545-3181
(912) 264-3772

Insteel 3-D® panel building system, including an expanded polystyrene foam panel with steel wire mesh

faces to which shotcrete is field applied to form a finished wall.

Applications:

Insulated load-bearing or non-load bearing walls.

Sizes:

Panels are 4' wide in lengths 6'-24'. Foam core thicknesses can vary from 1 1/2" to 5".

Fire Rating:

Ratings depend on thickness of concrete finish. 1 1/2" gives 1 1/2 hour rating; 2" gives 2 hour rating.

R-value:

Not specified.

Electrical Wiring:

Electrical conduit and plumbing route between wire mesh and foam core.

Comments:

This building system is claimed to withstand weather and seismic activity. Steel wire has recycled content, but recyclability of the wall system at the demolition of the structure may be difficult. Scrap panel can be reused by wiring it together.

J-DECK, Inc. Building Systems

2587 Harrison Road
Columbus, OH 43204
(614) 274-7755

Stress-skin insulated panels with EPS foam core and waferboard skins top and bottom. The panels are installed using 2 x 4 studs, 4' on center to create a structural panel system.

Applications:

Roof decks and exterior walls.

Sizes:

4' x 8', 4' x 9', and 4' x 10' sheets with EPS core thicknesses of 3 5/8", 5 5/8", 7 3/8" and 9 3/8".

Fire Rating:

Not specified.

R-value:

Average of R-4 per inch.

Comments:

Windows are set in place after installation of panels by cutting out openings using circular saw. These panels are dimensionally stable, and experience no swelling, warping, or twisting. Guaranteed not to delaminate.

Korwall Industries, Inc.

326 N. Bowen Rd.
Arlington, TX 76012
(817) 277-6741

Structural insulated panels made from expanded polystyrene with wafer board faces.

Applications:

Roof, exterior wall and floor panels for one- and two-story dwellings.

Sizes:

Foam cores in 3 9/16", 5 9/16" or 7 5/16" thicknesses. Panels are available in sizes 4' x 8' to 8' x 28'.

Fire Rating:

Code requires 1/2" gypsum board on interior walls.

R-value:

Not specified, although infiltration testing results are available.

Comments:

Korwall offers panels in house kits, or as panels alone.

The Murus Co. Building Systems

P.O. Box 220, Route 549
Mansfield, PA 16933
(717) 549-2100

Structural insulated panels with urethane foam core, faced with OSB.

Applications:

Wall and roof panels. The company also sells pre-cut I-joist floors, rafter and roof systems for complete shell packages.

Sizes:

Thicknesses of 4 1/2", 5 1/2", and 6 1/2", in 4' widths up to 20' long.

Fire Rating:

Class 1.

R-value:

4 1/2" panel is R-28, 5 1/2" is R-35, 6 1/2" is R-42.

Electrical Wiring:

Electrical chase built in.

Comments:

Cam-locks that join panels are recycled ABS plastic. 50% of urethane foam is recycled plastic. No studs are used in this system.

Nascor Incorporated

1212 34th Ave. SE
Calgary, AB T2G 1V7 Canada
Ph: (403) 243-8919
Fax: (403) 243-3417

NASCOR-III System™ solid expanded polystyrene infill panels and wood I-beams that are factory-assembled and delivered to the construction site in panels. The wood I-beams can be set on 16" or 24" centers and use less wood fiber to achieve structural framing integrity while allowing longer spans in floors and ceilings, reducing the overall amount of material. The light weight of the infill panels and the I-beams reduce energy expended in transportation.

Applications:

For walls, floors and ceilings. Nascor wall components are attached top and bottom to lumber plates by end nailing through the plates into the Nascor I-studs. Splines (1 1/2" square) are used to join the infill panels to the I-beam columns.

Sizes:

5 1/2" or 7 1/4" thick.

Fire Rating:

Not specified.

R-value:

5 1/2" panels are R-20; 7 1/4" panels provide R-30.

Electrical Wiring:

Electrical Wiring recesses are designed into infill panels and columns.

Comments:

NASCOR-III System is a structural building system that offers high energy efficiency, design flexibility, and potential for less construction time than conventional wood framing systems. Delivered in packaged bundles or complete modular sets.

Perma "R" Products, Inc.

P.O. Box 5235 EKS
Johnson City, TN 37603
(800) 251-7532
(615) 929-8007

Panels with expanded polystyrene core and OSB exterior face and gypsum board interior face

Applications:

Insulated panels are for use with timberframe construction.

Sizes:

Foam cores in 3 5/8", 5 5/8" or 7 3/8" standard thicknesses.

Fire Rating:

Not specified.

R-value:

Not specified.

Comments:

Panels spike or screw to timberframe, and join one another with OSB splines and expanding foam.

W.H. Porter, Inc.

4240 North 136th Ave.
Holland, MI 49424
(616) 399-1963

Insulated panels with expanded polystyrene core, in both structural and non-structural types.

Applications:

Type A panels with structural sheathing on both sides. Type B panels with gypsum wallboard on one side, structural sheathing on the other. Type B panels are used with timberframe or steel frame buildings.

Sizes:

Thicknesses 3 5/8", 5 5/8", or 7 3/8", in sizes 4' x 8' to 4' x 24'.

Fire Rating:

Maximum flame spread not more than 75. Smoke developed not more than 450.

R-value:

R-15 for 3 5/8", R-23 for 5 5/8", and R-30 for 7 3/8".

Electrical Wiring:

Not specified.

Comments:

Panels join with dimensional lumber splines, and are bonded with urethane adhesive.

Radva Corporation

Drawer 2900 FSS
Radford, VA 24143
(703) 639-2458

Thermastructure® and Wallframe™ panels with expanded polystyrene insulation bonded to galvanized steel framing members.

Applications:

Walls, floors and roofs.

Sizes:

Thicknesses 3 1/2" or 5 1/2", in sizes 4' x 8' to 4' x 12'.

Fire Rating:

EPS core has flame retardant added.

R-value:

R-14 for 3 1/2" panel and R-22 for 5 1/2".

Electrical Wiring:

Factory molded vertical or horizontal chases.

Comments:

Steel channels do not provide continuous thermal breaks, so thermal performance is improved. Panels make an efficient use of recyclable materials.

Schmucker Manufacturing Co.

417 E. Fourth St.
Derry, PA 15627
(412) 694-8082

Structural insulated panels with expanded polystyrene core and OSB faces.

Applications:

Residential, commercial and light industrial walls and roofs.

Sizes:

Panel thicknesses of 4 1/2", 6 1/2", or 8 1/4", in sizes to 8' x 24'.

Fire Rating:

Not specified.

R-value:

R-17 for 4 1/2", R-25 for 6 1/2" and R-32 for 8 1/4" panels.

Electrical Wiring:

Standard in 6 1/2" panel and optional in other styles.

Comments:

Panels join with OSB splines. Manufacturer will supply panels alone, or installation package.

Shelter Enterprises

P.O. Box 618 Saratoga St.
Cohoes, NY 12047
(518) 237-4101

Stress-skin panels consisting of expanded polystyrene core sandwiched between builder's choice of substrates such as 7/16" oriented strand board, 1/2" plywood, 1/2" gypsum and Kraft paper.

Applications:

Designed for exterior walls.

Sizes:

Available with standard EPS core thicknesses of 3 1/2", 5 1/2", 7 1/2" and 9 1/2". Panels are available in 4' x 9' through 4' x 16' sizes. Custom panels can be made to builder specifications.

Fire Rating:

Not specified.

R-value:

Average value of R-23 for a 5 1/2" core panel with plywood skins. Guaranteed stable R-values.

Electrical Wiring:

Not specified.

Comments:

All of the manufacturing by-products are recycled and used again in the manufacturing process by Shelter Enterprises. No CFCs used in manufacture or contained in the final product.

Stramit USA, LLC

Box 885

Perryton, TX 79070

(806) 435-9303

Easiwall compressed straw panels with paper facing.

Applications:

Interior wall panels, partitions, and roof decking.

Fire Rating:

Meets codes in England, being tested in Texas.

Comments:

This product has been manufactured and used in England for 50 years. The straw core of the product contains no binders. The Texas plant is just starting production.

Techbuilt Systems, Inc.

941 Clark Ave.

Cleveland, OH 44113

(216) 621-4340

Thermotech 21™ structural insulated panels with expanded polystyrene insulation and galvanized steel tubing as frame.

Applications:

Wall and roof panels. Door and window openings are custom cut.

Sizes:

Wall panel is 7 1/4" thick and roof panel 12" thick, in 48" widths and lengths 4' to 32'.

Fire Rating:

1/2" interior

rywall added to panel provides a wall system that surpasses requirements for ASTM 119 1-hour application.

R-value:

Finished wall R-32; finished roof R-50.

Electrical Wiring:

Pre-cut wire chase.

Comments:

This system uses 18 gauge galvanized steel, and is an efficient application of recyclable materials.

U.S. Building Panels, Inc.

10901 Lakeview Ave. SW

Tacoma, WA 98499

Ph: (206) 581-0288

Fax: (206) 581-0344

Stress-skin panels with an expanded polystyrene core between two sheathings of Sturdi-Wood®.

Applications:

Floors, roofs, and walls.

Sizes:

Available in 3 5/8" to 11 3/8" thicknesses, in 4' widths up to 20' in length.

Fire Rating:

Not specified.

R-value:

In walls 3 5/8" panels provide R-15.5.

Electrical Wiring:

Panels come with pre-drilled wiring chases.

Comments:

The labor time required to "dry-in" a building shell is greatly reduced. Panels contain no urea formaldehyde or CFCs.

Vermont Stresskin Panels

RR #2, Box 2794

Cambridge, VT 05444

(802) 644-8885

Structural insulated panels with expanded polystyrene insulation, and OSB, or OSB and wallboard faces.

Applications:

Walls, roofs, or curtain wall option for wallboard-faced panel.

Sizes:

Core thicknesses of 3 5/8" to 9 1/4".

Fire Rating:

Not specified.

R-value:

R 17 for 3 5/8" panel; R-41.25 for 9 1/4".

Electrical Wiring:

Channels optional.

Comments:

All EPS waste can be returned to the manufacturer for recycling. Panels join with OSB splines.

Wallframe, Inc.

1502 East Opp St.

Wilmington, CA 90744

(800) 969-1983

(310) 518-4848

Wallframe™ structural insulated panels with expanded polystyrene bonded to light gauge galvanized steel frames.

Applications:

Residential or commercial walls, roofs and floor panels.

Sizes:

3 1/2" or 5 1/2" thick, in 4' x 8' to 4' x 12' sizes.

Fire Rating:

Class A. Flame spread 5-20.

R-value:

Net R-15 for 3 1/2" and Net R-23 for 5 1/2".

Electrical Wiring:

Chases molded in.

Comments:

Panels join in shiplap with screws. Metal top and bottom channels or wood plates can be used. Product is ICBO and BOCA rated. Thermal break exists, and no structural sheathing is needed.

Winter Panel Corp.

R.R. 5, Box 168B

Brattleboro, VT 05301

(802) 254-3435

StructureWall™ foam-core building panels consisting of a core of polyisocyanurate foam insulation sandwiched between two OSB skins.

Applications:

Walls and roofs.

Sizes:

4' wide panels up to 28' long. 4 9/16" thick, including two 7/16" OSB faces.

Fire Rating:

Greater than 15 minutes with required 1/2" drywall finish.

R-value:

Minimum R-26.5.

Electrical Wiring:

Optional horizontal chases.

Comments:

No vapor barrier necessary. Freon gas is currently used as the foam blowing agent, but Winter Panel plans to produce freon-free foam in the near future. Panels join with dimensional lumber splines.

Honeycomb Panel and Core

Hexagon Honeycomb Corp.
7980 Clayton Road, Suite 201
St. Louis, MO 63117
(314) 647-0701

Structural kraft paper honeycomb core material for commercial applications. Hexagon does not manufacture laminated structural panels. They manufacture the honeycomb core.

Applications:

For floor, roof and wall panels.

Sizes:

Made to final producer specifications.

Weight:

Not specified. Honeycomb is inherently lightweight (average of 5% material by volume), yet very strong when laminated between panel skins.

Fire Rating:

Flame resistant in panel (U/L rated material available).

Comments:

Honeycomb cells are impregnated with phenolic resin to impart greater strength, resistance to moisture, long-term aging and durability characteristics, as well as immunity from decay, rot, fungi, termites and insects. Hexagon has been in the honeycomb business for thirty years, and provides construction and assembly machinery for new panelized housing manufacturers.

Hexacomb

9700 Bell Ranch Drive
Santa Fe Springs, CA 90670-2981

Ph: (800) 323-9163

Fax: (213) 802-8924

Manufacturers of kraft paper honeycomb core material suitable for panel fabrication.

Applications:

Floor, roof and wall panels.

Sizes:

Made to final producer specifications.

Weight:

Not specified. Honeycomb is inherently lightweight (average of 5% material by volume), yet very strong.

Fire Rating:

Flame resistant in panel. (U/L rated material available).

Comments:

The honeycomb is available with regular and phenolic resin impregnated kraft paper. The core can be faced with paper, aluminum, steel, plywood, particleboard, hardboard, gypsum board, fiberglass and a variety of other materials.

Tri-Cell Corporation

3841 Swanson Court
Gurnee, IL 60031

(708) 336-1321

(800) 352-3300

TRIPANEL and TRIDECK honeycomb panels made from recycled kraftpaper impregnated with phenolic resin for resistance to moisture, fungus, and insects. The honeycomb cell cores are faced with 3/8" plywood.

Applications:

Commercial displays, partitions and potentially structural floors and walls.

Sizes:

Available in a variety of panel dimensions and honeycomb cell sizes.

Weight:

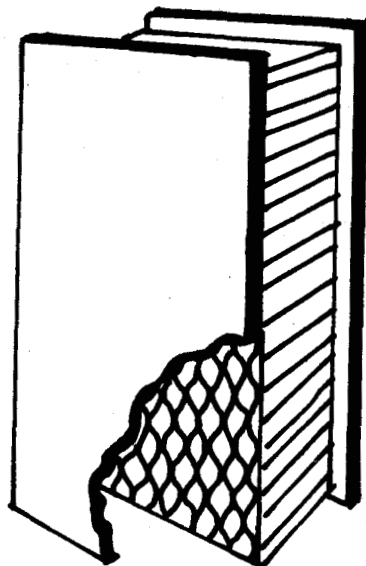
4' x 8' panel weighs 110 lbs.

Fire Rating:

Not specified.

Comments:

These panels can be laminated with virtually any skin material, and provide a very high strength to weight ratio. Can be cut with a knife, hand or power saws.



Sheathing & Wallboard

Sheathing is ordinarily one of the most wood-fiber-intensive aspects of construction. Some wall systems reduce or eliminate the use of exterior sheathing, and this can reduce the total amount of wood used in a construction project. Where sheathing is used, there are several material choices that are more resource efficient than traditional sheathing.

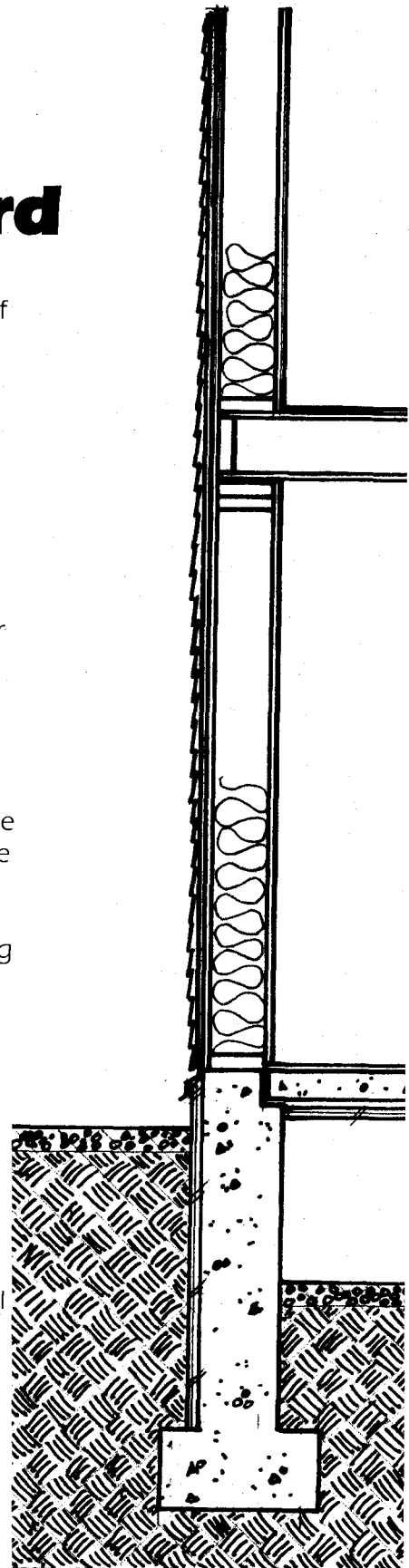
The switch from 1 x 6 and 1 x 8 ship-lap sheathing boards to plywood in the 1930s and 40s signalled a diminishing resource base and manufacturing advances. Plywood has been the most common exterior sheathing material used over the last few decades. It is manufactured from veneers that are peeled from large diameter trees and laminated together. Oriented strand board (OSB), which can be made from smaller diameter, fast growing tree species, allows for a more efficient utilization of harvested timber, and use of OSB sheathing is now an accepted industry practice.

Another sheathing innovation combines three wood veneer layers sandwiched around two inner layers of coarse particle board. This uses fewer veneers than plywood, which in turn reduces dependence on large diameter timber. At least one company offers an exterior sheathing made from gypsum and cellulose fiber. Another company offers a structural sheathing made from recycled wood fiber with foil facing.

Some of the fiber-cement composite manufacturers (see Exterior Siding & Trim) offer their products in sheet stock. These can be used in "shear wall" applications to prevent rack, and they offer excellent fire resistance. Some wall systems require the use of structural sheathing, while others can utilize non-structural sheathing. Structural sheathing is sometimes replaced by non-structural sheathing with rack metal or braces to meet structural codes.

This chapter also contains products that can be used as interior wallboard. They either contain recycled material or utilize waste resources. For instance: a hardboard product that is manufactured from waste wood; a new type of sheetrock made from perlite, gypsum, and recycled post-consumer newsprint; and fiberboard made from agricultural by-products or recycled newsprint. Fire codes often require at least 1/2" drywall on interior walls. Several companies make gypsum drywall with recycled content, although the quantity of recycled content varies widely between companies.

One of the problems associated with particleboard and fiberboard in the past has been urea formaldehyde outgassing. A new generation of board is now available that is made with phenolic resins that do not offgas formaldehyde and are stronger than their predecessors.



CanFibre Group Limited

Suite 100-1500 W. Georgia St.
Vancouver, BC V6G 2Z6
(604) 685-2430

Medium Density Fiberboard made from 100% recycled fibers, in a panel-press process that reduces the curing time for panels.

Applications:

Non-structural sheathing.

Sizes:

Sheets 4' x 8' x 3/4". Custom thicknesses up to 4" are possible.

Comments:

CanFibre expects to have a U.S. plant on line in California by the end of 1995. The manufacturing process can use wood fiber from telephone books or wood scrap materials.

Compak Systems Limited

Torr Street, Gainsborough
Lincolnshire, DN21 2EG
England

Ph: (0427) 616927

Fax: (0427) 810158

Composite panels made from agricultural byproducts, including wheat straw, rice straw, sugar cane bagasse, cotton stalks and others. The agricultural fiber is chopped and mixed with a resin binder; this mixture is fed into a steam heated press where the heat cures the resin to produce a rigid board.

Applications:

Can be used as a direct replacement for conventional woodchip board or thin plywood.

Sizes:

Thickness ranges from 4mm to 16mm (.16" to .63").

Comments:

Binder is formaldehyde-free. The manufacturing process is designed to be cost effective when operated on a small scale, such as would be appropriate in many rural areas in the U.S.

Domtar Gypsum

122 Old Dover Road
Newington, NH 03801
(800) 366-8274

Gyproc® gypsum board containing various percentages (up to 12%) of recycled scrap wallboard as well as byproduct gypsum (up to 100%) reclaimed from the emissions of fossil-fueled factories and chemical production facilities. Domtar has been progressive in efforts to utilize waste resources. Recycled content varies depending on particular manufacturing plant. Wallboard facings are made from 100% recycled newspaper and corrugated containers.

Applications:

Interior walls and ceilings for residential and commercial uses.

Sizes:

3/8", 1/2" and 5/8" in 4' x 8' and 4' x 12', 4' x 14' and 2' x 8' or 2' x 12' panels.

Adhesives Used:

Naturally occurring bond created by the gypsum powder.

Fire Rating:

Flame spread, 15.
Smoke developed, 0.

Comments:

Domtar operates twelve gypsum board plants throughout the U.S. and Canada.

Evanite Fiber Corporation

P.O. Box E
Corvallis, OR 97333
(503) 753-1211

Hardboard made from waste wood such as pallets, crates, and construction debris, which is chipped, mixed with sawdust and plywood manufacturing waste, and heat-pressurized to form a solid panel. This product makes excellent use of otherwise burned or discarded resources.

Applications:

Furniture, cabinets, and interior wall panels. Evanite hardboard is also used as a facing over laminated veneer lumber to create core material which is then wrapped in vinyl for window frames.

Comments:

Evanite eventually expects to recycle over 100,000 tons of junk wood annually, keeping this valuable wood fiber out of landfills.

Georgia-Pacific

133 Peachtree St. NE
Atlanta, GA 30303
(404) 652-4000

Blue Ribbon™ OSB rated sheathing and Blue Ribbon™ OSB rated Sturd-I-Floor®.

Applications:

Structural panel sheathing for roof deck, wall and subfloor. Sturd-I-Floor combines subfloor and underlayment in one sheet.

Sizes:

Sheathing in thicknesses 3/8" to 3/4". Floor in 19/32" to 1 1/8" thicknesses and 8' lengths.

Fire Rating:

Code approved.

Comments:

These products combine compressed wood strands in three layers, bonded with phenolic resin.

Homasote Company

P.O. Box 7240
West Trenton, NJ 08628-0240
(800) 257-9491
(609) 883-3300

A variety of sheathing products made from 100% recycled newsprint cellulose.

Applications:

Easy-ply® roof decking is designed for use with exposed beams. The panels join together with tongue and groove. They are nailed directly to wood rafters or beams and, depending on thickness, can be used for 24", 32", or 48" o.c. rafters. Most types of roofing finish materials and insulation boards can be applied directly to Easy-ply.

440 Homasote® fiberboard is used for exterior siding, nail base sheathing, ceilings and soffits. It can be nailed directly to framing, or applied over previously finished wall surface with adhesive.

Homasote 4-way® floor decking is a structural, noise-deadening sub-floor and carpet underlayment.

Sizes:

Easy-ply is available in four thicknesses from 1" to 2 3/8", in 2' x 8' (nominal) panels with tongue and groove on long edges.

440 Homasote fiberboard comes in two thicknesses: 1/2" available in 4' x 4', 4' x 8', 4' x 10', 4' x 12', and 5' x 8' sheets; 5/8" in 4' x 8', 4' x 12' and 8' x 12' sheets.

Homasote 4-way floor decking is

available in 1 3/4" and 1 11/32" thicknesses in 2' x 4' and 4' x 8' sheets.

Fire Rating:

These products have a Class C flame spread rating.

R-value:

Easy-ply; 1" = R-2.4, 1 3/8" = R-3.27, 1 7/8" = R-4.46, and 2 3/8" = R-5.0. 440 Homasote fiberboard; 1/2" = R-1.2, and 5/8" = R-1.33. 4-way floor decking; 1 11/32" = R-3.27, 1 3/4" = R-4.46.

Comments:

All Homasote products are protected against termites and fungi. The above listed panels can easily be handled on-site by two workers, and may be cut with handsaws or power saws.

See also Floor Coverings, and Panel Systems.

Iowa Recycled Plastics

322 North Main

Sioux Center, IA 51250

Recycled plastic sheets for use as agricultural building sheathing.

Applications:

Livestock barn sheathing. May also be used as shelving.

Sizes:

4' x 8' sheets. In marbled white or multicolor combinations.

Comments:

Panels are made from 100% post-consumer HDPE plastic, and are moisture resistant.

Louisiana-Pacific

111 S.W. Fifth Avenue

Portland, OR 97204

(503) 221-0800

Inner-Seal® OSB. Louisiana Pacific achieves an efficient harvest of wood fiber from small, fast-growing tree species, such as aspen, to manufacture a variety of wood products including these siding materials.

Applications:

Sheathing used on walls and roofs.

Sizes:

Available in standard sheathing dimensions in standard thicknesses.

Fire Rating:

Class C or 3 rating.

R-value:

7/16" = R-0.57.

Comments:

This product is dimensionally stable

and durable, and provides structural integrity for added shear strength and rigidity in exterior walls. L.P. strives to fully utilize the available fiber in all trees harvested from their private forest lands or their seven-year-rotation wood fiber plantations. See also Siding, Insulation, and Framing.

-and-

FiberBond™ fiber-reinforced gypsum panels made from three blended layers of gypsum, perlite and cellulose fiber from recycled newsprint and telephone directories.

Applications:

Three styles for underlayment, wallboard, and sheathing. Can be nailed, screwed and stapled easily. Higher density than conventional gypsum wallboard.

Sizes:

Available in 3/8", 1/2" and 5/8" thicknesses in sheets of 4' x 8', 9', 10', and 12'. Lengths available to 24'.

Fire Rating:

Type X. 1/2" panels are rated for 45 minutes and 5/8" panels are rated for one hour.

Comments:

FiberBond provides uniform strength and superior nail, screw and staple holding characteristics. Resists surface abrasion and impact damage. No taping required. Fully scrubbable. Provides good sound control and thermal insulation. An excellent use of recycled newsprint, that when combined with gypsum and perlite in the manufacture of these panels, provides a more sustainable use of our natural resources. See also Insulation, Framing, and Siding.

Meadowood Industries, Inc.

33242 Red Bridge Road

Albany, OR 97321

(503) 259-1331

"Meadowood" wall and ceiling board made from ryegrass straw—an agricultural byproduct. One of a new generation of products that puts agricultural waste fiber to good use.

Applications:

Can be used as an exposed decorative panel or faced with wood veneer for a desired interior finish. Is also being made available as a core material for laminated trim and interior building panels.

Sizes:

Manufactured in 4' x 8' sheets in a variety of thicknesses.

Fire Rating:

Class C fire rating.

Comments:

This board can be made from the waste of an annually grown crop—a good alternative to burning this resource in the field, as is currently done. Has a density of 40 lbs. per cubic foot. Meadowood is not yet in full production and is available in very limited quantities.

Oregon Strand Board Co.

34363 Lake Creek Dr.

Brownsville, OR 97327

(503) 466-5177

(800) 533-3374

COMPLY® sheathing consisting of three veneers of Douglas fir and two thick inner layers of reconstituted wood fiber that are bonded together, creating a solid-core sheathing that is strong and durable. This product exemplifies an efficient use of virgin wood fiber by allowing a greater percentage of the harvested fiber to be put to use in the final product. The wood fiber cores allow for non-veneer grade wood to be utilized.

Applications:

Walls, floors, and roofs.

Sizes:

Available in standard 4' x 8' dimensions in seven thicknesses. Edges can be tongue and groove or square.

Comments:

More expensive than waferboard or OSB, COMPLY is sold as a top value, solid core product. It is moisture resistant and guaranteed not to delaminate. COMPLY Rated Sheathing provides excellent fastener-holding ability. See also Exterior Siding & Trim.

Rodman Industries

P.O. Box 76

Marinette, WI 54143

Ph: (715) 735-9500

Fax: (715) 735-6148

Resincore® I particleboard made of sawdust, phenolic resin, and wax. Also Resinfloor™ industrial floor, made from blended hardwood fibers and phenolic resins.

Applications:

Particleboard for non-structural sheathing. Flooring is an alternative to hardwood strip flooring for factories and warehouses.

Sizes:

Particleboard in 55# with thicknesses from 1/2" to 1", and 45# with thicknesses from 5/8" to 1 3/16". Flooring comes in 4' x 8' x 3/4" predrilled sheets.

Comments:

These products use phenolic resin and contain no formaldehyde. Phenolic resin is water resistant and is stronger than UF resin board, so thinner board can be used. Resinfloor is twice as hard as oak.

Simplex Products Division

P.O. Box 10

Adrian, MI 49221-0010

(517) 263-8881

Thermo-ply exterior sheathing made from 100% recycled wood fiber, faced with aluminum foil or polyethylene.

Applications:

Structural or non-structural exterior wall sheathing applications.

Sizes:

48" wide by 96" long (custom lengths available). Three thicknesses, .078", .113" and .137", for standard grade, structural grade and super strength grade.

Fire Rating:

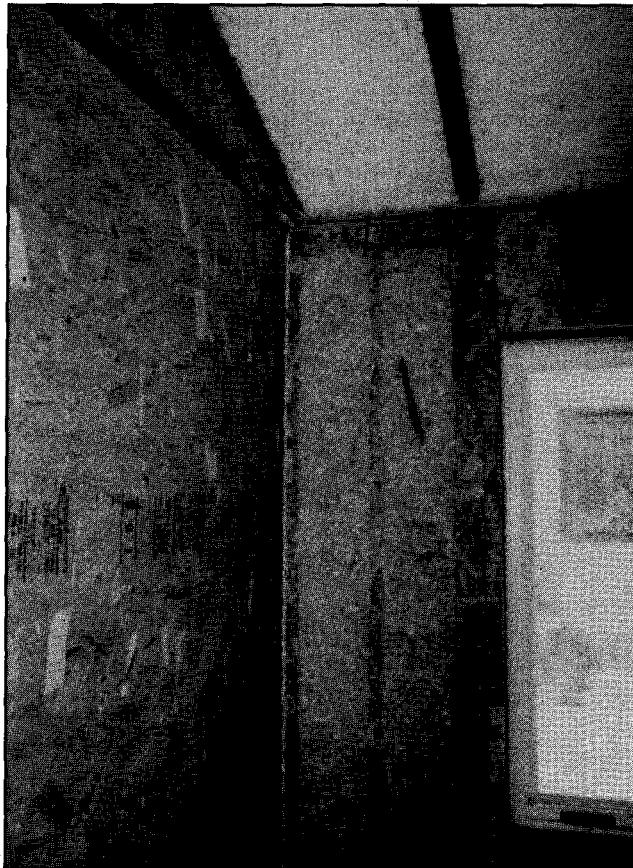
Class C flame spread.

R Value:

R-20 (Thermo-ply is designed function within a wall system to reduce the R-value loss caused by infiltration.)

Comments:

Thermo-Ply core contains 80% post-consumer recycled material from cardboard boxes, office waste, etc., and is recyclable. The bonding agent is polyvinyl alcohol, not a hazardous material. Thermo-ply has racking and shear strength necessary to meet building codes.

**Weyerhaeuser**

4111 East Four Mile Road

Grayling, MI 49738

(517) 348-2881

Structurwood® made from small, fast growing trees which are flaked and then bonded with waterproof adhesive. Structurwood EDGE for floors.

Applications:

Walls, floors, and roofs.

Sizes:

Available in standard dimensions in thicknesses of 3/8", 7/16", 1/2" and 5/8", 23/32" and 3/4". Custom orders to 8' x 24' x 1 1/4".

Fire Rating:

Class C.

R value:

R-1.6

Comments:

Structurwood is commonly used as a web material by other I-joist manufacturers.

Roofing

Homeowners want a durable, attractive roof. Many people admire the textural beauty of cedar shakes and slate or tile roofing. These materials are handsome, but do not necessarily provide for efficient resource use. Concerns of resource efficiency call for a roofing material to be lightweight, recycled and/or recyclable, and durable. At the same time, practicality dictates that roofing should be fire resistant and affordable.

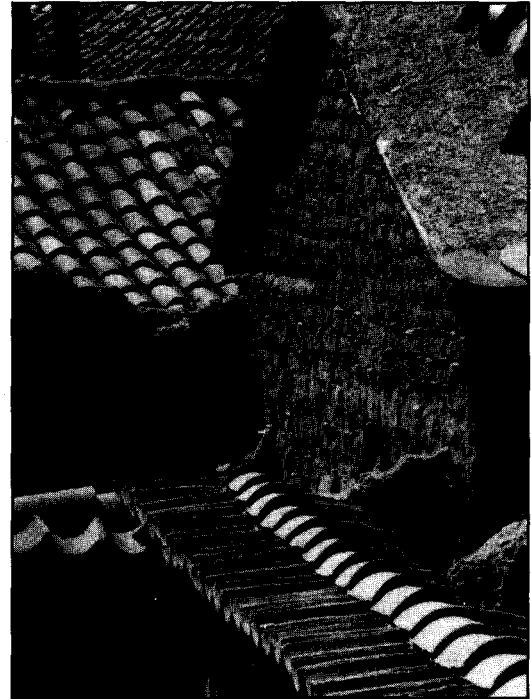
The manufacture of good quality cedar shakes (with their straight grain and knot-free characteristics) is dependent upon the few remaining old-growth cedar trees in the Pacific north-west and western Canada. Cedar is a very slow growing climax species that is difficult to harvest efficiently. Furthermore, despite their textural beauty, cedar shakes last only about 25-30 years in dry climates and 10-15 years in moist climates. Cedar shakes also demand a high level of maintenance. Furthermore, cedar shakes are a very unwise choice in areas prone to fire, since they are highly combustible when dry.

By contrast, two roofing materials with good fire ratings are tile and slate. Both are very durable, yet they have detriments. The extreme weight of these materials creates the need for larger dimensional roof framing and trusses to support the roof. This increases the resource demand and materials cost for the roof system. The cost of tile and slate themselves may also be prohibitive.

To minimize material requirements in roof framing, a roofing material should be relatively lightweight, yet durable. Several roofing products meet these criteria in varying degrees. This chapter contains fiber-cement composite roofing slates, as well as shingles, shakes and panels made from recycled metal or recycled plastic. There is a selection of recycled rubber composite roofing and accessories for flat roofs. A small selection of companies producing traditional organic asphalt shingles with recycled content are also listed here.

Most organic asphalt shingles available today contain recycled "mixed" waste paper in their base. Some contain reclaimed mineral slag as part of the surface aggregate. The recycled content of these traditional shingles merits acknowledgment, even though the shingles themselves have relatively short life spans (15 to 25 years) and are not yet easily recycled. (Note: see the chapter on Job-Site Recycling for information on efforts to recycle asphalt shingles.) Some roofing materials can be applied over an old asphalt-shingle roof which postpones the need to dispose of the shingles.

Fiber-cement composite slates or shakes are long-lasting (up to 60 year warranties), fireproof, and make efficient use of wood fiber. Although the fiber source for the listed manufacturers is not clear, the wood used in this type of product can be harvested from small diameter and fast-growing species, or reclaimed from wood waste. These slates weigh between 325 and 600 pounds per square (100 square feet make up a roofing "square") and can be used on standard roof structures. The blend of fiber with ground sand



and cement yields a durable product that can be ground up into a sand/mineral dust at the end of its life.

Fiber-cement shingles may not perform as well in freeze-thaw climates, and some manufacturers don't warranty their roofing products in northern regions or at higher altitudes. Check with individual manufacturers for product suitability in particular climates. Many companies that manufacture fiber-cement composite slates for roofing also make similar exterior siding products, and these are usable in any climate. Listings for those products are in the Exterior Siding and Trim chapter. Fiber-cement composite slates characteristically require hand nailing and more installation time than other roofing systems. The slates have a somewhat brittle consistency and installers must be careful to avoid breakage, as done during installation of natural slate.

Like some fiber-cement roofings, other roofing products may be vulnerable to repeated freeze-thaw cycling. Most manufacturers of such products limit their distribution and sales area, but homeowners in northern climates should be aware of the problem, and make sure that a roofing product is suited to the climate where it will be installed.

Metal roofing is durable and low maintenance. Most metal roofing products have a high percentage of recycled materials, as they are manufactured in electric furnace mills which are designed to use recycled stock. Metal roofs are lightweight, and can contain up to 100% recycled material. While there is a great deal of embodied energy in the extraction and refining of metal products, their high recycled content and ready recyclability somewhat offset their energy cost. At the end of its useful lifetime, most metal roofing is recyclable, unless it is coated with a non-metallic substance such as PVC, which is difficult to separate from the metal.

Metal panel roofing, generally steel or aluminum, is a standard product readily available from a number of manufacturers and distributors nationwide. This chapter provides listings for manufacturers of less ubiquitous metal roofing products, such as interlocking copper shingles, steel shingles and aluminum shakes.

Roof shingles made from recycled plastic resins provide an extremely lightweight roofing alternative. The recycled plastic roofing materials listed here weigh less than asphalt shingles, and their use diverts material from landfills. They may be recycled again at the end of their useful life.



Square:

**A measure of roof area
equal to 100 square feet.**

American Cem-Wood Products

P.O. Box C

Albany, OR 97321

(503) 928-6397

(800) 367-3471

Cemwood Shakes™, Trieste Tile™ and Permatek™ shakes composed of roughly 2/3 portland cement and 1/3 wood fiber derived from sawmill chips.

Applications:

Can be applied over solid or spaced sheathing.

Sizes:

Cemwood Shakes are bundled in random widths of 12", 7" and 5", and are 22" long with simulated wood texture on lower 11". Permatek shakes are 14' x 14 1/2".

Colors:

Cemwood Shake, Tile and Permatek each in two colors.

Weight:

Cemwood Shakes, 580 pounds per square; Permatek and Trieste Tile 450 pounds per square.

Fire Rating:

Class A rating depending on underlayment used.

Comments:

A lightweight, non-combustible, composite product which can be nailed and sawn similar to wood shakes. Comes with a 50 year warranty.

Cal-Shake, Inc.

P.O. Box 2265

Irwindale, CA 91706-2265

(800) 736-7663

(818) 969-3451

Cal-Shake, Cal-Slate, and Cal-Clay, roofing shake, slate and clay shingles made from cement, perlite, synthetic iron oxides, synthetic polyester fiber and recycled cardboard.

Applications:

New or reroof applications on sloped roofs.

Sizes:

Cal-Slate and Cal-Clay 6" wide. Cal-Shake in 5", 7", 10" 11" wide, 22" long with 10" exposed detail.

Colors:

Shake and slate each come in four different colors.

Weight:

560 pounds per square.

Fire rating:

UL Class A.

Comments:

This is a relatively heavy roofing material and is only sold in the Sunbelt. It is not recommended for areas with high occurrence of freeze/thaw cycles.

Celadon

P.O. Box 309

New Lexington, OH 43764

(800) CEL-SLATE

(800) 699-9988

Celadon™ Ceramic Slate™ clay shingle that acts as replacement for slate roofing.

Applications:

Simulates appearance of slate with lighter weight on sloped roofs of 6:12 minimum.

Sizes:

108 pieces per square. Pieces are 10 7/8" x 15 3/4" with 3/4" thickness and 10 1/8" x 13 1/4" exposure.

Colors:

Five colors, fired in.

Weight:

580 pounds per square.

Fire rating:

Impervious to fire.

Comments:

60 year limited warranty. This roofing product is relatively heavy, but is impervious to freeze/thaw and suited to use in northern climates.

CertainTeed Corporation

Roofing Group

P.O. Box 860

Valley Forge, PA 19482

(800) 782-8777

Variety of organic felt-based shingles that incorporate recycled paper and recycled waste slag with a resulting 20% to 25% recycled content.

Applications:

New and reroof uses.

Sizes:

Most common size available is 12" x 36" with 5" exposure.

Colors:

Many colors and patterns available.

Weight:

Approximately 215 - 230 pounds per square.

Fire Rating:

Class C fire resistance.

Comments:

The recycled content of traditional shingles such as these made by CertainTeed is often overlooked.

These shingles offer the consumer a good roofing product with recycled content. Available in a variety of styles with 20 to 30 year warranties. Ask for Roofing Group to find the manufacturer nearest you.

Classic Products

P.O. Box 701

Piqua, OH 45356

(800) 543-8938

(513) 773-9840

Rustic Shingle aluminum roofing made to look like hand split cedar shakes.

Applications:

For new and reroof uses.

Sizes:

The 12" by 24" shingles have a 1 1/8" butt thickness and are joined by a 4-way interlock.

Colors:

Available in seven colors with KYNAR finish.

Weight:

45 pounds per square.

Fire Rating:

Listed for Class A, B, and C fire ratings.

Comments:

Rustic Shingle has 98% recycled content, primarily used beverage containers. Energy savings and long life contribute to low lifecycle cost. Low weight means Rustic Shingle can be installed over existing roofs. 50-year limited warranty.

Conklin Metal Industries

P.O. Box 1858

Atlanta, GA 30301

(404) 688-4510

Diamond pattern metal roofing shingles, in galvanized and copper.

Applications:

Metal roofings shingles, for new or reroofing.

Sizes:

Shingles are 10" x 14" in a diamond pattern.

Weight:

Galvanized 103 pounds per square; copper 132 pounds.

Fire rating:

Will not burn.

Comments:

Metal shingles are recyclable. Conklin also offers alloy shingles, but these contain lead, and may affect the suitability of these roofs for rooftop water catchment.

Crowe Industries Ltd.

116 Burris St.
Hamilton, Ont L8M 2J5 Can.
(905) 529-6818

Authentic Roof slates, made from 100% recycled polymers and rubber.

Applications:

As an alternative to slate roofs, almost as easy to install as asphalt shingles.

Sizes:

Tiles 12" x 18", with exposures 6" to 8".

Colors:

Black, cast in patterns of actual slates.

Weight:

50-80 pounds less per square than asphalt type shingles. Requires no additional supports.

Fire rating:

Not specified

Comments:

Authentic roof is fastened with standard nails to any roof deck. Tiles are completely recyclable, and have a 50-year warranty.

Eiger Building Products

4770 Biscayne Blvd., Suite 1020
Miami, FL 33137
Ph: (305) 573-7778
(800) 45-EIGER
Fax: (305) 573-7775

EigerShake™ thermoplastic roofing made from GE Noryl® resin with 52% recycled plastic from computer cases.

Applications:

A cedar shake appearance, with interlocking installation, for new or reroofing. Can be installed over asphalt with no retrussing.

Sizes:

Panels 20" x 40", each equivalent to 13 cedar shakes.

Colors:

In three colors.

Weight:

90 pounds per square.

Fire rating:

Meets Class A flame protection standards when installed per manufacturer's recommendations.

Comments:

This product has a 50 year limited warranty. It passes 130 mph wind tests, and meets codes in the U.S. and Canada.

Eternit

P.O. Box 679
Blandon, PA 19510-0679
Ph: (800) 233-3155
(610) 926-0100
Fax: (610) 926-9232

Fiber-cement composite roofing slates made from portland cement and wood fiber cellulose. With textured surface and beveled edges, these slates are also available in three styles of corrugated roofing panels.

Applications:

In addition to conventional roofing applications, other uses include fascias, mansards, facades and industrial cladding. Corrugated style recommended for commercial and industrial structures.

Sizes:

Slates are 3/16" thick and 10 5/8" x 15 3/4" in dimension. Corrugated roofing comes in a variety of widths to 42", lengths to 10' and thicknesses of 7/32", 1/4" and 3/8".

Colors:

Available in blue black, grey green, and rose grey. Corrugated styles in natural grey only.

Weight:

Average 430 pounds per square. Corrugated weight depends on style with average product weight of 3 pounds per square foot.

Fire Rating:

Class A rating when installed over 5/8" sheathing.

Comments:

Eternit Slates are very durable, asbestos-free, and come with a 30 year non-prorated warranty. They can be cut and punched with a slater's hammer, and come pre-drilled. As they cannot be air-stapled, however, they require a bit more installation time than other roofing materials. See also siding.

Everest Roofing Products

P.O. Box 2430
Industry, CA 91746
(800) 767-0267
(310) 692-1446

Everest polymer roofing shake of polyurethane foam and polymer elastomer.

Applications:

The polymer shake substitutes for cedar or slate roofs. It is molded for random appearance and suitable for

reroofing or new roofs, with a 4-way interlock.

Sizes:

15 1/2" x 13"; 1 1/4" thick at front.

Colors:

3 "cedar" styles and 5 "slate" styles.

Weight:

150 pounds per square

Fire rating:

Class A

Comments:

Product has lifetime warranty and manufacturer claims it won't split or warp. Everest is a relatively light-weight roofing that provides a shake look.

Georgia-Pacific

133 Peachtree St. N.E.
Atlanta, GA 30303
(404) 652-4000
(800) 447-2882

A variety of asphalt organic shingles with recycled waste paper used in the base.

Applications:

New and reroof; residential and commercial.

Sizes:

Available in 3-tab style with 12" or 12 1/4" width and 36" length; "no cut-out" style with 12 1/4" width and 36" length; and T-lock style with 21 1/2" width and 19" length.

Colors:

Many colors available.

Weight:

Approximately 215 - 230 pounds per square.

Fire rating:

Class C.

Comments:

The recycled material in traditional shingles such as these is often overlooked. These shingles offer the consumer a good roofing product with recycled content.

Gerard Roofing Technologies

955 Columbia Street
Brea, CA 92621-2927
(714) 529-0407
(800) 841-3213

Roofing tiles and shakes with a base of pre-painted galvanized steel and a coating of graded stone granules.

Applications:

Residential and commercial. Panels are designed to be applied directly over 1/2" plywood sheathing, but can also be installed over open

rafters. Wood or steel battens are used under roofing.

Sizes:

Tiles are 45 3/4" x 15 1/2"; shakes are 44 3/4" x 15 1/2".

Colors:

Available in eight solid colors and seven Mediterranean blends.

Weight:

140 pounds per square.

Fire rating:

Class A.

Comments:

These panels interlock to create a continuous, weather-resistant barrier. The metals used in the manufacture of this product comes largely from recycled stock. Comes with a 40-year warranty on weatherproofness.

Humane Manufacturing Co.

805 Moore St.

Baraboo, WI 53913-2796

(800) 369-6263

(608) 356-8336

Roof-Gard™ recycled rubber walk pad for rooftops.

Applications:

To protect roofs from foot traffic.

Sizes:

4' x 6', 2' x 6', or 3' x 4', in thicknesses of 3/8", 1/2", or 3/4". In low diamond or button patterns.

Comments:

Virtually maintenance free, manufactured from recycled tires with no filler added.

Innovative Formulations Corporation

670 W. 33rd Street

Tucson, AZ 85713

Ph: 602-628-1553

Fax: 602-628-1580

A continuous filament, single-ply, water-based, fluid applied roofing system that acts as both an insulator and reflector for flat roofs.

Applications:

Mirrorseal is combined with Mirrorfab, a white spunbound polyester backbone fabric, and a reflective topcoat which can be applied over virtually any sound roof surface, reducing demolition waste.

Fire Rating:

Has no flash point.

Comments:

This system is designed to withstand extreme temperatures while retaining structural flexibility. Can support a

3500 pound footprint-sized load.

James Hardie Building Products

10901 Elm Ave.

Fontana, CA 92337

(909) 356-6300

(800) 426-4051

Hardishake® fiber cement composite roofing slates with a wood shake texture. Made from portland cement and wood fiber cellulose.

Applications:

New and reroof. Can be installed over existing roof without additional structural reinforcement.

Sizes:

1/4" thick, 22" long in widths of 6", 8" and 12".

Colors:

Available in seven colors.

Weight:

When laid with a 10" exposure, Hardishake has a dry weight of approximately 380 pounds per square.

Fire Rating:

Can be installed to achieve a Class A rating.

Comments:

When properly installed, Hardishake is covered by a 50-year transferable, limited warranty. Can be walked on without damage.

Louisiana-Pacific

111 SW Fifth Ave.

Portland, OR 97204-3601

(800) 777-0749

Nature Guard® fiber cement roofing shakes.

Applications:

New or reroof applications.

Sizes:

In 5", 7" and 12" widths, 22" long with 3/4" butt thickness.

Colors:

3 integral colors.

Weight:

Approximately 575 pounds per square.

Fire rating:

Non-combustible; will meet California fire codes.

Comments:

Product contains 10% fly ash and is new this year.

MaxiTile, Inc.

17141 S. Kingsview Avenue

Carson, CA 90746

(800) 338-8453

-or-

4153 L.B. McLeod Rd.

Orlando, FL 32811

(800) 845-6293

MaxiTile composite roofing consisting of Portland cement, silica and cellulose fiber. Designed to achieve the look of 2-piece Mission tile (corrugated profile).

Applications:

Appropriate for new and reroof uses.

Sizes:

Available as 36.5" x 24" shingles as well as hip and ridge caps. 1/4" thick.

Colors:

Terracotta Red, Autumn Brown, Clay, Marble Gray (light), and Oxford Gray (darker).

Weight:

340 pounds per square.

Fire Rating:

Class A.

Comments:

MaxiTile contains no asbestos and can withstand extreme weather conditions. Minimum headlap of 4" is recommended. Transferable 50-year limited product warranty.

Met-Tile

P.O. Box 4268

Ontario, CA 91761

(909) 947-0311

Zincalume steel roofing with stucco embossed finish.

Applications:

Met-Tile provides a lightweight alternative to clay tile roofing. Panels are applied vertically in one piece from ridge to eave.

Sizes:

Panels are 36" wide, in lengths 2'-20' by one-foot increments. A 20' panel covers the area of 80 clay tiles.

Colors:

Eight colors available.

Weight:

125 pounds per square.

Fire rating:

Class A, B, or C, depending on installation.

Comments:

Met-Tile includes a one-mil thick backer coat for weather resistance.

Metal Sales Manufacturing Corporation

6260 Downing
Denver, CO 80216
(800) 289-7663

Stile™ tile-like metal roofing panels with a base of hot-dipped galvanized recycled-content steel.

Applications:

Designed to simulate the look of clay tiles for residential, commercial and mansard-type roofs.

Sizes:

26 gauge panels in 4' widths and lengths 3' to 16' in 1' increments.

Colors:

Available in five colors.

Weight:

100 pounds per square

Fire rating:

Class A.

Comments:

These panels have an epoxy-based undercoat and a primed and painted top surface that is durable against ultraviolet light. They are overlapped roughly 5" on each side (one tile "wave") to provide a weather tight roof. 20-year limited warranty.

Re-Con Building Products, Inc.

Box 1094
Sumas, WA 98295
(800) 347-3373

Fire Free™ fiber cement roofing, in rustic shake, colonial shingle, or quarry slate styles.

Applications:

New or reroof applications for minimum pitch 3:12.

Sizes:

Length 22.5", shake widths 5", 7", or 12"; slate width 12". Maximum exposure 10".

Colors:

Several tan and gray integral colors.

Weight:

Slate and shake 395 pounds per square, shingle 375 pounds per square.

Fire rating:

Class A.

Comments:

50-year limited warranty, non-prorated. These fiber cement products are freeze/thaw approved for application in northern climates.

Revere Copper Products, Inc.

P.O. Box 300
Rome, NY 13442-0300
(800) 490-1776

Revere copper shingle metal roofing.

Applications:

For installation over solid substrate on roofs or walls with 3:12 pitch or greater.

Sizes:

4' lengths of shingles, with 9" exposure and .019" thickness. Coverage per shingle is 3 sq. ft.

Weight:

143 pounds per square.

Fire rating:

Class A.

Comments:

Copper can be expensive up-front, but provides a durable roof and is not only recyclable, but may also have high recycled content.

RTS Company

1805 Newton Ave.
San Diego, CA 92113
(619) 696-0102

Nine roofing systems consisting of steel or aluminum shingles. Manufactured from recycled metals.

Applications:

Commercial and residential. Can be installed over most existing roofs without removing old roofing.

Sizes:

Sizes vary by style. Mission Tile design is 8" x 17", while the "long-run" tile panel designs average 60" long in a variety of widths.

Colors:

Ten standard colors with custom colors available.

Weight:

Aluminum ranges from 35 to 60 pounds per square. Steel ranges from 80 to 140 pounds per square.

Fire rating:

Class A, depending on installation.

Comments:

These lightweight roofing materials reduce the need for a heavy superstructure below. 25-year warranty.

Supradur

P.O. Box 908
Rye, NY 10580
(800) 223-1948
(914) 967-8230

Supra Slate® II fiber-cement compos-

ite roofing shingles available in slate, shake and traditional styles. Made from portland cement and wood fiber cellulose.

Applications:

New and reroof.

Sizes:

Available in thicknesses of .155", .18" and .22" in rectangular, square and pentagonal shapes. Available dimensions range from 9.35" x 16" to 12" x 24".

Colors:

A variety of colors to choose from including black, grey, red, brown & green.

Weight:

Depends on style chosen. Ranges from 240 to 500 pounds per square.

Fire Rating:

Class A and B ratings.

Comments:

Slates are cured in a high-pressure steam autoclave to ensure dimensional stability. They come with pre-drilled nail holes, and will not warp, curl or shrink. All Supradur roofing products are covered by a forty-year non-prorated warranty.

Zappone™ Manufacturing

N. 2928 Pittsburg
Spokane, WA 99207
(800) 285-2677
(509) 483-6408

Recycled copper and recycled aluminum shingles, made of pure metal.

Applications:

Four-way interlocking design allows installation on roofs with minimum pitch of 3" over 12".

Sizes:

Single dimension is 15" x 9 1/8".

Colors:

Aluminum comes in seven color finishes of oven-baked paint, wood grain embossed.

Weight:

Copper is 94 pounds per square. Aluminum is 42 pounds per square.

Fire rating:

Both are Class A, B, C.

Comments:

Roofing passes wind and wind-driven rain tests to 110 mph. Aluminum is 100% recycled, copper is a minimum of 85% recycled. Both are recyclable. Aluminum shingle has a 50-year guarantee, plus a 20-year warranty on the finish.

Exterior Siding & Trim

Over 50% of the residential siding bought today consists of wood or wood composites. Most solid-sawn wood siding materials require considerable maintenance and have a limited useful lifetime. Weathering and installation problems that cause cupping and checking lead to frequent siding replacement that demands more resources and produces more tear-off waste than longer-lived sidings. Furthermore, installing solid wood siding often results in increased job-site waste, as checked or poor quality pieces are culled, and pieces are cut to end on studs. Wood siding is also highly combustible. There are many alternatives to solid wood siding that either provide for a more efficient primary use of wood resources or that contain recycled materials.

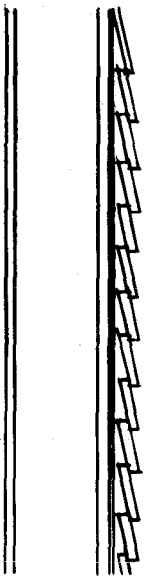
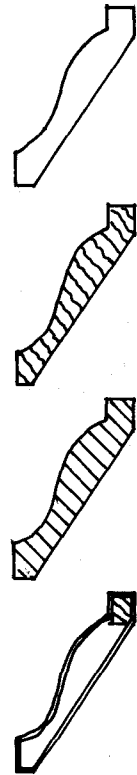
Engineered and composite wood siding products achieve a more efficient use of wood fiber than traditional solid-sawn wood siding, while providing a textural replica of solid wood. Composite wood products such as hardboard can use wood fiber recovered from other wood processing operations. Wood fiber can be mixed with a variety of resins to create a durable composite. Some engineered and composite wood sidings are coated and pre-finished to enhance their weather resistance and durability.

Fiber-cement composites offer an extremely durable, attractive and fire-proof alternative to wood or metal siding. The wood fiber in these products can be harvested from small diameter fast-growing species, or reclaimed from wood processing waste. They also require less energy to manufacture than steel, aluminum or vinyl siding. Fiber-cement siding can be textured to exhibit a wood-grain appearance. Some fiber-cement siding requires painting before use, and installers should be aware that cutting the siding produces a great deal of dust.

Although metal siding has a high embodied energy, it often includes a high recycled content. Most metal products available today to the housing industry contain more than fifty percent recycled metal, and can be recycled again at the end of their use. While metal requires a great deal of energy to manufacture, its durability and recyclability reduce the total energy involved in producing several generations of products.

Vinyl (polyvinyl chloride) is a well-known siding alternative, and is readily available from a number of manufacturers. Vinyl siding is available in wood-grain textures, and requires little maintenance. A few manufacturers reincorporate a small percentage of post-industrial scrap into the manufacturing process, but PVC is difficult to recycle, and none of the sidings contain post-consumer vinyl. At present, vinyl siding is not recyclable at the end of its useful life. Some environmental groups express concerns that the manufacture of PVC is the cause of excessive environmental degradation, and advise against using vinyl products.

Another exterior finish option is stucco. Conventional stucco has a cementitious base, although in some regions and climates traditional adobe stucco or asphalt-stabilized adobe provide a viable, low embodied energy alternative. A new generation of stucco finishes combine synthetic fibers or acrylic compounds in an exterior finishing system.



Trim traditionally has been made from high-quality, clear wood from large diameter trees. While wood remains the primary component for most interior and exterior trim, engineered wood products such as veneers and composites offer consistent quality, improved durability, and more efficient use of wood fiber. A number of companies offer exterior trim molded from urethane or polyester resin. This trim provides a durable, low maintenance alternative to exterior wood trim for applications such as attic vents and louvers. Interior trim products are listed in the Interior Finishes chapter.

ABT Co. Building Products

P.O. Box 98, Hwy 268
Roaring River, NC 28669
(800) 334-3551

A variety of molded hardboard siding products including panels, lap siding and simulated shake siding.

Applications:

Residential and commercial.

Sizes:

Siding is 7/16" thick and is available in a number of widths in 4', 8', 9' and 16' lengths.

Finish:

These products contain a heat and pressure applied resin and linseed oil overlay as well as an acrylic primer. Available in natural cedar and redwood textures.

Comments:

Free of the imperfections commonly found in solid sawn siding, these products resist splitting and checking. Plain ungrooved products can be used as soffit.

Eternit

Box 679
Blandon, PA 19510-0679
(610) 926-0100

A complete line of asbestos-free, fiber-cement building products used for fascias, facades and interior walls.

Applications:

Uses include exterior and interior wall claddings, soffits, fascias, partitions, and as a skin for laminated panels. Also for components in prefabricated wall panels, substrate for the application of stone aggregate, ceramic tile or architectural metal panels. For use in on-site studwall assemblies.

Sizes:

Most of Eternit's wall panel products are available in standard 4' x 8' and 4' x 10' sheets in many thicknesses.

Fire Rating:

Zero flame spread and fuel contribution.

Comments:

These products can be cut and drilled using traditional hand power tools and can be painted, coated with synthetic finishes, veneered with metal skins, or seeded with adhesively bonded stone aggregate. They can have a very smooth or textured surface and are impact resistant. Very little expansion and contraction when exposed to moisture or temperature extremes. Completely non-flammable. See also Roofing.

Georgia-Pacific

133 Peachtree St. N.E.
Atlanta, GA 30303
(404) 652-4000
(800) 447-2882

PrimeTrim™ exterior and interior trim is a high resin, high temperature cured all-wood fiber composite. This product provides an efficient use of wood fiber by allowing a higher percentage of harvested wood fiber to be used in the final product.

Applications:

Developed for non-structural uses such as fascia, rake board, corner board, band board and exterior trim. Can be applied directly over other materials such as siding, or nailed directly to structural framing.

Sizes:

16' lengths with no fingerjoints. Two thicknesses, 5/8" and 1", in eight widths from 3 1/2" to 11 1/4".

Finish:

Factory-primed face and two edges.

Comments:

Field-tested for over four years, PrimeTrim resists warping, cupping, twisting, splitting and checking. Contains no isocyanurate or urea formaldehyde resins. Can be cut with a fine-toothed hand saw or power saw with a combination blade.

-and-

Catawba® Hardboard siding made from wood chips.

Applications:

Residential exterior siding, in lap and panel styles.

Sizes:

Pieces 1/2" x 12" x 16' with either 4" or 6" lap style. In 7/16" thickness there are panels 4' x 7', 8', or 9', and 8" x 16' pieces.

Finish:

Sidings are available primed, in smooth or textured finish. Some styles are available unprimed.

Comments:

Many styles of this siding are available.

Husky Panel Systems, Inc.

5781 Berquist Rd.
Duluth, MN 55804
(218) 525-2981

Husky Half-Log exterior siding that replicates the appearance of log building. Consists of OSB backing, expanded polystyrene fill and aspen hardboard outer skin.

Applications:

Single unit can provide exterior sheathing, supplementary insulation and exterior finish.

Sizes:

In two styles, 9" logs and 13" logs, in 8' lengths.

Finish:

Factory applied finish is a solid-color stain with 15-year warranty.

Fire Rating:

Class III. The EPS is bromine treated.

Comments:

With prescriptive corner bracing this product can provide structural sheathing for a building, nailing directly to studs. The siding adds insulation value, as well: the 9" style is R-6.8 and the 13" style is R-9.2.

James Hardie Building Products

10901 Elm Ave.
Fontana, CA 92337
(909) 356-6300
(800) 426-4051

Asbestos-free autoclaved fiber-cement products made of portland cement, ground sand and cellulose fiber. Harditex Sheets, Hardiplank™ Lap Siding, and Hardipanel™ Vertical Siding. Hardisoffit™ asbestos-free autoclaved fiber-cement soffit.

Applications:

Harditex sheets are designed as an efficient alternative to stucco. Sheets are nailed to house frame, primed, and then textured with acrylic-based coating. Lap and vertical siding can be applied directly to wood or steel studs up to 24" on center.

Sizes:

Harditex sheets are 1/4" thick, in 4' x 8', 4' x 9' and 4' x 10' sizes. Hardiplank Lap Siding is 5/16" thick, in widths of 7 1/2", 8" and 9 1/2" and lengths of 12' and 14'. Hardipanel Vertical Siding is 1/4" or 5/16" thick in 4' x 8', 4' x 9', and 4' x 10' panels.

Fire Rating:

Zero flame spread, 0 fuel contributed. Class A (1).

Comments:

Harditex sheets are tapered on three edges, and can be cut with a power or hand saw, or cut-scored with knife. Immune to permanent water damage, rot, and termites. Very little expansion and contraction when exposed to moisture or temperature extremes. Textured coating systems using Harditex Base Sheets have been used throughout Australia and New Zealand for over 25 years.

Louisiana-Pacific

111 S.W. Fifth Avenue
Portland, OR 97204
(503) 221-0800

Inner-Seal® lap and panel siding, exterior trim, and soffit panels consisting of oriented strand board with a finished weather-proof surface. Louisiana-Pacific achieves an efficient harvest of wood fiber from small, fast-growing tree species to manufacture a variety of wood products such as these siding materials.

Applications:

Lap siding can be applied to either sheathed or unsheathed walls (with studs at least 24" o.c.). Panel siding may be applied directly to studs, or over existing sheathing.

Sizes:

Lap siding is available in 6", 8", 9 1/2" and 12" widths, in 7/16" thickness, in 12' and 16' lengths. Panel siding is 7/16" or 19/32" thick, available in standard 4' x 7' and 4' x 8' panels as well as oversized panels. Exterior trim is available 3/4" or 5/4" thick, in six widths from 4" to 12" in 16' length. Soffit panels are available in 4' x 8' size and oversizes up to 8' x 24'.

Finish:

The siding products are finished with an exterior-grade resin overlay and primed to create a protective skin.

Fire Rating:

Class C or 3 on substrate.

Comments:

Products are dimensionally stable and provide structural integrity for shear strength and rigidity in exterior walls. L.P. strives to fully utilize the available fiber in all trees harvested from their private forest lands or their seven-year-rotation wood fiber plantations.

Masonite Corporation

1 South Wacker Drive
Chicago, IL 60606
(800) 255-0785

OmniWood™ engineered hardboard siding, made from Southern yellow pine OSB and treated fiber overlay.

Applications:

Residential lap and shingle siding.

Sizes:

Available in widths 5" to 8" and in 16' lengths. Also in 4' x 8' panels.

Finish:

Factory-finished colors in pine and cedar textures.

Comments:

These hardboard products are 50% denser than natural sawn wood, resist splitting and checking, and are free of the imperfections commonly found in solid sawn siding, thereby reducing waste at the job site. 25-year limited warranty on substrate, 5-year warranty on finish.

Oregon Strand Board Co.

34363 Lake Creek Dr.
Brownsville, OR 97327
(503) 466-5177
(800) 533-3374

COMPLY® Lap siding and Versatile V-Groove lap siding consisting of three veneers of Douglas fir and two thick inner layers of reconstituted wood fiber that are bonded together, creating a solid-core siding that is strong and durable.

Applications:

Comply Lap Siding can be installed directly to 24" o.c. stud framing, reducing the amount of exterior studs required. Versatile V-Groove lap siding can be installed in vertical, horizontal or diagonal patterns.

Sizes:

Versatile V-Groove lap siding available in 8' lengths (clear or knotty) in 6" or 8" widths. Comply lap siding is available in 6", 8", and 10" widths. Both come in thicknesses of 19/32" and 5/8".

Comments:

Comply uses fewer veneers than plywood, allowing for lower grade wood fiber to be utilized. This provides a more efficient use of harvested fiber. Moisture resistant and guaranteed not to delaminate. These products provide excellent strength, stiffness and fastener-holding ability.



Ply-Trim

1524 Center St.
Tacoma, WA 98409
(800) 966-8746
(206) 572-7300
P.O. Box 2336
Youngstown, OH 44509
(800) 759-8446

Ply-Trim® Douglas fir plywood joined into panels, then cut to standard board widths.

Applications:

For use as exterior trim with brick, wood, aluminum, or vinyl siding.

Sizes:

Standard widths up to 12", in thicknesses of 5/8", 3/4", 1", or 1 1/2", in 16' standard lengths. Custom sizes available for volume orders.

Finish:

Sections sealed and primed for painting with acrylic-base house paint or opaque stain.

Comments:

Ply-trim is stronger and more stable than natural wood, and holds paint 2-3 times longer. Even a 2' piece can be used without splitting, so there is less jobsite waste.

Smurfit Newsprint Corp.

427 Main St.
Oregon City, OR 97045
(800) 547-6633
(503) 650-4274

Cladwood® exterior siding, a resin-bonded particle board substrate with both-side fiber overlay.

Applications:

Exterior siding. Cladwood requires a continuous vapor barrier of one perm or less on the warm side of the wall to which it is applied.

Sizes:

Thicknesses of 7/16" or 1/2", both in 48" X 96" and 48" x 108", or shiplap 48 3/8" x 96" and 48 3/8" x 108".

Fire Rating:

Class C.

Finish:

No primer needed. Surface must be finished with paint or solid color stain.

Comments:

Particleboard core includes planer shavings and waste wood. Overlay contains waste newsprint. Siding has a 20-year warranty.

Temple-Inland Forest Products

P.O. Drawer N
Diboll, TX 75941
(800) 231-6060
(409) 829-5511

TrimCraft™ engineered wood trim product made from wood chips that are refined into individual fibers, and formed under heat and pressure into a uniformly dense material.

Applications:

For exterior window or door trim, corner, band and rake board as well as for fascia and soffits. This product can also be used for interior door, window, base and ceiling trim, and can be applied directly over other materials such as siding or brick, or nailed directly to structural framing.

Sizes:

3/4" thick, available in five widths from 4" to 12" in lengths of 16'.

Finish:

Comes with a moisture resistant, oven-baked, factory applied primer.

Comments:

This is an excellent example of how wood fiber can be put to use in an efficient manner through value added technology, reducing waste in the process. TrimCraft is a non-structural product that is easy to work and has consistent board characteristics. Comes with a 10-year warranty against product defects, as well as a 5-year warranty on the factory applied primer.

Werzalit of America, Inc.

P.O. Box 373
Bradford, PA 16701
(800) 999-3730
(814) 362-3881

Werzalit Cladding combines hardwood fiber and melamine resin in a compression molding process. Core is covered with phenolic laminate and thermoset acrylic coating.

Applications:

For new and retrofit construction. Prepunched, tongue and groove, shiplap exterior siding.

Sizes:

In four styles: Heritage, 6 1/8", Americana, 4", 6" or 8", Allegheny 8", and Colonial 8". Thicknesses are 1 1/16" except for Colonial, which is 1 3/16". Lengths are 12' except for Heritage, which is 8' 10 3/16".

Finish:

Factory baked finish needs no painting. Available in 12 colors.

Fire Rating:

Flame spread 45 for standard products, 15 for fire retardant products.

Comments:

Werzalit core material is made from a mix of hardwoods including Black Cherry seconds and otherwise unusable byproducts. The manufacturing process is suitable to almost any raw material, and has been used worldwide with a number of different agricultural fibers.

Wolverine Technologies

17199 Laurel Park Dr. Suite 201
Livonia, MI 48152-2679
(800) 521-9020
(313) 953-1100

Weatherstone vinyl siding manufactured from preconsumer recycled vinyl through a process of co-extrusion, in which virgin PVC and internal reclaimed PVC are fused together.

Applications:

Residential and commercial.

Sizes:

Standard lap siding sizes available in seven colors.

Comments:

Requires no maintenance; comes with a 50-year transferable warranty.

Insulation

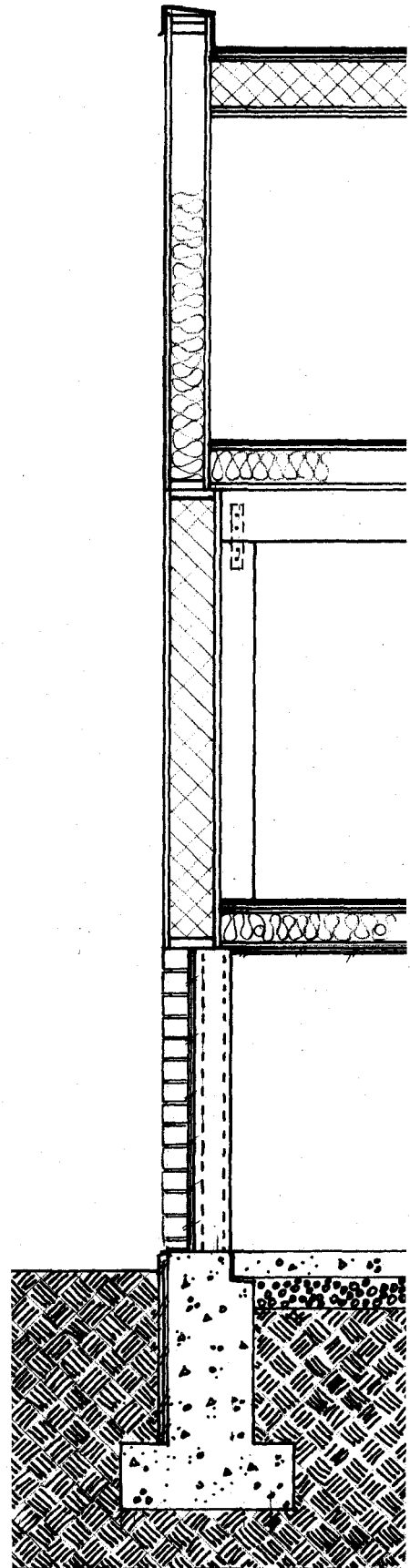
Choice of an insulation material is usually based on resistance to heat flow (R-value), availability, toxicity and cost, but resource efficiency also deserves consideration. There are a number of insulation products made from secondary resources that were partially processed in the manufacture of other products, or from recycled products such as paper, glass, or plastic packaging.

Partially processed materials contain varying amounts of embodied energy—the energy expended during extraction, refinement and manufacture. Rather than being buried in a landfill or incinerated, these resources can be further processed to create products such as insulation, soundproofing and fireproofing.

One example of partially processed material use is mineral wool insulation. Some mineral wool insulation is slag wool made from a waste by-product of steel production. Other mineral wool insulation is made from rock. The mineral wool insulation is non-combustible, with a melting point above 1200°C, is non-corrosive, exudes no odor, and does not support the growth of fungus or bacteria. Steel production uses a great deal of energy—more than production of glass or paper—and yet, once this energy is expended, further processing of the mineral by-products can provide an additional product. Mineral wool insulation has an R-value of between 3 and 4 per inch.

Another product, cellulose insulation, is made from post-consumer recycled wood fiber in the form of newspapers or telephone books, which are ground or shredded and processed for use as insulation. Cellulose insulation is comparatively low in embodied energy, yet provides an R-value between 3.2 and 3.7 per inch. The insulation can be dry-blown or poured in a loose-fill application into enclosed cavities. More commonly, the insulation is applied in a wet-spray method, in which it is mixed with water as it is sprayed into the wall or ceiling cavity. Sprayed cellulose insulation leaves few voids, filling in well around studs and wiring, and thus reducing problems of air infiltration. Some manufacturers spray-apply cellulose mixed with an adhesive, as an insulative surface finish. A number of cellulose insulation manufacturers appear in the second section of this chapter.

One concern with cellulose insulation has been its fire resistance. Cellulose is usually mixed with boric acid or sodium borate as a fire retardant. Either of these treatments requires boron, a non-renewable resource which exists in limited quantities. There are also some



R-value:

The measure of a material's ability to resist the flow of heat through it; insulative value.

U-value:

The measure of conductance; the inverse of R-value.

concerns about the longevity of the fire-retardant in application, since it is water soluble.

Another concern with wet spray cellulose insulation is the need for the insulation to dry completely before being enclosed in the wall. It is important to achieve an appropriate mix of water and insulation, or the insulation can either settle or take an inordinately long time to dry. Lack of thermal efficiency and moisture problems leading to structural damage are potential results of overly wet cellulose insulation. Look for a qualified installer to practice proper installation procedures for wet-applied cellulose insulation.

The cellulose insulation industry and mineral insulation manufacturers (including fiberglass manufacturers) are extremely competitive. Both industries tend to provide highly subjective information on the superiority of their products over competing types of insulation. In

truth, both types of insulation have merits and limitations.

Fiberglass is still the most common insulation material, and some manufacturers are including increasing amounts of recycled glass in their manufacturing processes. The third portion of the chapter provides a selection of fiberglass insulation companies that use significant percentages of recycled glass in their production processes.

Fiberglass insulation requires far more energy to manufacture than cellulose, but weighs less. Fiberglass insulation must be installed carefully, using proper precautions. A common concern with fiberglass stems from the indoor air quality problems and possible carcinogenic effects that may be caused by small glass fibers. There are few opportunities to recycle fiberglass at the end of its useful life, although fiberglass insulation batts can sometimes be reused.

Foam insulation provides excellent R-values, but expends by far the most energy in manufacture of the insulation types listed here. Products with recycled foam content reduce the overall energy expended for manufacture while providing a use for an otherwise wasted secondary resource. A number of foam insulation manufacturers recycle their own scrap and other post-industrial scrap, and at least one company recycles post-consumer foam. One problem with recycled foam insulation has been its geographically limited availability.

Some types of foam insulation, including extruded polystyrene (XPS), were originally expanded using CFCs. Most of these manufacturers are now shifting to HCFCs, which reportedly have less than 5% of the effect on the ozone than the CFC standard had. One manufacturer listed here uses HFC-134a, which contains no chlorine, and has "Zero Ozone Depletion Potential." By contrast, expanded polystyrene (EPS) foam is usually expanded with carbon dioxide in a CFC-free manufacturing process. Entries for foam insulation appear in the fourth section of this chapter.

Other resource efficient or recycled insulation options exist, and a selection of alternatives appears in the last section of this chapter. Cementitious foam insulation is respected for the indoor air quality it promotes. A relatively new insulation product utilizes recycled cotton textile scrap to produce a batt insulation with performance similar to that of fiberglass, yet without some of the concerns associated with fiberglass.



The first section of this chapter lists recycled-content ventilation baffles. Ventilation baffles are usually installed between the roof rafters, spanning from eaves to vent, before insulation is applied. The baffles create a channel for air to flow in the roof cavity, in order to remove problematic moisture buildup. Ventilation also helps to keep the roof cool and thereby extend the life of roofing materials.

Ventilation Baffles

ADO Products

7357 Washington Ave.
Edina, MN 55439
(800) 666-8191
(612) 943-2190

Attic ventilation chutes made from recycled high-density polyethylene.

Applications:

For retrofit and new construction.

Sizes:

48" long, in widths of 11", 14" and 22". Provides vent channel of 1.4".

Comments:

These rigid ventilation chutes are installed with staples, and will not break during nor dislodge after installation, or deform when exposed to moisture.

Insul-Tray, Inc.

E. 1881 Crestview Drive
Shelton, WA 98584
(206) 427-5930

Water-resistant corrugated cardboard panels made from recycled mixed waste paper.

Applications:

Panels are designed to be stapled into walls, ceilings, and floors to form cavities that can be filled with blown-in cellulose insulation.

Sizes:

4' long, 200# test.

Fire Rating:

Panels have a Class 1 fire rating.

Comments:

These baffles are designed to be used with recycled cellulose insulation.

Cellulose Insulation

All-Weather Insulation Co., Inc.

5309 Barnestown Rd.
Springfield, KY 40069
(606) 336-3931

All-Seal Insulation

P.O. Box 13048
Fort Wayne, IN 46866
(219) 432-7591

American Environmental Products

P.O. Box 38
Elkwood, VA 22718
(800) 488-5565
(703) 825-8000

American Insulation, Co.

P.O. Box 91
Bloomer, WI 54724
(715) 568-3898
(800) 633-3179

Applegate Insulation Manufacturing

P.O. Box 292
Okemos, MI 48805
(517) 349-0466

Arctic Insulation, Inc.

1218 North 11th Ave.
Greeley, CO 80631
(970) 353-2392

Bonded Insulation Company, Inc.

P.O. Box 337
Hagaman, NY 12086
(518) 842-1470

CAN-CELL Industries, Inc.

16355-130 Ave. N.W.
Edmonton, AB T5V 1K5 Canada
(403) 447-1255

Cell-Pak Inc.

P.O. Box 1023
Decatur, AL 35602
(205) 350-3311

Cellin Manufacturing, Inc.

Elkwood, VA
(703) 825-8000
(800) 825-5565

Central Fiber Corporation

4814 Fiber Lane
Wellsville, KS 66092-0749
(913) 883-4600
(800) 654-6117

Champion Insulation 301 Pleasant Hill Ave.

Lomira, WI 53048
(414) 269-4311

Clayville Insulation

P.O. Box 713
Burley, ID 83318
(208) 678-9791

Energy Control, Inc.

P.O. Box 327
Ossian, IN 46777
(219) 622-7614

Energy King

14235 SE 98th Court
Clackamas, OR 97015
Ph: (503) 653-5000

Energy Zone Manufacturing, Inc.

Buffalo, MN 55313
(612) 682-5755

Fiber Master/ ThermoCon

P.O. Box 1712
Monroe, LA 71210
(318) 323-1337

Fiberwood, Incorporated

5854 88th St.
Sacramento, CA 95828
(916) 387-9754

Hamilton Manufacturing, Inc.

118 Market Avenue
Twin Falls, ID 83304
(800) 777-9689
(208) 733-9689

IN-CIDE TECHNOLOGIES, Inc.

50 N. 41st Ave.
Phoenix, AZ 85009
(800) 777-4569, (602) 233-0756
Comments:

IN-CIDE states that their insulation is the only EPA-recognized pest control insulation on the market. This insulation is manufactured by a number of licensed distributors.

IN-CIDE Insulation Manufacturers:**American Cellulose Manufacturing, Inc.**

Rte. #1 Box 162
Minonk, IL 61760
(309) 432-2507

CraftMaster

Allentown, PA
(215) 264-7541

Nu-Woll Insulation

2472 Port Sheldon Rd.
Jenison, MI 49428
(616) 669-0100

P.K. Insulation Mfg. Co.

Box 281
Joplin, MO 64802
(800) 641-4296

Suburban Insulation

Hagerstown, MD
(301) 791-7360

Tennessee Cellulose

Limestone, TN
(615) 257-2051

Insul-Mor Manufacturing, Ltd.

Oregon, IL 61061
(815) 732-7973

International Cellulose

P.O. Box 45006
Houston, TX 77245-0006
(713) 433-6701

Louisiana-Pacific

Fenton, Missouri
(314) 343-9103
Nature Guard™ cellulose insulation.
Note:

Louisiana Pacific also manufactures cellulose insulation to meet In-Cide Technologies specifications. They are two separate products.

Modern Insulation Inc.

P.O. Box 157
Spencer, WI 54479
(715) 659-2446

Mountain Fiber Insulation

P.O. Box 337
Hyrum, UT 84319
(801) 245-6081

Northern Insulation Products

Gibbon, MN 55335
(507) 834-6519

ParPac

4545 E. 56th Ave.
Commerce City, CO 80022
(800) 850-8505

Perma Flake Corporation

Greenville, MS 38701
(601) 334-9852

Redi-Term Insulation Inc.

3061 South, 3600 West
Salt Lake City, UT 84119
(801) 972-6551

Regal Industries

Route 1, Box 46
Crothersville, IN 47229
(812) 793-2214

Southern Cellulose

6057 Boat Rock Blvd.
Atlanta, GA 30336
(800) 666-3590
(404) 344-3590

Suncoast Insulation Manufacturing Co.

7102 N.30th. St.
Tampa, FL 33610
(813) 238-0486

Tascon, Inc.

7607 Fairview St.
Houston, TX 77041
(713) 937-0900

Thermoguard Insulation Co.

451 Charles St.
Billings, MT 59101
(800) 821-5310
(406) 252-1938

-or-

North 125 Dyer Rd.
Spokane, WA 99212
(800) 541-0579

Thermo-Kool of Alaska

P.O. Box 230085
Anchorage, AK 99523
(907) 563-3644

Thermo-Pak Mfg., Inc.

P.O. Box 115
Vergas, MN 56587
(800) 627-5190

United Fibers

4280 Iowa St., Unit J
Benicia, CA 94510
(707) 746-5060

Mineral Wool Insulation

American Rockwool, Inc.

P.O. Box C
Nolanville, TX 76559
Ph: (817) 698-2233
Fax: (817) 698-2234

Loose-fill fiber insulation made from mineral slag.

Applications:

Can be blown into any area that requires insulation, such as between ceiling joists, cross bracings, truss bracing and other uneven spaces difficult to insulate with batt insulation.

R-value:

Ranges between R-3.89 and R-4.15 per inch.

Fire Rating:

Flame spread of 10 smoke density of 10.

Comments:

Contains no asbestos, cellulose, or phenols. It is noncombustible, noncorrosive, permanent, odor free, will not absorb moisture, nor support mildew or fungus. Will not rot, decay, or break down.

FIBREX Inc.

P.O. Box 1148
Aurora, IL 60507
(708) 896-4800
(800) 342-7391

Insulation blankets made from 92% recycled rock wool fiber from mineral slag—a waste by-product from the production of steel.

Applications:

These insulation blankets are designed to fit between exterior or interior wall studs for sound and thermal insulation.

R-value:

R-4 per inch.

Density:

2.0 pounds per cubic foot.

Fire Rating:

Class A. Composed of inorganic, non-flammable materials with a high melting point of 2000° F.

Comments:

These insulation blankets reduce air flow leaks within walls. Chemical and asbestos-free. Very effective for reducing sound infiltration.

Roxul, Inc.

551 Harrop Dr.
Milton, ON L9T 3H3, Canada
(800) 265-6878

Mineral wool insulation made from volcanic rock and recycled steel slag.

Applications:

Provides thermal and sound insulation; is available in batt and board forms.

R-value:

5 1/2" of mineral wool insulation is R-21.5.

Sizes:

Product is available in various types, configurations and sizes.

Fire Rating:

Mineral wool has high resistance to fire, and can withstand temperatures in excess of 1832° C without melting.

Comments:

Mineral wool insulation is lightweight, consisting of 1% fibers and 99% air.

USG Interiors

2301 Taylor Way
Tacoma, WA 98421
Ph: (206) 627-0379
Fax: (206) 627-0424

Mineral fiber loose fill insulation from 50% post-consumer slag.

Applications:

For residential and commercial use.

R-value:

R-3.0 to 3.4 per inch.

Fire Rating:

Flame spread 5, smoke developed 10. Able to withstand temperatures greater than 2000°F.

Comments:

Contains no asbestos. Is moisture resistant, noncorrosive, non-deteriorating, mildew and vermin proof.

Fiberglass Insulation

CertainTeed Corporation Insulation Group

P.O. Box 860
Valley Forge, PA 19482
(610) 341-7739
(800) 523-7844

Fiber glass batts made with 5% pre-consumer and 20% post-consumer recycled glass.

Applications:

Designed for application in walls and ceilings and floors.

R-value:

R-3.0 to 4 per inch.

Sizes:

Available in a variety of thicknesses and widths, in rolls and batts.

Fire Rating:

Can be installed to achieve 1-hour and 2-hour fire ratings.

Comments:

Contains some recycled material. Ask for Insulation Group to find information on regional manufacturers.

Owens Corning Fiberglas Canada, Inc.

4100 Yonge St.
Willowdale, ON M2P 2B6,
Canada
(416) 733-1600

Baseclad™ rigid glass fiber board insulation.

Applications:

Baseclad is an exterior insulation for foundations.

R-value:

2" thick Baseclad is R-8.5; 3" is R-13.

Sizes:

2" or 3" thicknesses in 48" x 96" sheets.

Comments:

Owens Corning Fiberglas Canada uses 35% post-industrial recycled glass in their manufacturing operations. Baseclad serves as an alternative to rigid foam for foundation perimeter insulation.

Ottawa Fibre, Inc.

Box 415, R.R. 4

Ottawa, ON K1G 3N2

(613) 736-1215

Fiberglass insulation products utilizing recycled glass.

Applications:

Residential batts, rolls, and noise control, semi-rigid and rigid boards, ceiling tiles, blankets, exterior sheathing.

R-value:

Varies by product from R-3.3-4.4 per inch.

Sizes:

Various thicknesses and sizes, depending on product.

Fire Rating:

Conforms to Canadian standards. Flame spreads for all products are less than or equal to 15.

Comments:

These fiberglass insulation products include all colors of post-consumer recycled glass. The insulation averages 75% recycled content, which is a very high percentage for fiberglass.

Schuller International, Inc.

717 17th Street

Denver, CO 80202

(800) 654-3103

(303) 978-2785

Fiberglass insulation batts with 20% recycled glass content.

Applications:

For residential and commercial use.

R-value:

R-3.0 to 3.3 per inch

Sizes:

Available in batts, blankets, insulating boards, as well as loose fill.

Fire Rating:

Depends upon insulation type and installation method.

Comments:

15% post consumer re-melted bottle glass.

Foam Insulation

Note:

The AFM Corporation licensed manufacturers listed in the Panel Systems chapter also offer rigid expanded polystyrene foam board insulation that contains a small percentage of recycled pre-consumer polystyrene.

Amoco Foam Products

375 Northridge Road, Suite 600

Atlanta, GA 30350

(800) 241-4402

(312) 241-4402

Amofoam®-RCY extruded polystyrene insulation board with a minimum of 50% recycled polystyrene content.

Applications:

Can be used on perimeter foundations, cavity walls, slab-on-grade, and exterior sheathing.

R-value:

R-5.0 per inch.

Sizes:

Available in 2' x 8' or 4' x 8' sheets in thicknesses of 1", 1 1/2", and 2".

Fire Rating:

Flame spread rating of 10, and smoke developed rating of 60-100.

Comments:

The recycled polystyrene content is a blend of post-consumer and pre-consumer. This product is foamed with HCFCs rather than CFCs, to reduce the potential for ozone depletion.

Celfortec

C.P. P.O. Box 310

Valleyfield, PO J6S 4V6, Canada

(514) 377-1725

Celfort Codeboard extruded polystyrene insulation in rigid board form. Board is extruded using HCFCs and the company adheres to the Montreal Protocol.

Applications:

Insulation can be used in foundation, wall and roof applications.

R-value:

R-5 per inch.

Sizes:

2' x 8', 4' x 8' and 4' x 9' pieces in thicknesses from 1" to 4".

Fire Rating:

Fire codes require 1/2" gypsum wallboard covering interior surfaces of insulation.

Comments:

The company regrinds and reuses their own scrap, and purchases scrap from other manufacturers. Recycled polystyrene constitutes 6% of the manufacturer's total consumption at this time. Use of this insulation allows construction of an R-20 wall with 2 x 4 studs rather than 2 x 6 studs.

Environmentally Safe Products, Inc.

313 W. Golden Ln.

New Oxford, PA 17350

(800) 289-5693

(717) 624-3581

Low-E and Micro-E Insulation™ made of polyethylene foam bonded to two exterior faces of pure polished aluminum.

Applications:

For installation anywhere traditional insulation would be used. Improves the performance of mass insulation when installed in conjunction. Low-E and Micro-E block convective currents and provide a barrier against air and vapor infiltration.

R-value:

Horizontal R-7.75, Up R-7.55, Down R-10.74.

Sizes:

Low-E is 1/4" thick, Micro-E is 1/8" thick. Both come in 16" o.c. with tabs x 75', 24" o.c. with tabs x 100', or 4' x 125'.

Fire Rating:

Flame spread rating 0, and smoke developed rating 20.

Comments:

Polyethylene foam contains up to 40% pre-and post consumer recycled foam. Post consumer component comes from plastic milk jugs. Low-E stops 97% of radiant energy transfer.

Foam-Tech

P.O. Box 87, Route 5

North Thetford, VT 05054

(802) 333-4333

Supergreen™ Foam and Class II closed cell polyurethane foam insulations. Field applied.

Applications:

New and retrofit wall, roof and foundation insulation, providing insulation value, vapor resistance, structure and infiltration control.

R-value:

"Aged" R-6.7 per inch.

Fire Rating:

Flame spread 25, fuel contributed 15, smoke developed 155-250.

Comments:

Supergreen Foam uses HFC-134a, which contains no chlorine, as a blowing agent. Because it is field applied by company representatives, this insulation is available only in Northern New England.

Icynene, Inc.

376 Watline Ave.

Mississauga, ON L4Z 1X2,

Canada

(905) 890-7325

Urethane spray foam insulation, expanded with CO₂, applied on site by certified contractors.

Applications:

Can be sprayed onto flat surfaces or injected into enclosed spaces. Icynene is usually installed in open wall cavities of new construction.

R-value:

R-3.6 per inch.

Fire Rating:

Flame spread <20, smoke developed <400.

Comments:

Icynene is unusual among urethane insulations in that it is not expanded with ozone-layer-depleting CFC or HCFC, but instead with CO₂. The resulting foam is soft, rather than stiff like other plastic foams. Once a cavity has been sprayed full of insulation, excess insulation is scraped off flush with the surface of the studs. At present this excess insulation is not recycled, causing the Icynene product to have significant potential for production of job-site waste that decreases its overall resource efficiency.

Palmer Industries, Inc.

10611 Old Annapolis Rd.

Frederick, MD 21701

(301) 898-7848

-or-

Nordic Builders

162 N. Sierra Ct.

Gilbert, AZ 85234

(602) 892-0603

air krete®, an ultralight cementitious foam insulation with cellular structure.

Applications:

Designed for installation in cavity fill applications. Can be installed in any cavity through a 1" to 3" diameter hole. Can be used in both new and existing masonry block, wood or steel stud construction. In new construction, foam is troweled into open stud cavities.

R-value:

R-3.9 per inch at standard installed density of 2 pounds per cubic foot.

Fire Rating:

Zero flame spread, zero fuel contributed.

Comments:

air krete is 98% inorganic, chemically stable, and contains no formaldehyde or asbestos. It has good acoustical absorbance, but will not support compressive loads at "standard" density. This insulation is often recommended by "healthy house" builders for its promotion of good indoor air quality.

Other Insulation Products

American Sprayed Fibers Inc.

1550 E. 91st Drive

Merrillville, IN 46410

(800) 824-2997

(219) 769-0180

Dendamix™ spray-applied fireproofing made from a mixture of recycled paper, stone and plastic. Sound-Pruf™ spray-applied acoustical insulation made from rock wool and cellulose and a liquid adhesive.

Applications:

Both can be applied directly to steel, wood, concrete, and other surfaces. Primarily used for commercial and industrial applications.

R-value:

Both products, R-3.0 to 3.5 per inch.

Fire Rating:

Both products, flame spread 5 and smoke developed 5.

Comments:

These products contain no asbestos or corrosive materials. They are non-toxic and do not support the growth of bacteria or fungus.

Greenwood Cotton Insulation Products, Inc.

P.O. Box 1017

Greenwood, SC 29648

(800) 546-1332

Kraft-faced batts and loose fill insulation made from recycled cotton textile scrap.

Applications:

Residential and commercial construction, for use in walls or attics.

R-value:

R-3.1 per inch

Sizes:

Available in blow-in form. Batts and rolls for cavity installation are available in 15", 16", 23" and 24" widths, in thicknesses from 2 1/2" to 12".

Fire Rating:

Paper-faced batts are Class C, Type II.

Comments:

Greenwood Cotton Insulation is biodegradable and requires little energy to produce. Gloves are not required for installation and the insulation does not cause itching.

Huebert Fiberboard, Inc

E. Morgan St., P.O. Box 167

Boonville, MO 65233

(816) 882-2704

Two wood-fiber roof insulation boards made from 15% recycled magazines and newspapers, and 85% waste mill wood chips.

Applications:

Both of these insulation boards are recommended for use on flat roofs.

R-value:

Roof Insulation Board R-2.78 per inch. High Density R.I. PLUS R-1.25 per inch.

Sizes:

Roof Insulation Board in 2' x 4', 4' x 4' and 4' x 8' sheets in thicknesses of 1/2", 3/4" and 1" (solid), and laminated thicknesses of 1 1/2" and 2". High Density R.I. PLUS roof insulation available in 1/2" thick, 2' x 4' sheets.

Fire rating:

Not specified. Should not be exposed to open flame.

Comments:

These products are designed to be used in conjunction with single-ply membrane systems that require a Class E underlayment.

International Permalite, Inc.

300 N. Haven Ave.

Ontario, CA 91761

(909) 983-9591

(800) 858-8868

Tapered roof insulation boards made from expanded perlite, recycled cellulose binders, and water proofing.

Applications:

For new and reroof applications on flat roofs. Can be used to protect foam and soft roof insulation materials from a top coat of hot asphalt.

R-value:

2.78 per inch.

Sizes:

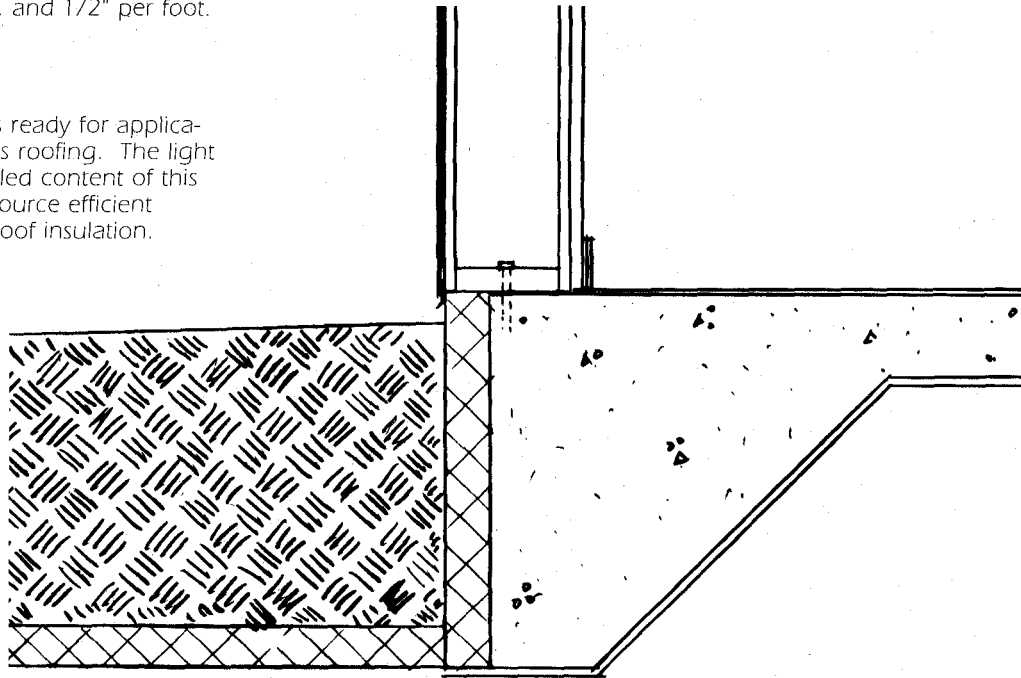
Standard size is 2'x4'. Available in eight thicknesses (averaged over width of tapered board) from 3/4" to 4". Available with slopes of 1/16", 1/8", 3/16", 1/4", and 1/2" per foot.

Fire Rating:

Class A.

Comments:

Finished system is ready for application of bituminous roofing. The light weight and recycled content of this system offer a resource efficient approach to flat roof insulation.



Windows & Doors

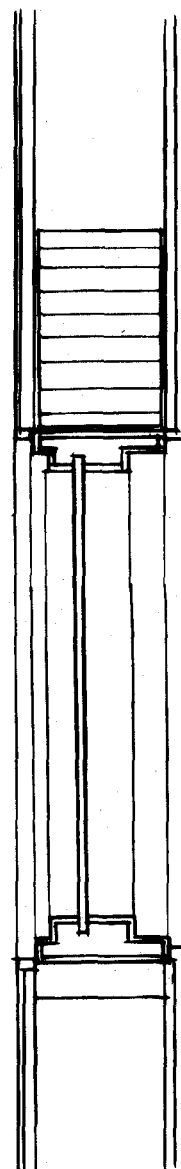
Windows have always lowered the thermal efficiency of even the best-insulated wall. Poor installation and the low insulative value of the window glass and frame combined to make windows a net heat loser in cold climates, and an unwanted heat gainer in warm climates. Fortunately, vast strides have been made in window technology during the past decade. Windows are now available that can provide a net solar gain where heating is desired or prevent heat gain in cooling-dominated climates. Research is underway on even more advanced windows, but many high-performance window systems are already commercially available, and experiencing ever-increasing usage.

Current technology combines insulative frames, multiple glazings, gas filling, thermal break spacers and window coatings to dramatically improve the thermal performance of windows. Double-pane glass windows with low-emissivity (low-E) films are becoming common. Argon, an inert gas, is often used between panes for lowered conductivity and increased R-value. The combination of argon with double low-E films can produce center-of-glass R-values of R-8.

This chapter includes manufacturers of window film treatments which greatly enhance the thermal efficiency of window glass. Different types of glazing and films are available for different applications, and selecting windows appropriate for the climate and orientation of a building can dramatically reduce heating and cooling bills. Even if a building is not a "solar" design, it makes good energy sense to design window placement and create window specifications with thermal performance in mind.

As window glazings become more efficient, proportionally more energy is lost through the frame. New types of low-conductivity window glass spacing, called "thermal break spacers," help to improve the thermal efficiency at the window edge by interrupting heat conduction across the frame. This raises the overall R-value of the window. Thermal break spacers are available by request in the product lines of several major window manufacturers. It is important to consider the overall or "unit" R-value, rather than just the center-of-glass value, when selecting windows. The best readily available windows may be R-4 to R-5.

Traditionally, the finest clear-grained wood has been used for doors and window frames. Wood products such as these can weather the elements fairly well if properly primed, painted, treated and maintained. However, the availability of clear heartwood lumber has declined in recent years, with a resultant increase in cost. The window and door manufacturing industry has responded by using substrates of finger-jointed pine or edge-glued scraps of lower value wood, and putting high-value veneers on the finish surface. A few companies are using wood composites of scrap fiber and resin in window frames. These options are



becoming more common as good wood becomes scarce. Metal, vinyl or fiberglass clad wood window frames are becoming increasingly popular as a way to enhance the durability of wood without sacrificing its aesthetic appeal. Although all of these methods make more efficient use of wood, they still have a relatively low thermal efficiency.

Wood window frames are usually chemically treated to resist moisture and rot. The wood preservatives commonly used in windows can pose a health concern for some chemically sensitive individuals, and can cause environmental damage in large quantities.

Like wood and clad wood, aluminum window frames have relatively low thermal efficiency. They are durable, but, like any aluminum product, require enormous energy to produce. Another option is fiberglass window frames. Insulated fiberglass frames are much less conductive than metal or wood, and provide improved thermal performance. A new generation of fiberglass frames combines fiberglass and wood to achieve both weather resistance and the appearance of wood. This chapter lists fiberglass and wood composite frame windows.

Vinyl windows are another option. Vinyl is less conductive than metal, but is not as durable. Vinyl windows are pre-finished, and the extrusion process for vinyl requires less energy than production of other window frames. At the same time, some environmental groups recommend against the use of vinyl due to concerns about the chlorine content and the processes used in production of PVC. Vinyl windows are produced by a number of national manufacturers, and are readily available.

For doors, fiberglass or metal skins provide a durable alternative to wood faces made from clear-grain heartwood found only in old-growth hardwood and softwood trees. The lightweight foam cores available in exterior fiberglass and steel doors provide good insulation. Most of the fiberglass door skins available today replicate the texture of traditional solid wood doors. Doors with composite wood fiber skins are also available. Most doors, including those with metal or fiberglass skins, contain wood stiles and rails, and may also contain a wood-fiber core. This chapter lists manufacturers of wood composite interior doors, and fiberglass and metal entry doors.

Because most of the heat that is lost through exterior doors is from air leakage, energy efficiency can be improved by choosing entry doors that are pre-hung with compression-type or magnetic weather-strips. Following recommended installation procedures can also help to prevent poorly-fitted doors that allow air leakage.

Castlegate Entry Systems

911 E. Jefferson St. P.O. Box 76
Pittsburg, KS 66762
(800) 835-0364

Fiberglass entry doors and patio doors with foamed-in-place polyurethane core.

Styles:

Oak woodgrain in stile-and-rail pattern. Wide selection of styles and lites. Glass available in ice crystal, beveled, tinted, and romantic vintage styles.

Comments:

Neutral surface color ready for oil base stain or paint. 30-year warranty on door panel. A durable alternative to a solid wood door.

Georgia-Pacific

P.O. Box 105605
Atlanta, GA 30348-5605
(404) 652-4000

Grand Passage® exterior doors and coordinated sidelites. In wood textured fiberglass or with steel shell.

Styles:

Various sizes and designs with decorative or clear glass. Six panel, seven panel and flush styles available. Steel doors are paintable, and fiberglass are paintable or stainable.

Comments:

Doors have polyurethane foam cores with wood stiles and rails. The R-value is 5 to 6 times that of a wood door, the company claims.

Jeld-Wen

P.O. Box 1329
Klamath Falls, OR 97601-0268
(800) 877-9482
(800) 535-3936

Elite® molded wood fiber doors, with 1/8" composite wood fiber skins over a variety of frames including medium density fiberboard, solid core particleboard, and laminated veneer frame with polystyrene core. Challenge® insulated steel entry doors.

Styles:

Passage doors, bifold doors, narrow doors, and exterior doors, in standard sizes. Choice of finish textures; door arrives primed, ready for paint or stain.

Comments:

Process uses heat and pressure to

bond door skin and frame together to prevent delamination and warping. Molded doors have a five-year warranty. Steel doors have polystyrene core and one to five-year warranty.

Marvin Windows and Doors

Warroad, MN 56763
(800) 862-7587

Integrity™ wood and Ultrex™ fiberglass pultrusion frame windows.

Styles:

One-, two-, and three-wide casements, awnings and pictures, as well as bows, bays and multiples. In white or gray baked-on finish.

Comments:

These windows have solid wood frames with an exterior shield of Ultrex. Unlike a clad-wood window the exterior frame portion is pultrusion fiberglass. The Ultrex has low expansion and contraction and will not corrode, bend, or warp. Windows are available with low-E glazing and argon gas fill, and have U-values of .30 to .28 depending on the style.

Masonite Corporation

1 South Wacker Drive
Chicago, IL 60606
(800) 446-1649 (door hotline)

CraftMaster™ line of interior molded hardboard doors.

Styles:

Available in four panel designs with attractive wood grain pattern. The doors can also be painted or stained.

Comments:

These doors are made from lumber mill waste shavings. Masonite manufactures the door skins which are then used in assembly at independent door plants. The finished doors can include finger-jointed rails and stiles and a honey-comb core.

Milgard Manufacturing, Inc.

P.O. Box 11368
Tacoma, WA 98411-0368
(800) 234-1177

Early in 1995, Milgard will begin sales of a new window line that combines a fiberglass frame with a thin interior wood veneer for the look of a wood window, but with reduced demand for clear wood and enhanced weather resistance.

Owens Corning Fiberglas Co.

Fiberglas Tower
Toledo, OH 43659
(419) 248-8000
(419) 248-6089

A complete line of windows including Fibron™ fiberglass-frame and sash filled with fiberglass insulation.

Styles:

Double-hung, picture, casement, and awnings. Come with standard double-pane insulating glass, with low-E and gas-fill windows.

Comments:

The Fibron frames can be painted and will not rot, warp, corrode, shrink, or swell.

Peachtree Doors, Inc.

Box 5700
Norcross, GA 30091-5700
(800) 447-4700
(404) 732-2499

Complete line of polyurethane-core doors and windows with fiberglass or steel skins.

Styles:

Leaded glass options for sidelites and transoms.

Comments:

A durable alternative to a solid wood door. The steel skins are made with a high percentage of recycled metal. Peachtree utilizes AERT's Moistureshield™ substrate material (see Miscellaneous) for subsills and bottomrails.

Pease Industries, Inc.

7100 Dixie Hwy.
Fairfield, OH 45014
(800) 883-6677
(513) 870-3600

Fiberglass door systems with a solid polystyrene core and adjustable sill. Insulated steel entry doors.

Styles:

A variety of styles and sidelite designs available. Single or double doors. Fiberglass are wood grain; steel are smooth finish.

Comments:

A durable alternative to a solid wood door. These doors and entry systems can be stained or painted. Steel door has wood stiles and rails.

Simpson Door Company

P.O. Box 210
McCleary, WA 98557
(360) 495-3291

Advent collection composite wood exterior and interior doors.

Styles:

Interior doors in several face styles, 2' to 3' 6" wide and to 8' tall. Exterior doors in several face styles, 2' 6"-3' 6" wide and to 8' tall.

Comments:

Doors have a wood veneer skin over a substrate of 95% preconsumer wood residue in a 3/4" composite panel.

Southwall Technologies

1029 Corporation Way
Palo Alto, CA 94303
(800) 365-8794
(415) 962-9111

Manufacturers of Heat Mirror™ clear, colorless insulating glass with Heat Mirror suspended film.

Styles:

Heat Mirror is available in six different performance categories, geared to different climates. Also available in a variety of glass types and colors.

Comments:

Heat Mirror is manufactured by 28 companies across North America, and available from several major window makers. Southwall Technologies also produces the HeatSeal Thermal Break Spacer, and XIR® Solar Control Window Film, a clear retrofit film which reflects heat while passing visible light.

Suntek

6817A Academy Pkwy. East
Albuquerque, NM 87109
(505) 345-4115

Window film which turns reflective white when temperature activated, to block 90% of solar heat.

Styles:

On-demand or passive, with transition temperatures set anywhere between 60°F and 150°F. In widths up to 4'.

Comments:

For skylights, greenhouses, and non-view windows. Film turns clear when temperature drops. Illumination through window stays at a nearly constant level, and is always diffuse.

Taylor Perma-Door

P.O. Box 457
West Branch, MI 48661
(800) 842-3667

Fiberglass doors with a composite core of insulative urethane and a honeycomb substrate.

Styles:

Available in 6 and 9 panel styles with variety of sidelite, transom, and lite options.

Comments:

These doors can be stained or painted and have a 25-year warranty.

Therma-Tru Corporation

P.O. Box 8780
Maumee, OH 43537
(800) 537-8827
(419) 882-5625

Fiber-Classic™ compression-molded fiberglass entry door systems with solid polyurethane insulating core. Classic-Craft™ compression-molded composite skins with Oakover jambs. Also insulated steel doors.

Styles:

A variety of styles with sidelites framed in zinc or brass leading.

Comments:

These doors and entry systems come with a limited 25-year warranty. Available with a wood grain pattern that is easy to paint or stain.

Wenco Windows

P.O. Box 1248
Mt. Vernon, OH 43050-8248
(800) 458-9128
(614) 397-1144

Eliminator-PF double hung window with Werzalit® wood fiber and resin composite frame and UltraGlass™ insulated glass. All Wenco JX-7® series windows have Werzalit sills.

Styles:

Variety of styles, sized to fit rough openings from 1' 10" x 3' 1 1/2" to 5' 2" x 5' 5 1/2".

Comments:

Eliminator-PF comes with a prefinished exterior in white, beige, or earth tone. Prefinished interior sash replicates ponderosa pine look. No need for paints or stains. 2 1/2 times the insulation value of wood sash. Eliminator-PF is currently available only in Northeastern U.S.

Winter Seal Vinyl

1300 Dussel
Maumee, OH 43537
(419) 897-9500

Fiber Frame™ Fiberglass patio doors and fiberglass reinforced composite windows.

Styles:

Variety of styles and custom colors.

Comments:

Fiber-Frame will not expand, contract, twist, bow, crack, rot, warp, rust or corrode. Low-E glass available in all door lites and windows.

Interior Finishes

Many alternatives to conventional interior finishing products exist. Some contain recycled materials, while other products claim to be natural or non-toxic. Recycled products on the market include paints and textural finish materials. Wallpaper made from recycled paper and wood chips is available. Acoustic ceiling tiles with recycled newsprint are a common product. Latex paint is recycled as a part of "household waste cleanup" programs in cities with aggressive recycling programs. Many companies are marketing recycled paint on a regional basis. People who live in regions without a paint recycling operation can order recycled paint direct from the larger companies listed in this chapter, for shipment to their building sites. Recycled paint was formerly offered only in limited colors and styles, but the selection is expanding, and recycled paint is generally significantly cheaper than its virgin counterpart.

This chapter also lists interior finishes and trim that extend the natural resource base by replacing clear softwood or expensive hardwoods with other materials. For example, trim can be made from fingerjointed soft lumber covered by a hardwood veneer. Non-wood trim is another option. Lightweight and refinished plumbing fixtures, and surfacing products which can be used as countertops are also listed in this chapter. Finish floor coverings can be found in the "Flooring Coverings" chapter.

Indoor finishes and accessories such as fabrics and furniture with recycled content are beyond the scope of this book, but some specialized references for them are listed at the end of this Guide.

Many people are interested in identifying "healthy" or non-toxic interior finishes that do not degrade indoor air quality. Several reference guides devoted to "healthy materials" have been published. This guide lists only those natural and non-toxic products which also meet criteria for resource efficiency, and makes no claim to evaluate the relative toxicity of products.



ABTco, Inc.

3250 W. Big Beaver Rd.
Troy, MI 48084-2982
(800) 521-4250

Prime Moulding™, Canterbury™, Pine Plus™ and Ultra Oak® non-wood paintable and stainable trim and moulding.

Applications:

Interior architectural trim and moulding.

Sizes:

Many profiles available in each style.

Finish:

Paintable without sanding, priming or sealing.

Comments:

Trim is made from extruded polystyrene that is blown with H-134a, a non-CFC blowing agent. Trim is available in consistent lengths, finish and quality, so causes less waste than wood trim.

American Standard

Box 6820, 1 Centennial Plaza
Piscataway, NJ 08855
(800) 821-7700 ext. 4023
(201) 980-3000

Bathtubs and whirlpools manufactured with a porcelain enameled surface bonded to an enameling grade metal and structural composite material. The manufacturing process requires 50% of the energy required to manufacture cast iron tubs and the final product is half the weight of cast iron.

Comments:

The tub also retains water heat better than cast iron.

Armstrong World Industries

P.O. Box 3511
Lancaster, PA 17604
Ph: (717) 397-0611
Fax: (717) 396-2126

Ceiling tile made from recycled newspaper, mineral wool, perlite and clay.

Applications:

For commercial and residential use.

Sizes:

12" x 12", 24" x 24" and 24" x 48".

Fire Rating:

The tiles themselves are not rated. Approved for use in UL fire rated assembly.

Comments:

This is an example of a company

using recycled material in the manufacture of their product, but only recently promoting this fact, as consumers recognize that recycled products are not necessarily inferior.

Bathcrest, Inc.

2425 S. Progress Dr.
Salt Lake City, UT 84119
(801) 972-1110

Glazecote™ synthetic porcelain that chemically bonds to bathroom surfaces, giving a shiny finish.

Applications:

For bathtubs, sinks and tile.

Colors & patterns:

In a full line of colors, and can match colors from most major lines of fixtures.

Comments:

Glazecote must be applied by a company representative. The company has franchises in many states and Canada. The process can repair finish damage or change fixtures to new colors. It presents an alternative to fixture replacement, and is warranted for 5 years.

Buchner Panel Manufacturing

1030 Quesada Ave.
San Francisco, CA 94124
(800) 483-6337
(415) 822-8540

EcoPanels, certified sustainably managed hardwood veneers over substrates of Medite II or Gridcore.

Applications:

Panels for walls, cabinetry, millwork and other interior finishes.

Styles:

Maple, cherry and oak veneers, as well as other woods from certified sustainably managed forests.

Comments:

Panels with Gridcore substrate may vary in thickness up to 1mm, due to Gridcore manufacturing, and may change dimension as a result of fluctuations in atmospheric humidity. EcoPanels are an innovative product using both sustainable veneers and recycled substrates.

Contact Lumber

1881 S.W. Front Ave.
Portland, OR 97201
(800) 547-1038

A variety of jamb, moulding and other trim products made from thin veneers of finish wood laminated

over a core of finger-jointed lumber in the Pine-Neer® line or over softwood for the Oak-Over® line.

Applications:

Door stiles, moldings, jambs and window trim.

Sizes:

A wide variety of dimensions are available.

Finish:

Available either pre-finished or sanded and ready for finish.

Comments:

While veneers have seen much use elsewhere, these products utilize the finger-joint and composite technologies in the substrate to offer an efficient use of wood fiber. These composite trim materials do not warp or twist like solid wood.

The Green Paint Co.

P.O. Box 430
Manchaug, MA 01526
(800) 477-1992
(508) 476-1992

Recycled collected paint, reprocessed to meet or exceed standards for virgin paint.

Applications:

Variety of paint types, including urethane reinforced alkyd floor enamel, exterior oil-based primer, solid exterior oil stain, exterior latex house paint, interior latex eggshell finish and interior latex flat finish.

Colors:

Variety of colors, with samples available.

Comments:

This product is made from a minimum 90% post consumer waste. Packaging is recycled and recyclable. Paint is available in New England, or may be ordered directly from the company.

Gridcore

5963 La Place Court, Suite 207
Carlsbad, CA 92008
(619) 431-8494

Honeycomb-style panels that can be made from up to 100% recycled cellulose fibers. Panels are molded as a slurry and water is vacuumed out to produce a strong, lightweight panel.

Applications:

Gridcore has many potential applications ranging from furniture construction to interior partitions. Currently the company retails the

product for use in theater and film set design, as a replacement for plywood. Gridcore is available for other uses on a limited basis, and is used as substrate in EcoPanels produced by Buchner Panel.

Comments:

Gridcore has also researched fabrication of the panels from kenaf fiber. Kenaf is an annually-renewable agricultural crop.

Major Paint Co.

4300 W. 190th St.
Torrance, CA 90509-2826
(310) 542-7701

Cycle II line of recycled latex paint, containing a minimum of 12% post-consumer collected paint and 38% secondary paint waste from the company's paint manufacturing.

Applications:

Interior and exterior finishes. Paint comes in latex flat, semi-gloss, and primer.

Colors:

A variety of colors.

Comments:

Available direct from the company.

Marlite

202 Harger St.
Dover, OH 44622
(216) 343-6621

Marlite® Plank wallcovering made of engineered substrate with a melamine top coat.

Applications:

Designed for high-traffic commercial interiors.

Sizes:

16" x 96" x 1/4" modules, in 35 different finishes, including colors, woodgrains, and patterns.

Fire Rating:

Class C. Marlite Firetest™ plank is Class A.

Comments:

The wood fiber substrate uses a high percentage of post-manufacturing recycled wood byproducts. The finished product is more durable than drywall.

Phenix™ Biocomposites, Inc.

1511 N. Gault
St. Peter, MN 56082
(800) 324-8187
(507) 931-9787

A composite building material called Environ™ made from soybean flour

and waste paper.

Applications:

Can be used to make paneling, furniture, flooring, cabinets, molding, doors, and other structural or decorative components.

Sizes:

Four colors, in sheets 24 1/2" square or 4" x 48" or 36" x 72".

Comments:

Environ is colored to have the appearance of granite. It can be milled, glued, sanded and shaped in the same manner as wood. Every 22 board feet of Environ uses about one bushel of soybeans and 55 pounds of waste paper.

Rasmussen Paint Co.

12655 S.W. Beaverton Road
Portland, OR 97005
(503) 644-9137

Recycled latex paint collected through Portland Metro's household hazardous waste facility.

Applications:

Interior and exterior. Recommended as a primer and surface coating for residential, office and industrial uses.

Sizes:

Available in two and five-gallon buckets.

Comments:

For information on the recycling program, contact Portland Metro's Associate Solid Waste Planner at (503) 221-1646, ext 351.

Santana

P.O. Box 2021
Scranton, PA 18501
(800) 233-4701

Plastic sheets made of HDPE, consisting of virgin plastic caps on a recycled core, heat molded into one homogeneous sheet.

Applications:

Toilet compartments, shower compartments, vanity tops. Usually used in public restroom facilities.

Sizes:

1" thick sheets, preformed into products.

Colors & patterns:

A variety of solid colors and marble finishes.

Comments:

This plastic may contain 50-90% recycled materials, depending on their availability at time of manufacture. The plastic is moisture resistant and requires little maintenance.

Solomit Strawboard

26 Glomar Court
Dandenong 3175
Victoria, Australia
03-793-3088

Compressed strawboard panels reinforced with galvanized wire held in place with wire stitches. A product that puts agricultural waste fiber to good use.

Applications:

A rigid ceiling material for non-structural use in interior walls and ceilings.

Sizes:

25mm and 50mm (roughly 1" to 2") thicknesses in a variety of widths, in lengths from 1200mm to 5000mm (roughly 4' to 16' 6").

Fire Rating:

Solomit complies to the latest Australian building codes and can be used in public buildings.

Comments:

Provides R-1.24 and good sound absorption. This product creates a beautiful textured ceiling. While not readily available in the U.S., products such as this one will inevitably find a place in the market. In the near future, Solomit will be manufacturing panels out of waste thinnings of Australian plantation forests.

Syndesis Studio

2908 Colorado Avenue
Santa Monica, CA 90404-3616
(310) 829-9932

Solid pre-cast lightweight cement-based Syndecrete™ products made to custom order. Production process can incorporate recycled aggregate material such as stone, wood, plastic chips and shavings to achieve custom patterns and designs.

Applications:

Counter and table tops, cabinets, bathtubs, floor tiles, stair tread and wall panels. Suitable for interior and exterior use.

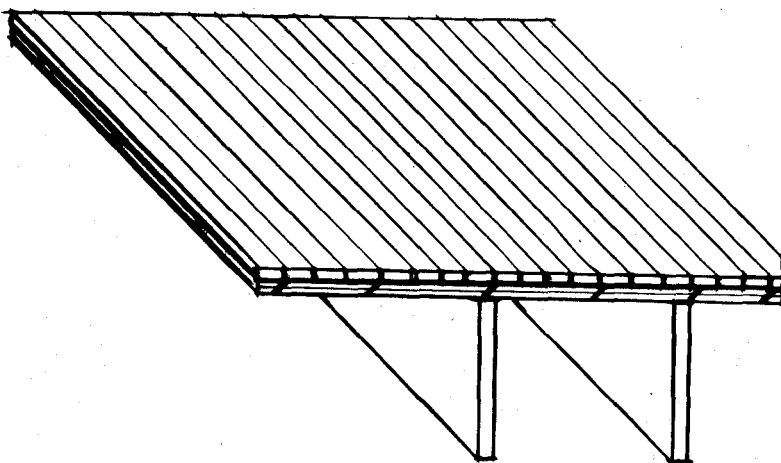
Styles:

Ten standard and custom colors.

Comments:

Weighing 75 pounds per cubic foot, Syndecrete is half the weight of conventional concrete and is more resistant to potential chipping and cracking. Can be cut and tooled with common wood cutting tools.

Floor Coverings



This chapter lists durable, resource efficient floor coverings in a variety of textures, styles and materials. They can be used in a wide variety of interior and exterior applications, in either residential or commercial buildings.

Some floorings are produced from renewable resources. Cork flooring comes from the bark of the Cork Oak tree in the Mediterranean region, which is able to replenish its outer bark when the bark is harvested on a nine-year rotation. Cork is fire resistant, acoustical, non-allergenic, easy to install, and cork tile creates a minimum of waste during installation. Cork is lightweight, but has a comparatively high embodied energy due to the distance it must be transported before installation. Other renewable flooring products include traditional linoleum made from materials such as linseed oil, cork, jute, wood flour and pine resins. This true linoleum is very durable and abrasion resistant, and can last 40 years or more.

Mats and carpets can also be made from durable, renewable fibers such as sisal, coir, jute, seagrass, and wool. Sisal fibers are extracted from the leaves of the henequen plant which is cultivated in parts of Central and South America and Africa. Coir fibers come from tough coconut husks. Both plants are hardy species that do not require artificial fertilizers, pesticides or herbicides. Jute is an annual crop grown on the flood plains of Bangladesh and processed in that country. Seagrass grows in South China, and is considered to be the strongest grass plant.

Floor coverings with recycled content, such as the tiles and carpets listed in this chapter, also represent an efficient use of resources. Discarded resources such as waste glass from the manufacture of windshields and PET plastic from post-consumer soft-drink bottles are being reprocessed into durable and attractive flooring products. Recycled tire rubber and recycled textiles are put to good use as carpet pad. Many commercial and industrial floorings contain recycled tire rubber or tire cord. Some rubber flooring materials are suitable for exterior, as well as interior, use.

Several companies use recovered post-consumer waste PVC in industrial and agricultural flooring tiles that resist chemical damage and provide drainage. Some of the recycled-content commercial and industrial flooring products have residential applications as well. They may be used for exercise rooms, laundry rooms, entryways or for exterior stairs and outdoor walkways.

We encourage reuse of materials for as many components of the home as feasible, and floors present a fine opportunity to reuse wood. It is possible to create a beautiful wood floor without using virgin old-growth timber or increasingly rare hardwoods. Used wood flooring can be recovered from remodeling and demolition projects in local communities, or purchased from one of the companies listed in the Salvaged Materials chapter.

***Mats and carpets
can be made from
durable, renewable fibers
such as sisal, coir, jute,
seagrass, and wool.***

Jute, Cork, Sisal, Coir & Linoleum

Dodge-Regupol

P.O. Box 989
Lancaster, PA 17608-0989
(717) 295-3400
(800) 322-1923
Cork flooring tiles.

Applications:

Residential and commercial use.

Sizes:

Thicknesses of 3/16" or 5/16".

Colors & Patterns:

Available in shades and finishes such as polyurethane or wax coated.

Comments:

Cork is a renewable resource.

Eco - Container Corporation

14651 Ventura Blvd, Suite 340
Sherman Oaks, CA 91403
Ph: (800) 327-3060
Fax: (818) 788-9844

Jute rugs and carpets. Non-toxic dyes.

Applications:

For commercial and residential use.

Sizes:

Many thicknesses and sizes available.

Comments:

The dyes used in the carpets and rugs are supplied by members of the Ecological and Toxicological Association of Dyestuffs Manufacturers.

EX: Inc.

400 East 56th St.
New York, NY 10022
(212) 758-2593

A variety of cork products.

Applications:

Wall and floor tile underlayment and soundproofing.

Sizes:

Vary by product. Tile is available in a number of sizes.

Colors & Patterns:

Tiles come in many of textures, and in natural finish or ecological varnish.

Comments:

EX: Inc is the export office for a consortium of Sardinian cork producers.

Fibreworks

1729 Research Dr.
Louisville, KY 40299
(800) 843-0063
(502) 499-9944

Sisal floor and wallcoverings, with no backing.

Applications:

Covers problem or rough surfaces including concrete block.

Sizes:

In widths of 4' or 8', length 100'.

Colors & Patterns:

Available in 19 colors.

Comments:

Sisal is a durable covering good for high use areas.

Forbo North America

P.O. Box 667
Hazelton, PA 18201
(800) 233-0475
(717) 459-0771

Linoleum flooring.

Applications:

Recommended for industrial (due to its durability) as well as residential use.

Sizes:

Available in 79" x 105" rolls in thicknesses of 8/10", 1/10" and 1/8"; or 1/10" thick tiles in two sizes, 12" x 12" and 24" x 24".

Colors & Patterns:

Lightly marbled patterns in 36 colorations.

Comments:

Linoleum has a very long life span - it is often referred to as a "40-year floor" - and resists indentation, abrasions and cracking.

Hendricksen Natürlich Flooring

6761 Sebastopol Avenue, Suite 7
Sebastopol, CA 95472-3805
(707) 829-3959

Natural linoleum and cork flooring. Sisal, jute and seagrass rugs and carpets.

Applications:

Virtually all areas of the home, or commercial use.

Sizes:

Available in standard sized rolls.

Colors & Patterns:

Many textures, colors & patterns.

Comments:

A variety of durable natural fiber floor coverings, with low toxicity.

IpoCork

1280 Roberts Blvd. Suite 403
Kennesaw, GA 30144
(404) 421-9567
(800) 828-2675

Vinyl covered cork tiles.

Applications:

Residential and commercial.

Sizes:

Comes in standard 12" x 12" tiles and 3" x 36" planks, with custom sizes available by special order.

Colors & Patterns:

No two tiles are identical in pattern or color. Pieces may vary slightly in tone and grain configuration, and should be mixed or shuffled to achieve desired floor pattern.

Comments:

Very strong, resilient, and comfortable. Should not be installed where excess moisture is expected.

Ceramic Tile

Metropolitan Ceramics

P.O. Box 9240
Canton, OH 44711-9240
(216) 484-4887

Quarry tile made from recycled in-house materials that would normally be waste. #814 Ironrock Special and #81X Ironrock Special X, with granular iron slip resistant additive.

Applications:

Indoors or out, in any climate.

Sizes:

Nominal 8" x 8" x 1/2"

Comments:

This product is not listed in the company catalog because it is a non-standard color, but it is first-grade quality. This is not the same product as their standard line.

Summitville Tiles, Inc.

Summitville, OH 43962

Ph: (216) 223-1511

Fax: (216) 223-1414

Four styles of impervious glazed porcelain pavers made from a by-product of feldspar mining.

Applications:

Suitable for heavy traffic areas in commercial and residential settings, indoors or out.

Sizes:

8" x 8" and 12" x 12" squares in thickness of 5/16". One style is available in 2" x 2", 3" x 3", 2" x 4" and 4" x 4" sizes.

Colors & Patterns:

Eleven colors available in solid and granite-like patterns.

Comments:

Summitville has created a manufacturing system that reuses 100% of its own solid wastes.

Terra-Green Technologies, Inc. Stoneware Division

1650 Progress Drive

Richmond, IN 47374

(317) 935-4760

Durable, glass bonded Traffic Tiles™ that are made with glass recycled from the auto windshield manufacturing process. Comprised of over 70% recycled glass, Traffic Tiles are an innovative use of a very specific waste material. Their Craftsman Line also incorporates recycled glass and scrap tile.

Applications:

Interior or exterior floors and interior walls. Installed like any standard ceramic tile.

Sizes:

Traffic Tiles™ 3/8" thick, in nominal 4" x 4", 4" x 8", 6" x 6" and 8" x 8" sizes. Trim pieces are also available. Craftsman Line 1/2" thick.

Colors & Patterns:

Nineteen colors available in Traffic Tiles™, an additional ten in Craftsman Line.

Comments:

These tiles are freeze/thaw proof, fully vitreous and have a low porosity. They are fire-sealed and have an embossed back to ensure good adhesion. Meet or exceed all industry standards for commercial tile.

Tile Cera

300 Arcata Blvd.

Clarksville, TN 37040

(800) 782-TILE

Ceramic tile manufactured in a closed-loop process.

Applications:

Floor and wall tile.

Sizes:

12" x 12", 16" x 16", 8" x 10" and 6" x 8".

Comments:

In-house scrap and cull tile is reincorporated into the manufacturing process. The finished tile contains approximately 5% recycled material. Although this is a low recycled content, the company's closed-loop manufacturing process is noteworthy. No tile body solid waste is produced, and water used in manufacture is recycled within the plant.

Carpet**Hendricksen Natürlich Flooring**

6761 Sebastopol Ave. Suite 7

Sebastopol, CA 95472-3805

(707) 829-3959

Natural wool carpets.

Applications:

Virtually all areas of the home, or for commercial use. Can be installed wall-to-wall or used as area rugs.

Sizes:

Sold by square yard.

Colors & Patterns:

Many patterns, textures and colors.

Comments:

These carpets have durable, renewable natural fibers with low toxicity.

Image Industries

P.O. Box 5555

Armuchee, GA 30105

(404) 235-8444

(800) 722-2504

Wearlon® carpets with 100% recycled PET plastic fibers (soft drink and ketchup bottles) as carpet face fibers. Duratron® carpets made from combination of PET fibers and nylon.

Applications:

New and remodeling installations.

Sizes:

Standard carpeting roll dimensions.

Colors & Patterns:

A variety to choose from.

Comments:

Bottle-grade PET resins provide a more durable fiber for carpeting than virgin carpet-grade PET resins. PET fibers are naturally stain resistant and do not require the chemical treatments commonly used on nylon carpets.

Talisman Mills, Inc.

6000 Executive Dr.

Mequon, WI 53092

(800) 482-5466

Envirelon™ carpets made from 100% post consumer recycled PET plastic.

Applications:

Commercial quality carpet for new or remodeling installations.

Colors & Patterns:

Three styles in a variety of colors.

Comments:

Is stain resistant and rates higher than nylon carpet in durability testing.

Carpet Pad and Floor Underlayment**W.R. Bonsal**

P.O. Box 241148

Charlotte, NC 28224

(800) 334-0784

WECU cork underlayment, made from the renewable bark of the cork tree.

Applications:

Underlayment for tile or hardwood flooring. Cork provides stress crack protection and sound control.

Sizes:

In rolls or sheets in thicknesses 3/32", 1/2" or 6mm.

Comments:

1/4" WECU provides R-2.6.

Chris Craft Industrial Products

P.O. Box 70

Waterford, NY 12188

(518) 237-5850

A variety of carpet padding made from reclaimed and recycled fibers such as jute, hemp, acrylics and cotton.

Applications:

For residential and commercial use.

Sizes:

Available in 6' and 12' wide rolls in a variety of thicknesses.

Fire Rating:

Varies by fiber and thickness. Check with Chris Craft for listing.

R-value:

About R-2.7 per inch.

Comments:

These pads are an excellent use of reclaimed fibers from industrial textile mills and recycled jute and hemp from burlap and rope. Treated to be mold and mildew resistant. Surface coated for enhanced durability and ease of application.

Dodge-Regupol

P.O. Box 989

Lancaster, PA 17608-0989

(717) 295-3400

(800) 322-1923

Carpet pad made from 100% recycled tire rubber.

Applications:

For residential and commercial use. Can be used on under-floor heating systems.

Sizes:

Available in standard rolls in thicknesses of 3-10 mm.

Fire Rating:

Not specified.

Comments:

This recycled rubber underlayment can withstand temperatures from 40° C to 120° C. Free of toxic materials such as PCB, mercury and formaldehyde. Provides excellent sound absorption.

DURA Undercushions Ltd.

8525 Delmeade Road

Montreal, PQ Can.

(514) 737-6561

Carpet pad manufactured in a cellular structure from ground tire scrap rubber granules bonded with latex.

Applications:

For residential and commercial use. Can be installed using either conventional "tackless" method or by the double-stick method.

Sizes:

Width 4'6". Thicknesses: Protector 5 mm, Duracushion 6 mm.

Fire Rating:

Passed FFI-70 (Pill Test); Class 1 ASTM E-648 Radiant Panel.

Comments:

This product is made from 90% recycled tire rubber and was originally developed in the United Kingdom in the 1950's.

Georgia-Pacific

P.O. Box 105605

Atlanta, GA 30348-5605

(800) BUILD-GP

(404) 652-4000

Particleboard underlayment made from resin-bonded wood shavings and chips.

Applications:

For use as a floor underlayment. Not for exterior, damp or below-grade installations.

Sizes:

4' x 8' panels in 1/2", 5/8" and 3/4" thicknesses.

Comments:

This underlayment uses recovered wood fiber.

Homasote Company

Box 7240

West Trenton, NJ 08628-0240

(800) 257-9491

(609) 883-3300

440 CarpetBoard and Comfort Base™ carpet underlayments made from 100% recycled newsprint cellulose.

Applications:

440 CarpetBoard can be installed over wood floors or wood sub-flooring, to deaden impact noise and provide comfort when used under carpet and pad. Comfort Base high-density fiberboard is recommended for application over concrete slabs or concrete floors as an underlayment for carpet or other floor coverings.

Sizes:

Available in 4' wide panels in 4' and 8' lengths, in 1/2" and 5/8" thicknesses.

Fire Rating:

Class III (C).

Comments:

These underlayments are termite, rot and fungi protected, and contain no urea formaldehyde or asbestos additives. They can be applied using a glue-nail method or with nails only.

RB Rubber Products

904 E. 10th Ave.

McMinnville, OR 97128

(503) 472-4691

(800) 525-5530

Rubber matting made from 100% recycled waste tire rubber.

Applications:

1/2" or 3/8" thicknesses are recommended as carpet underlayment.

Sizes:

Available in four thicknesses, 1/4", 1/2", 3/8" and 3/4". Many widths available in lengths up to 96'.

Comments:

Tires are one of this country's most problematic waste resources. This product offers a solution to the problem of what to do with the 240 million tires discarded each year in the U.S. These mats provide excellent shock absorption and durability. See also Landscaping (walkways).

Other Floorings

Durable Mat Company

75 North Pleasant St.

P.O. Box 290

Norwalk, OH 44857

(800) 537-1603

(419) 668-8138

A variety of floor tiles and mats made from recycled rubber from truck tires.

Applications:

For entrances and workshops.

Sizes:

Available as stand alone mats with an approximate 3/4" thickness, or continuous pattern flooring with a thickness of 3/8".

Colors and patterns:

Continuous pattern Dura-Tile II floor tiles have a chenille-like textured surface.

Comments:

These mats are similar to those seen in many commercial applications. Entrance mats are suitable for exterior use. Dura-Tile II is installed to create a carpet-like surface suitable for entrances or as a wall-to-wall floor covering.

Eagle One Golf Products

1201 W. Katella Ave.
Orange, CA 92667
(800) 448-4409
(714) 997-1400

Recycled rubber interior and exterior safety matting.

Applications:

Exterior pathways and stairs, where non-slip surface is desirable. Interior use in locker rooms.

Sizes:

Exterior matting in 4' x 6' x 3/4" mats. Interior in 38" x 38" x 3/8" mats.

Colors & Patterns:

Ten colors available, all as color flecks in a black background.

Comments:

100% recycled car tire rubber.

El Dorado Velvet Tile

2876 South Vail Ave.
City of Commerce, CA 90040
(213) 727-1935

Recycled rubber flooring tile made of nylon cord from tires vulcanized to rubber, fabric reinforced backing.

Applications:

High traffic areas, indoor or outdoor doorways, stair landings, and docks.

Sizes:

Standard 10" squares. Available in 12", 6", 5" or 4" squares, or 3" x 9" strips.

Comments:

The product carries a five-year guarantee against surface wear.

Flexco Co.

P.O. Box 553
Tuscumbia, AL 35674
(800) 633-3151
(205) 383-7474

Flex-Tuft™ rubber floor tile made from reclaimed commercial tire components reinforced by nylon scrim, then bonded to vulcanized rubber backing.

Applications:

For areas of commercial traffic, including indoor and outdoor use on ramps, steps, or concourses.

Sizes:

In tiles 12" square, or 6" x 12", or in 12" x 30' rolls. All 3/8" thick.

Comments:

Limited five year warranty. Resistant to organic deterioration and damage from the elements.

Global Recycled Products

P.O. Box 301
Kittery, ME 03904-0301
(207) 439-5080

Eco-Tile™ industrial floor tiles made of 100% recycled PVC.

Applications:

Flooring for heavy-duty traffic areas. Tiles lock into place, for hard surface.

Sizes:

Tiles are 19 1/2" square, 3/16" thick.

Colors & Patterns:

Black or gray, custom colors available.

Comments:

More durable than rubber.

Lancaster Colony Commercial Products

P.O. Box 630
Columbus, OH 43216
(800) 292-7260

Rubber and PVC tiles and matting, made from recycled materials.

Applications:

Industrial flooring.

Sizes:

Depends on specific products.

Comments:

Lancaster has a wide variety of products, not all of which have recycled content.

Mats, Inc.

P.O. Box 916
Braintree, MA 02184
(617) 848-6313

A variety of flooring products made with recycled rubber or recycled PVC.

Applications:

Flooring for industrial or exterior uses, or weight rooms.

Sizes:

Many, depending on type of product.

Colors & Patterns:

Many colors, depending on product.

Comments:

Not all products are recycled.

Multi-Tech Ltd.

2318 E. 3rd St.
Sioux City, IA 51101
(800) 452-4374

Duro-Guard 9000-B commercial industrial flooring made from post-industrial PVC with various additives.

Applications:

For exterior or interior applications over any dry and hard surface, for areas of wet and heavy use. This is a welded panel monolithic system.

Sizes:

In commercial and industrial thicknesses, with three finishes and a variety of colors.

Comments:

The flooring is resistant to abrasion and chemicals.

No Fault Industries, Inc.

11325 Pennywood Ave.
Baton Rouge, LA 70809
(800) 232-7766
(504) 293-7760

Saf Dek™ poured rubber decking surface. Seamless, porous, resilient, slip resistant.

Applications:

Playgrounds, pool decks, active traffic areas.

Colors & Patterns:

Four standard colors, custom colors.

Comments:

A majority of the rubber used in this surfacing material is post-consumer tire rubber.

Oscoda Plastics, Inc.

731 Morley Dr.
Saginaw, MI 48601
(800) 545-3876
(517) 754-9120

Protect-All and Legsaver vinyl floorings made from post-industrial vinyls. Legsaver has a virgin cap sheet over recycled base.

Applications:

Protect-All is for interior and exterior use in weight rooms, workshops, garages, entryways, and industrial applications. Legsaver is for interior use in classrooms, offices, hallways and retail stores.

Sizes:

Both styles come in 12" x 12" x 1/4" tiles. Protect-All is also available in various size sheets or interlocking tiles.

Colors & Patterns:

Protect-All in light or dark gray,
Legsaver in standard colors.

Comments:

These floorings are resistant to many chemicals. Protect-All may be installed without adhesives.

Pacific Mat Co.

6807 South 216th St., Bldg. A

Kent, WA 98032

(800) 345-6287

(206) 395-6287

Recycled tire rubber floorings, mats and tiles, and recycled PVC floorings, mats and tiles.

Applications:

Durable floor and surface coverings for agricultural buildings, sports facilities and playgrounds, industrial work areas, and other areas needing drainage.

Sizes:

Various sizes and styles available.

Comments:

Pacific Mat Company also offers products without recycled content. Product descriptions usually mention recycled content if it is included.

Turtle Plastics

2366 Woodhill Rd.

Cleveland, OH 44106

(216) 791-2100

Turtle Tiles and Grit Top Tiles, interlocking grid-surface tiles made of 100% recycled PVC. Grit Top uses recycled carbide grit.

Applications:

Workspaces that require drainage, barns, pools and showers.

Sizes:

12" x 12" x 3/4" tiles, with 12" x 2" edge ramps.

Colors & Patterns:

Standard black, twelve custom colors.

Comments:

Five year replacement warranty. Tiles stand up to solvents, chemicals and sunlight. Made from 100% recycled PVC.

RCM International

P.O. Box 327

Elk River, MN 55330

Ph: (800) 328-9203

Fax: (612) 421-4501

Interlocking floor tiles manufactured from recycled polyvinyl chloride (PVC).

Applications:

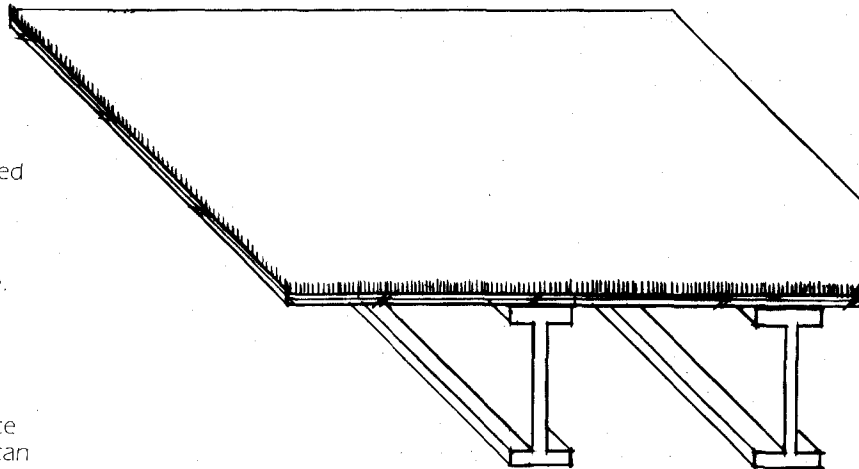
For commercial and industrial use.

Sizes:

Contact RCM.

Comments:

PVC is usually a problem for recycling programs. If it can be source separated, products such as this can provide a durable reuse.



Salvaged Materials

Reuse of building materials is highly resource efficient. Reuse not only requires far less energy than recycling, but also preserves the cultural and historic value inherent in used materials. In addition, reuse diverts waste from landfills. The high quality of many historic building materials en-



hances their suitability for use in new building projects. Older building materials often show fine craftsmanship and offer a unique and distinctive look. Used wood offers access to large pieces of quality wood from rare tree species, at a low environmental cost. Even if used materials require cleaning or minimal reworking, they can still provide an energy and resource savings over new materials.

Some companies specialize in supplying a particular line of used building materials on a regional or national scale. A sampling of the many companies that sell specialized types of salvaged building materials for reuse appear in this chapter. Many types of building materials can be salvaged for reuse. Don't overlook the potential to salvage and reuse materials from demolition and remodeling jobs within your own community. Examples of materials that can be reused include metal roofing, tile roofing, bricks, fixtures, hardware, beams, dimensional lumber and flooring. Materials salvage and reuse are closely tied to construction waste reduction practices, and more information on materials salvage can be found in the chapter on job-site recycling.

The most common commercially salvaged and reused building component is antique wood from beams in turn-of-the-century industrial buildings. Documentation of the wood's history may be available from the supplier. In addition, a few companies listed in this chapter salvage lumber by recovering virgin logs cut years ago and then lost when they sank to river bottoms during raft transport to sawmills. At least one company salvages wood from trees cut during urban landscaping and orchard maintenance. Wood can also be salvaged from residential buildings, barns, and even railroad cars.

Some companies offer original hand-hewn beams for reuse in their present form. Other wood is remilled into flooring, millwork, or paneling. Most companies grade the wood depending on its grain, the number and type of knots, and the number of nail holes left from its prior use. Reusing premium quality timbers exemplifies an appropriate and efficient approach to managing a valuable resource that would otherwise be wasted. This reuse also reduces the demand placed on virgin stands of timber.

The majority of the lumber reclamation efforts are based in the

Reusing premium quality timbers exemplifies an appropriate and efficient approach to managing a valuable resource that otherwise would be wasted.

This reduces the demand placed on virgin stands of timber.

Southeast, the Mid-Atlantic region and the Pacific Northwest. A few companies salvage wood from demolition projects across the nation. The wood recovered in the Pacific Northwest is primarily Douglas fir, while the southern and eastern wood is predominantly antique heart pine. This wood came from the longleaf pine, which was so popular for construction that it was harvested nearly to extinction by the early part of this century. The longleaf pine grows straight and tall, producing a highly desirable wood, but it takes 200-400 years to mature. The conditions necessary for regeneration aren't present in most of its former range, so the longleaf pine is rare today, but the supply from old buildings is relatively plentiful.

Other species of antique salvaged wood are also available, including cypress, chestnut and oak, as well as a selection of exotic woods. Some companies which offer salvaged wood also have product lines made from virgin wood. It is important to distinguish between product offerings.

A few companies that supply other types of salvaged building materials, such as bricks and roofing tiles, are also listed in this chapter. Other materials may be available from local reuse centers and salvage operations.

Although the supply of reclaimed antique lumber is certainly not inexhaustible, it makes sense to reuse good wood rather than burying or burning it.

Many other building materials can be salvaged from demolition or remodeling projects and reused.



Aged Woods

2331 E. Market St.
York, PA 17402
(800) 233-9307
(717) 840-0330

Antique planks retrieved from 75-200-year-old structures.

Applications:

Company supplies tongue and groove flooring, paneling, molding profiles and stair parts.

Sizes:

A number of different grades are available, based on wood character and patina. Board widths are available in styles from 3" to 7".

Comments:

Wood species available include oak, poplar, American chestnut, white pine, yellow pine, heart pine, cypress and hemlock.

Albany Woodworks

P.O. Box 729
Albany, LA 70711-0729
(504) 567-1155

Reused longleaf heart pine flooring salvaged from pre-1900 buildings throughout the southeastern U.S.

Applications:

New construction and remodeling. For paneling, cabinet stock, facings, moldings, exposed beams, stair treads and risers.

Sizes:

3/4" x 3", 4", 5" and 5 1/4" in premium, number one, and country-cabin grades. Wide plank available in 1 1/2" x 11" or better.

Comments:

Some lengths and grades available in limited supply.

Big Timberworks

P.O. Box 368
Gallatin Gateway, MT 59730
(406) 763-4639

Timberframing company that reuses lumber for trusses and framing on building projects.

Applications:

Custom timberframing, as well as remilled flooring and millwork.

Comments:

Big Timberworks uses primarily recovered Douglas fir, but may also use recovered redwood or Southern yellow pine.

Blaine, Inc.

2410 Linden Lane
Silver Spring, MD 20910
(301) 565-4949

Blaine offers replacement door and window hardware.

Applications:

Company stocks replacement parts and hardware for windows, patio doors, closet doors and window screens.

Comments:

Blaine's motto is "Any part for any window." The material for repair of existing windows allows their continued use, and the availability of parts can foster reuse of salvaged windows.

The Brickyard

P.O. Box A
Harrisonville, MO 64701
(816) 887-3366

The company supplies clinker bricks in the form of stockpiled cull bricks from an abandoned brick plant that was used between 1919 and 1968.

Applications:

The company specializes in matching existing construction. Bricks can be used in fireplaces, chimneys and walls, or as accent in other brick walls.

Sizes:

No two bricks are exactly alike. Styles available include solids, ten-hole, three-hole and oversized brick. A variety of colors are offered.

Comments:

This company has a limited supply of brick available from this site, and will cease operations there when the supply is exhausted. Similar operations could be possible elsewhere.

Centre Mills Antique Wood

P.O. Box 16
Aspers, PA 17304
(717) 334-0249

Antique wood with documentation, from wreckage and salvage of old buildings by the Centre Mills company.

Applications:

Hand hewn barn beams and joists, original log houses, flooring and wall boards, other house and barn parts.

Comments:

Salvaged wood is available in a variety of species including oak, chestnut, white pine, poplar, hemlock, yellow pine and cypress.

Coastal Millworks

1335 Marietta Blvd. N.W.
Atlanta, GA 30318
(404) 351-8400

Resawn pre-1900 antique heart pine structural beams, reclaimed from non-historical structures slated for demolition.

Applications:

New construction and remodeling. Flooring, paneling, stair parts, mantles, exposed beams and architectural millwork. Over 1000 profiles in stock.

Sizes:

Three tongue and groove flooring styles in standard thickness of 25/32" and widths from 3" to 14". Thicker planks are available.

Comments:

After resawing, the lumber is kiln or air dried to achieve moisture content between 6% and 8%. All defects are then removed. Coastal Millworks flooring is available in four grades of antique heart pine and eleven other wood species.

Conklin Authentic Antique Barnwood

R.D. #1 Box 70
Susquehanna, PA 18847
(717) 465-3832

Pine, hemlock, chestnut and heart pine flooring made from remilled antique beams.

Applications:

New construction and remodeling. Flooring, stair components, paneling, mouldings and mantles.

Sizes:

Available in sorted or random mixed sizes, 2' to 12' in a number of widths and thicknesses

Comments:

All material is from old barns. Timber is trimmed, denailed and ready for use. Availability may vary.

Delta Lumber & Millwork Co.
4701 East 5th St.
Austin, TX 78702
(512) 385-1812

Delta offers millwork from reclaimed lumber, including information on reclamation of lumber.

Comments:

Species available include long leaf yellow pine, sinker cypress, yellow pine and fir.

Duluth Timber Company
3310 Minnesota Ave.
Duluth, MN 55802
Ph: (218) 727-2145
Fax: (218) 722-7446

Reused lumber reclaimed from the recycling of buildings, bridges and other salvagable materials.

Applications:

For framing, trim, flooring, stair components, etc.

Sizes:

A wide variety of beams and sawn lumber available.

Comments:

Duluth's stock consists primarily of Douglas fir and southern yellow pine. Lumber is sold as is or resawn. All nails are removed by Duluth.

Goodwin Heart Pine Company
Route 2 Box 119-AA
Micanopy, FL 32667
(904) 373-9663
(800) 336-3118

Flooring, dimensional lumber, molding and beams milled from virgin heart pine and cypress logs that Goodwin reclaims from riverbeds in the South.

Applications:

Flooring, stair parts, cabinetry and trim.

Sizes:

Different patterns, grades and milling options, in custom dimensions.

Comments:

Goodwin reclaims the densest logs of timber rafts that sank while being floated downstream to mills in the late 1800s. Logs are preserved by cool water and lack of oxygen.

G.R Plume Company
1301 Meador Ave.
Suite B-11 & 12
Bellingham, WA 98226
(206) 676-5658

Reclaimed architectural timbers, and millwork.

Applications:

Timbers, flooring, paneling, furniture.

Sizes:

Various.

Comments:

Douglas fir timbers salvaged from turn-of-the-century structures.

Into the Woods
300 North Water St.
Petaluma, CA 94952
(707) 763-0159

A wide variety of exotic woods, gathered from urban forests, orchard trees, and native, local hardwoods. Some re-used wood.

Applications:

Counters, cabinets, closet linings, baseboards, doors, windows, flooring and trim work.

Sizes:

A variety of wood species and cuts are in stock at any given time.

Comments:

Into the Woods offers many unusual woods from orchard trees, as well as offering alternative look-alikes for rare woods, such as black locust for teak, or acacia for rosewood.

J Squared Timberworks
449 North 34th Street
Seattle, WA 98103
(206) 633-0504

Remilled old growth Douglas fir reclaimed from old lumber mill buildings, barns and warehouses.

Applications:

Flooring, staircases, doors, trim, tables, desks, bookcases, etc.

Sizes:

Available in a variety of sizes.

Comments:

J² specializes in the design and construction of handcrafted timber framed homes.

Jefferson Lumber Company
P.O. Box 696
McCloud, CA 96057
(916) 235-0609

Timbers, beams and lumber milled from timbers reclaimed from old buildings in the Pacific Northwest.

Applications:

Framing, trim and flooring.

Sizes:

Custom milled to specifications.

Comments:

The reclaimed timbers are naturally dry and dense. Jefferson provides an in-house grading system and guarantees all orders to fit specifications.

J.L. Powell & Co., Inc.
600 South Madison St.
Whiteville, NC 28472
(800) 227-2007

Salvaged antique heart pine from factories and warehouses built prior to 1900.

Applications:

Flooring and paneling, each in four grades, as well as stair parts and moldings.

Sizes:

Widths 2"-9" in 4/4 thickness.

Comments:

Heart pine and cypress available.

The Joinery Co.
P.O. Box 518
Tarboro, NC 27886
(919) 823-3306

Flooring made from reused antique longleaf heart pine.

Applications:

Residential and commercial uses.

Sizes:

Select Prime grade comes in 4/4 thickness, in widths from 3" - 7". Customer specified widths available also. Several grades available.

Comments:

Remilled from timbers salvaged during demolition of "Early American" buildings.

Maxwell Pacific

P.O. Box 4127
Malibu, CA 90264
(310) 457-4533

Reclaimed previously used lumber,
custom milled.

Applications:

Timbers, flooring, paneling, molding,
siding, decking and component
parts.

Sizes:

Various, and to specifications

Comments:

Many species available, including
Douglas fir, redwood, cedar and
pine.

Mayse Woodworking Co.

319 Richardson Rd.
Lansdale, PA 19446
(215) 822-8307

Heart pine flooring remilled from
buildings built before 1900.

Applications:

Flooring and stair parts.

Sizes:

Boards are 7/8" thick with offset
tongue and groove, in widths 3" to
12".

Comments:

Mayse is selective in its wood use.
The company removes defects from
the wood, and uses all heartwood.

Mountain Lumber Co.

P.O. Box 289
Ruckersville, VA 22968
(800) 445-2671
(804) 985-3646

Antique longleaf heart pine, re-
trieved from pre-1900 structures
around the country, prior to their
demolition.

Applications:

Flooring (offset tongue and groove),
stair parts, beams, paneling, wain-
scot and moldings.

Sizes:

In nominal thicknesses of 3/4" or 1".
Widths range from 3" to 10",
depending on style. Call the
company for availability of specific
widths. Pine comes in seven grades.

Comments:

Antique American oak, antique
American chestnut and antique
French oak are available.

New England Slate Co.

Burr Pond Rd.
Sudbury, VT 05733
(802) 247-8809

Company offers used slate recovered
from the roofs of old buildings.

Applications:

Slate can be used for repair or
restoration of existing slate roofs.
Cobble slate tiles are used as
flooring. A cobble slate veneer is
available for use on hearths or
countertops.

Sizes:

Roofing is available in 12"-24"
heights of random width. Flooring
is various sizes, 1/4" thick and veneer
is 3/16" thick.

Comments:

Slate is non-combustible, easy to
maintain, and does not need to be
sealed. The company will custom
cut roofing slates to match an
existing roof.

North Fields Restorations

Wethersfield St.
Rowley, MA 01969
(508) 948-2722

Offers antique wood flooring,
salvaged lumber and used windows,
as well as complete dismantled
buildings and salvaged architectural
details.

Applications:

Flooring is available in tongue and
groove style.

Sizes:

Flooring in styles 8" to 14" wide,
with some types 20" or 24" wide.

Comments:

Wood species available in flooring
include antique pine, heart pine, oak
and chestnut.

On Track, Inc.

P.O. Box 651
Hillsboro, OR 97123
(503) 693-1613

Apitong hardwood recovered from
the transportation system. Sources
include antique railroad cars.

Applications:

Flooring.

Sizes:

2" x 1/2" or 5/8" tongue and groove
style, or 4" x 1/2".

Comments:

Apitong is a low moisture content
wood with a natural resistance to
staining.

P & N Recycling

140 Mariposa Terrace
Medford, OR 97504
(503) 772-4132
(916) 987-0697

Recycled dimensional lumber from
dismantled structures - including old
lumber mills - in the Pacific North-
west. Mostly Douglas fir.

Applications:

Beams, headers, trim, casings and
flooring.

Sizes:

Depends on current inventory;
includes 3" x 12" to 12" x 12" beams
in lengths from 12' to 46'. Custom
milling available.

Comments:

These people have worked with
northwest timber supplies for many
years, first in the timber industry and
now with their P & N Recycling
business, making sure these old yet
valuable timber resources are not
burned and wasted. This top quality,
tight growth lumber is remilled.

Pioneer Millworks

1755 Pioneer Rd.
Shortsville, NY 14548
(716) 289-3090

Timbers, lumber, flooring and
millwork resawn and milled from
material salvaged and reclaimed
from dismantling of commercial and
industrial buildings, bridges and
barns.

Applications:

Flooring, interior trim and millwork,
structural and decorative timbers and
beams.

Sizes:

Wide variety of sizes available,
custom milled.

Comments:

Call or fax materials lists to them for
a quotation. Support and consulta-
tion for installation and design is
available.

Renaissance Roofing Inc.

P.O. Box 5024
Rockford, IL 61125
(815) 874-5695

Maintains a computer inventory of a
national supply of salvaged clay
roofing tiles and roofing slate from
demolished buildings.

Applications:

Tiles can be used in restoration roofing or repair.

Sizes:

Many sizes, colors, types and brand names of tile are available, and the company can locate most types of tile.

Comments:

This company buys tile and slate salvage from demolition contractors across the United States, and with enough advance notice may buy materials outright and perform removal and salvage themselves.

Superior Hardwoods

1900 Grant St.

Missoula, MT 59801

(800) 572-9601

(406) 728-4976

Salvaged used wood from the Pacific Northwest.

Applications:

Wood is remilled for use as flooring.

Comments:

Inventory depends on availability of local salvage wood.

Sylvan Brandt

651 East Main St.

Lititz, PA 17543

(717) 626-4520

"Architectural Artifacts" quarterly newsletter on antique building materials, and a changing inventory of salvaged doors, windows, wood and hardware.

Comments:

The company specializes in antique building materials from 1750-1850, but has many materials available.

Tile Roofs, Inc.

P.O. Box 177

Mokena, IL 60448

(815) 544-4141

Used tile and slate roofing for restoration projects, with an inventory dating to the late 1800s.

Comments:

This company also sells new tile.

Tile Search, Inc.™

P.O. Box 580

Roanoke, TX 76262

(817) 491-2444

Salvaged roof tile and slate.

Applications:

For roofing repair, restorations, additions or new construction.

Sizes:

Company can match manufacturer, profile, color, texture and age for most tiles.

Comments:

Tile Search will find tile and slate, or sell recovered slate and tile roofing, on their computer network.

Tiresias, Inc.

P.O. Box 1864

Orangeburg, SC 29116-1864

(803) 534-8478

(803) 534-3445

Flooring made from reused antique heart pine remilled from timbers salvaged during demolition of "Early American" buildings.

Applications:

Residential and commercial uses.

Sizes:

Comes in widths of 3", 4", 6", and 8", in thicknesses of 3/4" or 5/4".

Comments:

Nearly 75% of the pre-1900 houses and commercial structures in the Carolinas, Georgia and Florida were built largely with heart pine.

What Its Worth

P.O. Box 162135

Austin, TX 78716

(512) 328-8837

Antique longleaf heart pine salvaged from building demolition.

Applications:

Flooring (offset tongue and groove), and "Rustic Grade" for ceilings.

Sizes:

Flooring in 3 1/4", 4 1/4", or 5 1/4" widths, 3/4" thick.

Comments:

This company also has Louisiana virgin tidewater cypress, recovered from river beds.

The Wood Cellar

(A division of Atlantic Wood)

1206 Laskin Rd., Suite 202

Virginia Beach, VA 23451

(800) 795-9114

(804) 428-9114

Reclaimed and reprocessed heart pine from turn of the century warehouses and factories.

Applications:

Flooring, in unfinished, prefinished, long strip or parquet styles.

Sizes:

Flooring 3/4" x 3" or 5", random length. Long strip panel 5/8" x 7 3/8" x 7'10 1/2", in two strip or three strip style. Parquet flooring in 12" squares.

Comments:

This flooring has the same hardness as red oak.

Woodhouse

P.O. Box 7336

Rocky Mount, NC 27804

(919) 977-7336

Reclaimed antique Southern yellow longleaf pine, fir, white spruce, and heart pine from abandoned factories and textile mills.

Applications:

Interior use for flooring, stair parts, beams, moldings, cabinetry, or panel doors. Exterior uses also.

Sizes:

Nominal widths 3" - 9", 3/4" or 3/8" thick.

Comments:

In plainsawn or quartersawn styles, in a number of grades. This company also sells virgin wood as a separate product from the antique wood.

The Woods Company

2357 Boteler Rd.

Brownsville, MD 21715

(301) 432-8419

Remilled antique lumber from barns, log houses or old industrial buildings.

Applications:

Flooring, cabinet lumber, staircase materials, beams, paneling and molding.

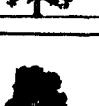
Sizes:

Flooring in random width pattern, lengths 4' - 12' with center match tongue and groove.

Comments:

Wood species available are heart pine, chestnut, fir, oak, poplar, hemlock, white and yellow pine.

Landscaping

	HEIGHT	DIA.	SPREAD	SPACED
	MATURE	TRUNK		O.C.
	50'-75'	2'-3'	40'-60'	30'-40'
	AILANTHUS <i>dilanthus glandulosa</i>			
	20'-40'	1'-2'	20'-40'	25'
	APPLE <i>Malus sylvestris</i>			
	70'-80'	2'-3'	35'-50'	40'-50'
	ASH, WHITE <i>Fraxinus americana</i>			
	50'-75'	1 1/2'-4'	40'-50'	30'-40'
	BEECH, AMERICAN <i>Fagus americana</i>			
	50'-75'	3'-4'	50'-70'	50'-60'
	BEECH, EUROPEAN <i>Fagus sylvatica</i>			
	50'-75'	1'-3'	30'-50'	30'-40'
	See small trees for Grey Birch. BIRCH, WHITE (European) <i>Betula alba</i>			
	80'-100'	3'-4'	50'-60'	50'-60'
	CATALPA, WESTERN <i>Catalpa speciosa</i>			
	60'-80'	2'-3'	50'-60'	50'-60'
	GINKGO BILOBA <i>Maidenhair tree</i>			

Houses utilize natural resources in both their structure and siting. Residential landscaping can add significantly to the resource consumption associated with a dwelling, since in many areas conventional lawn and garden landscaping is resource intensive to produce and maintain. The popularity of non-native lawn grasses places an ever-increasing demand on scarce water supplies, particularly in the arid West. Techniques such as rooftop rainwater catchment systems, native plant landscaping and xeriscaping can help relieve the pressure on water supplies, and provide a means of maintaining native vegetation and habitat for wildlife.

Preventing excessive stormwater runoff is another important function of landscaping. Water that runs off of parking lots, streets and other paved areas usually does not soak into the ground, but can instead cause overloading problems at water treatment plants or contaminate surface water supplies with chemical residues from roads. Porous paving systems, vegetation strips, and land contours are all means of slowing runoff and capturing rainwater for irrigation and aquifer recharge.

Another means of reducing the high resource demands of conventional landscaping is to use recycled-content products for drainage structures, paving, fences, retaining walls, and outdoor furniture. This chapter lists some examples of recycled products designed for those purposes. Recycled rubber pavers or bricks made from oil-contaminated soils are available for exterior walkways.

Recycled plastic lumber or plastic/wood composite lumber provide durable alternatives to solid wood for exterior applications such as fences, benches, decking, docks, retaining walls, picnic tables, and landscape borders. Plastic lumber is currently approved for use only in non-structural applications, since it does not have strength comparable to wood lumber. Plastic lumber can readily substitute for treated wood in non-structural applications, however, due to its weather- and insect-resistant nature. Plastic lumber is rot and corrosion proof, and will not crack, splinter, or chip. It has a long life expectancy in exposed, sub-grade or marine applications, and does not leach chemicals into ground or surface water or soil as treated wood can.

Plastic lumber resists vandalism and does not require painting. It is available in a variety of colors, including white, although many companies have a standard color of either brown or black, and produce

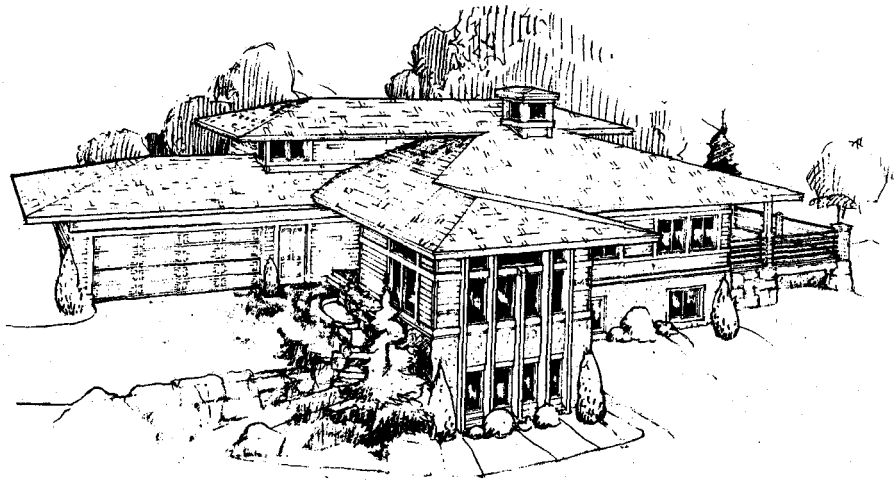
colored lumber only for custom orders. These products can be nailed, screwed, sanded, glued or turned on a lathe with standard woodworking tools. One challenging aspect of working with plastic lumber is its high expansion coefficient, which must be considered during installation.

Plastic lumber manufacturers have proliferated recently, and they offer a wide variety of products. Some companies use only HDPE plastic, while others utilize commingled plastic waste which may include small quantities of paper and metal, as well as many different types of plastic resin. A few manufacturers mix plastic with recycled tire rubber. Some plastic lumber contains wood fiber, which helps strengthen the lumber and reduce expansion, works more like wood, and can hold paint or stain.

Plastic lumber is available in a variety of profiles and sizes. No standards exist yet for plastic lumber, so quality and product performance may vary by manufacturer. Many manufacturers make available the results of independent testing of their products. Plastic lumber manufacturers have recently formed a trade association to set industry standards and define applications for future structural use of some products.

The other landscaping products in this chapter include soaker hoses made from recycled rubber, drainage tubing with recycled PVC, drainage aggregate made from recycled glass or recycled EPS beads, recycled plastic stepping stones, and recycled rubber retaining blocks. Landscape ornaments made from cement mixed with recycled fiberglass, polystyrene and tire rubber are also included.

Another alternative to the high resource demands of conventional landscaping is to use recycled-content products for drainage structures, paving, fences, retaining walls, and furniture.



Exterior Walkways

Recycled Rubber Products

American Tire Recyclers

302 N. Lane Ave.
Jacksonville, FL 32254
(800) 741-5201
(904) 786-5200

Rebound, Sportsturf and Equestri-Foot recycled tire rubber in crumb form for outdoor surfacing.

Applications:

Rebound is a soil amendment of crumb rubber and composted organics that promotes better turf growth, requires less water and provides better drainage for sports fields and lawns. Sportsturf is fiber reinforced rubber granules used on jogging and walking trails, and in parks and playgrounds. Equestri-Foot is a top surface for indoor and outdoor arenas that enhances footing.

Comments:

This product turns problematic tire waste into beneficial additives for heavy use areas, addressing problems of soil compaction.

Bomanite Corporation

P.O. Box 599
Madera, CA 93639-0599
(209) 673-2411

FlexTech resurfacing material made from recycled rubber granules and virgin resins which are mixed on-site and troweled in place.

Applications:

For resurfacing damaged pool decks, walkways, driveways and patios.

Weight:

About one pound per square foot.

Comments:

Adheres to concrete, asphalt, metal and other surfaces. When used in exterior applications, it should be periodically resealed to retain color and luster.

Carlisle Tire & Rubber Company

P.O. Box 99
Carlisle, PA 17013
(717) 249-1000
(800) 851-4746

Softpave™ resilient tiles molded from recycled tires and a rubber binder. They are slightly textured and water permeable to provide an all weather surface. These floor tiles offer a use for some of the over 200 million tires discarded each year in the U.S.

Applications:

Patios, decks, walkways, weight rooms, exercise floors. Can be installed over concrete, asphalt, wood, gravel, or crushed stone bases.

Sizes:

I-block shaped tiles, 12" x 9 1/2", and patio tiles 24" x 24"; both are 1" thick.

Colors & patterns:

Red, black, green, grey, flecked.

Comments:

Softpave tiles can be installed loose or adhered directly to substrate for a secure, long-term bond. They may be cleaned with a leaf blower, broom, hose, vacuum, or mop. Mild detergent can be used if desired. These tiles provide excellent traction.

Dodge-Regupol

P.O. Box 989
Lancaster, PA 17608-0989
(717) 295-3400
(800) 322-1923

Everlast flooring is made from 100% recycled tire rubber.

Applications:

Everlast flooring is recommended for athletic rooms and high use areas such as exercise rooms and walkways. Also for use as exterior pavers.

Sizes:

Rubber flooring comes in 18" or 36" square tiles as well as sheets and rolls up to 36" wide.

Colors & patterns:

The rubber flooring is available with a wide variety of colored patterns on a black background.

Comments:

Every five square feet of Everlast rubber flooring uses approximately one scrap tire.

Mat Factory

760 West 16th Street, Suite E
Costa Mesa, CA 92627
(714) 645-3122

Interlocking floor mats made from 100% recycled tire rubber.

Applications:

For residential, industrial and commercial uses such as playgrounds and for handicapped access.

Sizes:

Contact Mat Factory.

Comments:

A good use of recycled rubber.

Promat

P.O. Box 967
Richmond, IN 47375
Ph: (317) 935-7541
(800) 428-6573
Fax: (317) 935-4685

Rubber mats made from reclaimed auto and truck tires.

Applications:

Fatigue mats and runners.

Sizes:

Available in a number of thicknesses in widths up to 48" and lengths up to 12'.

Comments:

A good use of recycled rubber.

RB Rubber Products

904 E. 10th Ave.
McMinnville, OR 97128
(503) 472-4691

Rubber matting made from recycled waste tire rubber.

Applications:

Suggested for entryways.

Sizes:

Available in three thicknesses, 1/2", 3/8" and 3/4". Many sizes available from 4' x 4' square to continuous custom pieces up to 90' in length.

Colors & patterns:

Standard charcoal color.

Comments:

Provide excellent shock absorption and durability. See also Floor Coverings (carpet pads).

Paving Bricks

Cunningham Brick Company, Inc.

Route 2, Cunningham Brick Road
Thomasville, NC 27360
(919) 472-6181

Brick nuggets made from reprocessed oil contaminated soils. The reclaimed soil is processed and baked to create rough red-colored nuggets.

Applications:

An excellent material for xeriscaping, decorative walkways and driveways.

Size:

Average of 3 3/4" in overall width.

Comments:

Also sold for use on baseball infield running paths.

Maryland Clay Products

7100 Muirkirk Road
Beltsville, MD 20705
(301) 419-2214

Paving bricks that incorporate oil-contaminated soil in manufacture.

Applications:

Walkways, driveways and brickwork.

Comments:

Brick manufacturers routinely add oil in the manufacturing process to produce high quality brick. This partial solution to the management of oil-contaminated soils holds great potential. The petroleum in the soil is used as a fuel in the heating process that turns clay into brick, and the soil is recycled. Maryland Clay is also looking at manufacturing bricks using sewage sludge.

Phoenix Scientific

3670 N. High St. Suite 203
Columbus, OH 43214
(614) 945-0326

Paving bricks made from municipal incinerator ash.

Applications:

For driveways and walkways.

Sizes:

Can be made in a variety of colors.

Weight:

30% lighter than conventional brick.

Comments:

This is a viable use for incinerator ash. When fired into bricks (after being mixed with clay), the compo-

nents of the ash become insoluble as they are fused into a unified ceramic material. Phoenix Brick can be produced to exceed all ASTM standards regarding freeze-thaw resistance and compressibility.

Waccamaw Clay Products, Inc.

3300 Waccamaw Boulevard
Myrtle Beach, SC 29578
(803) 236-2121

Paving bricks made from oil-containing soils.

Applications:

For driveways, walkways and patios.

Sizes:

Available in standard paving brick dimensions in a variety of patterns

Comments:

The petroleum in the soil is consumed as fuel during the firing process resulting in a stable brick.

Recycled Plastic Lumber

A.E.R.T.

P.O. Box 1237
Springdale, AR 72765
(501) 750-1299

Lifecycle decking made from recycled low and high density polyethylene plastic and cedar fibers from recovered mill waste. Lifecycle is not a commingled plastic lumber. It substitutes for treated wood in decking and can be stained. Lifecycle has a low coefficient of lineal thermal expansion.

Aeolian Enterprises

One Lloyd Ave. Pl., Suite 201
Latrobe, PA 15650
(412) 539-9460

Hollow profile plastic lumber, made from 100% recycled industrial and post-consumer HDPE.

Aldan Lane Company

Box 990 Hwy 22W
Kalona, IA 52247
Ph: (319) 656-3620
Fax: (319) 656-3656

Plywood laminated with recycled high density polyethylene and formed in a corrugation, for use under shingles, or to line garages and outbuildings. Plastic lumber for tables, pallets, etc.

Bedford Industries

1659 Rowe Ave, Box 39
Worthington, MN 56187-0039
(800) 533-5314
(507) 376-4136

Plastic timbers, from recycled post-consumer and industrial HDPE with paper binder.

BTW Industries, Inc.

2000 S.W. 31st Avenue
Pembroke Park, FL 33009
(305) 962-2100

Envirowood™ benches, picnic tables, decking and railing made from 100% recycled commingled post-consumer plastics.

Carrysafe

361 Bluff City Blvd.
Elgin, IL 60120
(800) 231-9721
(312) 523-1366

Carrysafe® Re-Source Lumber™ plastic planking from recycled high density polyethylene (HDPE) plastic pellets derived from milk jugs.

Cascades Re-Plast Inc.

1350, Chemin Quatre Saisons
Notre-Dam-du-bon-Conseil
PO J0C 1A0
(819) 336-2440

Plastic lumber and outdoor furniture made from 100% post-consumer and post industrial thermoplastics gathered in curbside collection.

Collins and Aikman

P.O. Box 1447
Dalton, GA 30721
(800) 241-4902
(706) 259-2125

Recycled plastic lumber picnic tables, park benches, birdhouses and trash receptacles, made from the company's Powerbond RS carpet, collected from consumers for recycling as part of the company's cradle-to cradle philosophy.

Dura Post and Dura Bord

P.O. Box 492
Puyallup, WA 98371
Ph: (800) 676-4091
Fax: (206) 588-3039

DuraPost for fences, DuraBord plastic lumber. Made from 100% post-consumer recycled plastic.

Duratech Industries, Inc.

P.O. Box 536
Lake Odessa, MI 48849
Ph: (616) 374-7443
Fax: (616) 374-3170

Benches and tables made from recycled plastic lumber manufactured from 100% post-consumer HDPE.

Eagle Recycled Products

1900 Betmor Ln.
Anaheim, CA 92805
(714) 939-8400

Plastic lumber in a variety of shapes and outdoor furnishings using 100% recycled plastic.

Earth Safe

P.O. Box 2861
Hyannis, MA 02601
(508) 420-5681

Benches, tables and fencing, made from a blend of recycled plastic and wood fiber.

Environmental Plastics, Inc.

4981 Keelson Dr.
Columbus, OH 43232
(614) 861-2107

Lumber manufactured from recycled plastics and regrind vinyls. Comes with 20-year limited warranty.

Environmental Recycling

83 North Edmore Lane
West Islip, NY 11795
Ph: (516) 669-2037
Fax: (516) 981-2234

Lumber made from 100% post-consumer plastic, for use in fences.

EnviroSafe Products, Inc.

81 Winant Pl.
Staten Island, NY 10309-1311
(718) 984-7272

Products made from composite planks consisting of post-consumer plastic (fast food clam shells, shrinkwrap and food bags) and recycled wood chips/sawdust (from a furniture manufacturing plant).

Envirowood, Inc.

501 W. Algonquin Rd.
Mt. Prospect, IL 60056
(800) 323-0800
(708) 981-0315

Envirowood plastic lumber from commingled plastic waste, primarily post-consumer. Expected lifetime 50 years.

Field Support and Supply

509 NE 165th St.
Seattle, WA 98155
(206) 361-6197

Dura-Lagg planks and Dura-Bloc for use in retaining walls. Made from 100% recycled industrial plastic.

Hammer's Plastic Recycling Corporation

RR 3 Box 182
Hwy 20 & 65 North
Iowa Falls, IA 50126
Ph: (515) 648-5073
Fax: (515) 648-5074

Plastic lumber used for benches, picnic tables, and landscape timbers. Licenses a number of manufacturers across the nation and distribute their product nationally.

Jeanell Sales Corp.

P.O. Box 537
Sharon, TN 38255-0537
(901) 456-2681

Recycled plastic lumber and profiles made from 100% post-industrial and post-consumer commingled plastic waste.

Kept, Inc.

18574 S. Hwy. 99E
Oregon City, OR 97045
(503) 655-0758

KEPTwood and KEPTech plastic lumber and fiber reinforced plastic lumber from recycled plastic including milk jugs.

Mobil Chemical Company

Composite Products Division
800 Connecticut Avenue
P.O. Box 5445
Norwalk, CT 06856
(800) 846-2739

Trex™ composite lumber made from waste wood fiber and recycled post-consumer plastics. Accepts paint

and stain, can also be left unfinished. In two colors. Works like wood.

Obex, Inc.

P.O. Box 1253
Stamford, CT 06904
(203) 975-9094

NovaWood landscape ties from recycled plastics # 1-7, including plastic bags and foam from residential, industrial and commercial sources.

Phoenix Recycled Plastics, Inc.

4601 Market Street, Suite 4000
Philadelphia, PA 19139
Ph: (215) 748-3430
Fax: (215) 748-2193

Two types of landscape timber made from recycled plastics including HDPE, PET, LDPE and polypropylene primarily derived from milk and soda jugs. Phoenix has a fiberglass reinforced plastic lumber that they say can be used for structural applications, including joists, beams, substructure and bulkheading.

Plastic Lumber Company

520 S. Main St., Suite 2446
Akron, OH 44311-1010
Ph: (216) 762-8989
Fax: (216) 434-7905

Picnic tables, benches and site amenities manufactured from commingled plastics (primarily HDPE and LDPE). The primary source of HDPE is post-consumer milkjugs, while the LDPE comes from recycled bubble packs, shrink wrap and aseptic packaging.

Plastic Pilings, Inc.

8560 Vineyard, Suite 205
Rancho Cucamonga, CA 91730
(909) 989-7685

Recycled plastic pilings with a steel rebar core, for marina use, in lengths 40' to 88'.

Recycled Plastic Industries, Inc.

1820 Industrial Drive
Green Bay, WI 54302
Ph: (414) 468-4545
Fax: (414) 468-4765

Recyclamaid plastic lumber made from recycled milk jugs.

Recycled Plastic Man Inc.

P.O. Box 3368

Venice, FL 34293

(813) 497-1020

Plastic lumber and outdoor furniture, made from 100% recycled plastic.

Recycled Polymer Associates

152 West 26th St.

New York, NY 10001

(212) 463-8622

Hollow profile fencing, and plastic lumber. Made from 95% combined recycled polyolefins and 5% coloring agents and inert materials.

Renewed Materials Industries

621 W. Division St.

Muenster, TX 76252

(817) 759-4181

"Rumber" made from old tires, waste rubber, and waste plastic. The product is tongue and groove, for use as a flooring or in retaining walls.

RePlas Products, Inc

411 B Southgate Court

Mickleton, NJ 08056

(609) 423-2607

A variety of lumber products made from recycled plastic.

Sanders Enterprises, Inc.

3019 Nash Rd.

Scott City, MO 63780

(314) 334-9600

Recywall retaining wall and sound barrier system, and Recy-Tile paving tile. Made from mixed plastic waste. The Recywall contains crushed glass, and is filled with compost and organic waste and planted with living plants.

Superwood

P.O. Box 2399

Selma, AL 36702-2399

(205) 874-3781

Lumber made from plastic from milk jugs, bread bags, and plastic toys.

Trimax of Long Island

2076 Fifth Avenue

Ronkonkoma, NY 11779

Ph: (516) 471-7777

Fax: (516) 471-7862

Trimax™ Lumber made from reinforced foamed polyolefin resin from recycled polyolefin domestic and industrial scrap. Used in outdoor structures.

Other**AquaPore Moisture Systems**

610 S. 80th Avenue

Phoenix, AZ 85043

Ph: (602) 936-8083

Fax: (602) 936-9040

Moisture Master® soaker hoses made from recycled tire rubber.

Applications:

For above or in-ground drip irrigation of gardens and landscapes.

Sizes:

Available in 1/2" and 5/8" diameters, in lengths of 25, 50, and 75'.

Comments:

These hoses are porous throughout to distribute a controlled amount of water through the entire hose. A recycled product that also provides for efficient use of water resources.

ARRC, Inc.

500 Industrial Rd.

Mankato, MN 56001

(507) 345-1375

Multi-Bloc Interlocking blocks made from recycled tires.

Applications:

Blocks stack into panels to use for landscaping and terracing, or reinforcing hillside retaining walls.

Sizes:

Various sizes and densities. Standard color is black, custom colors available.

Comments:

Blocks are coated with fire retardant.

EEE ZZZ Lay Drain Company, Inc.

P.O. Box 867

Pisgah Forest, NC 28768

(704) 883-2130

Recycled expanded polystyrene (EPS) aggregate used as a substitute for gravel in septic systems and other drainage applications.

Applications:

Underground uses include foundation drains, interceptor drains, septic system absorption fields and other groundwater control applications.

Comments:

The EPS is recycled mostly from industrial and commercial operations. A lightweight material with a high compression strength and percolation rate.

Glass Aggregate Corporation

1085 Oakleigh Road N.W.

Grand Rapids, MI 49504

(616) 791-0793

R.E.D. - PAK (Reduce Environmental Damage - Pak).

A self-contained underdrain unit, consisting of a geotextile non-woven fabric sleeve filled with crushed, recycled glass. Uses 99.6% recycled mixed glass (including ceramics, pottery, etc.) which doesn't have to be washed or sorted, and can include minor contaminants such as lids and labels.

Applications:

Underdrain systems for highways, roads, streets, parking lots, building foundations, and water table stabilization. Can also be used for erosion control.

Sizes:

One unit is 6" in diameter and 40" long, to be used in a series.

Weight:

Each unit weighs 40 to 45 pounds.

Comments:

The company hopes to develop licensing agreements with private firms and other organizations throughout the country, as the manufacturing process is designed to allow the operator to collect, produce and distribute the product near the materials source.

Invisible Structures, Inc.

14704-D East 33rd Place

Aurora, CO 80011

(800) 233-1510

(303) 344-2233

Gravelpave² and Grasspave², porous paving systems made from 95% recycled post-consumer plastic from film canisters and pop bottle bottoms.

Applications:

Gravelpave maintains porosity and keeps gravel spread evenly in areas too heavily travelled for grass. Grasspave prevents compaction and promotes drainage for seeded or sodded areas used for infrequent parking or low traffic access drives.

Sizes:

Each block is 20" x 20" x 1".

Comments:

Porous paving helps to capture rainwater and prevent stormwater runoff. Grasspave use can also reduce temperatures around individual buildings. These systems can handle heavier loads than standard asphalt and concrete, and standard snow removal equipment can be used on them.

Mandish Research International

5055 State Road 46

Mims, FL 32754

Ph: (407) 267-2561

Fax: (407) 268-1972

Precast lightweight Donolite concrete products made from cement mixed with recycled fiberglass, polystyrene, and/or tire rubber. The recycled polystyrene comes from a foam sheathing manufacturer and the fiberglass comes from old boats.

Applications:

Can be used for cast birdbaths, fence posts, landscape timbers and landscape ornaments.

Comments:

Mandish is interested in licensing others and providing the equipment and technology necessary to set up manufacturing. They also sell molds to landscapers from their plant.

Plastic Tubing Inc.

P.O. Box 878

Roseboro, NC 28382

(800) 334-6602

(919) 525-5121

Corr-A-Flex recycled plastic flexible tubing for site drainage.

Applications:

Drainage. Tubing comes in slotted, solid, or double wall.

Sizes:

10' or 20' lengths, or coils, in diameters from 4" to 15".

Comments:

The tubing is made with 0-70% recycled HDPE, from post-industrial and post-consumer sources. Recycled content varies with application, and the customer may specify tubing with a high recycled content.

**Presto Products Co.--
Geosystems Division**

P.O. Box 2399

Appleton, WI 54913-2399

(800) 548-3424

Geoblock porous pavement system made from high strength reinforced plastic with a minimum of 50% post-consumer recycled content

Applications:

For utility access lanes, driveways, highway medians, and approaches to monuments, etc. The system creates a load bearing pavement yet allows drainage and grass.

Sizes:

Blocks are 12" x 36" with a depth of 1.25" or 2" and a tongue and groove interlock on all edges.

Comments:

Blocks provide over 80% open area for water penetration. Seating blocks may require sand/gravel/topsoil mix on a sub-base.

United Resource Recovery

Route 2, Box 265

Jonesboro, AR 72401-9560

(501) 932-3500

Recycled plastic stepping stones, made from 100% post-consumer plastic, faced with rock.

Applications:

Exterior walkways.

Sizes:

12" square or 12" round stones, with a variety of finishes. Stones can be custom designed with numbers or letters molded in.

Comments:

Each stone weighs approximately 5 pounds.

Miscellaneous

Most of the entries in this chapter contain high percentages of recycled post-consumer or post-industrial waste. Others are simply more resource efficient than products now in common use. Manufacturers of construction materials such as recycled plastic sheets, shims, and nail fins are included. Producers of aggregate for concrete and masonry are found here, as well.

This chapter contains listings for alternative wood preservatives. Wood used in outdoor or subsurface applications is extremely vulnerable to the elements, and treated wood is generally specified for these applications. There are concerns about the longevity of treated wood, and particularly the environmental impacts of chemicals used in the treatment process. Wood preservatives often include chromium and arsenic, and these chemicals may leach out of the wood in marine or wet sub-grade applications and contaminate groundwater or soil. This chapter lists wood treated with less-toxic alternatives such as borate.

For some applications more durable and sustainable substitutes for wood are available. Recycled plastic lumber is a viable alternative to wood for landscaping or fences. Decks and patios can be constructed from materials other than wood such as plastic lumber, stone, tile, or rubber pavers. Choosing a weather-resistant material eliminates the need for harsh preservative treatments.

A.E.R.T.

P.O. Box 1237
Springdale, AR 72765
(501) 750-1299

-or-

P.O. Box 172
Junction, TX 76849
(915) 446-3430

Advanced Environmental Recycling Technologies, Inc. has developed a composite material, Moistureshield™, made from recycled wood fiber and recycled polyethylene.

Applications:

Currently being used as a substrate by window and door manufacturers for door rail and window sill fabrication.

Sizes:

Made to custom specifications.

Comments:

This material is resistant to weather, extreme temperatures and chemicals, and will not rot, warp, crack or expand due to weather. The wood fiber is derived chiefly from waste

cedar. Both high density and low density polyethylene waste can be utilized with A.E.R.T.'s technology.

Bomanite Corporation

P.O. Box 599
Madera, CA 93639-0599
(209) 673-2411

"FlexTech" resurfacing material made from recycled rubber granules and virgin resins which are mixed on-site and troweled in place.

Applications:

For resurfacing damaged pool decks, walkways, driveways and patios.

Weight:

Approximately one pound per square foot.

Comments:

Adheres to concrete, asphalt, metal and other surfaces. When used in exterior applications, it should be periodically resealed to retain luster.

Catrel USA

3638 Camino del Rio N. Ste. 203
San Diego, CA 92108
(619) 285-1188

-or-

Raritan Plaza II, CN 3106
Edison, NJ 08818
(201) 225-4849

Conversion of municipal solid waste into products that can be incorporated into building materials.

Applications:

Aggrete™ spheres and pellets can be used in the manufacture of concrete bricks and blocks. Fibrete™ has insulating and adhesive properties suitable for the manufacture of plasters and mortars.

Comments:

Catrel plant operations do not involve refuse combustion and do not consume any water for waste processing and conversion. Catrel waste processing plants are designed to be locally built, and according to Catrel USA, cost 80% less to build than a comparable incineration facility.

C-Max Technologies

2140 W. 12th Ave.

Vancouver, BC V6K N2N Can.

Ph: (604) 738-0505

Fax: (604) 738-0505

Contumax products made from waste wood and plant fibers, which are bonded with a magnesium oxyphosphate cement to create a variety of products that are strong, dimensionally stable, insoluble in water, and have excellent fire and insect resistance.

Applications:

For the manufacture of continuous-press processed boards, expanded rigid foams, as well as molded or extruded products such as shingles.

Comments:

The fiber content in Contumax products is 60-90% by volume of each C-MAX formulation. Different formulations of the fiber ingredients produce a variety of densities, strengths and other properties resulting in many different final products.

Chemical Specialties, Inc.

One Woodlawn Green, Suite 250

Charlotte, NC 28217

(800) 421-8661

(704) 522-0825

Wood preservatives using diffusible borates.

Applications:

Impel rods for in situ treatment of poles, posts, and millwork. ACO is used to pressure treat wood for outdoor uses.

Wood species used:

Douglas fir, western hemlock and Southern yellow pine.

Comments:

Wood preservatives are needed for wood used in below grade and structural outdoor applications. ACO contains no chrome and no arsenic.

Environmental Specialty Products

P.O. Box 1114

Guasti, Ca 91743-1114

(909) 390-8800

-or-**Innovative Plastic Products Inc.**

P.O. Box 898-109

Greensboro, GA 30642

(706) 453-7552

InnoPlast GPTM sheets manufactured from recycled commingled plastic waste.

Applications:

Designed to be used as reusable concrete forms. Possible other uses as exterior sheathing or sub flooring.

Sizes:

Standard size is 40" x 48", available in thicknesses of 1/4", 3/8", 1/2", and up to 1 1/2".

Comments:

InnoPlast uses a 50% thermoplastic portion of polyethylene as a carrier element into which various plastics and impurities are imbedded.

EZ-Shim

123 Santa Barbara St.

Santa Barbara, CA 93101

(800) 788-8945

(805) 963-9098

EZ-ShimTM recycled plastic shim with precut break points.

Applications:

For setting doors and windows and hanging cabinets.

Sizes:

1 1/4" x 8" each, in break away sheets of ten. Shims will snap off to length at any given set point.

Comments:

BOCA and UBC approved, these shims are of consistent quality and experience no shrinkage. They also offer a use for a problematic waste product.

Medite Corporation

P.O. Box 4040

Medford, OR 97501

Ph: (503) 773-2522

Fax: (503) 773-2522

Medex, a formaldehyde-free medium density fiberboard made from pre-consumer wood waste.

Applications:

Designed for exterior non-structural uses for high moisture areas. Can also be used for interior applications such as cabinets, window and door parts and mouldings. Not designed to be used in contact with soil. Also Medite II, an MDF, formaldehyde-free, for dry areas.

Sizes:

Average thickness of 3/4" in a variety of dimensions up to 5' x 18'.

Comments:

The resins used in Medex cure into a formaldehyde-free polyurethane. Available with a factory prime coat on two sides.

The Millenium Group

121 South Monroe St.

Waterloo, WI 53594

(800) 280-2304

(414) 478-2304

The Nailer®, a drywall fastener made from 100% post-consumer recycled plastic.

Applications:

Replaces conventional wood lath catcher or drywall clips. The Nailer is used for preparing inside corners for drywall hanging. It attaches to the top plate of the wall with staples.

Comments:

This drywall hanging system saves labor and materials. Twenty Nailers will replace 4 vertical studs, or 26 linear feet of wood, when installed 16" on center.

Neutralysis Industries

550 Frontage Road Suite 291
Northfield, IL 60093
(312) 441-9444

Neutralite is a non-toxic concrete aggregate made from municipal waste. This patented process combines municipal solid and liquid wastes with clay to produce a pelletized feed stock that is then kiln-fired to produce an inert lightweight ceramic aggregate which can then be used in the building industry. This is an excellent example of putting waste resources to work in building materials.

Applications:

Structural lightweight aggregate for concrete and masonry.

Comments:

Provides a complete processing of the waste stream, without the high volume of gas emissions associated with conventional incineration. Acunet Envirotech Inc. of Saginaw, Mich. plans to operate the first Neutralysis plant in the U.S. soon.

Recycled Plastics, Inc.

Rt. 1 Box 95A
Garfield, MN 56332
(612) 834-2293

Recycled plastic sheets from 100% post-consumer HDPE or from 100% post-industrial regrind.

Applications:

Sheets are used for foundation forms, below-grade sheathing, furniture, cabinet doors, trim and baseboards.

Sizes:

4' x 8' sheets, in thicknesses 1/8" to 1 1/4". Custom colors available.

Comments:

Panels can be welded to join. When using these panels the expansion of 3/16" per 4' per 40° temperature must be considered.

RePlastec

Erie Industrial Park
Port Clinton, OH 43452
(419) 635-4000

Recycled plastic nail fins/drain troughs.

Applications:

Nail fins are used for new door and window installation. Drain troughs for basement waterproofing system.

Comments:

Products are extrusions from 100% recycled plastic.

Sorbilite

5721 B Bayside Rd.
Virginia Beach, VA 23455
(804) 464-3564

Sorbilite Composite Molding system, a high pressure press that uses a binding agent, a catalyst and fibers under pressure and heat to create medium-density fiberboard components.

Applications:

This press can produce components for furniture or panels for cabinetry, as well as other products, from fibrous waste.

Comments:

The Sorbilite press makes use of wood waste, and other fibrous waste including carpet fibers and peanut shells. The Sorbilite press is the core of a fast, low-energy system available in different sizes.

Sure Fit Shims

P.O. Box 35225
Greensboro, NC 27425-5225
Ph: (800) 225-0848
Fax: (919) 668-7790

Shims manufactured from recycled plastics.

Applications:

For general construction use wherever shims are needed.

Sizes:

Standard size is 1 1/4" wide with upper height of about 1/2".

Comments:

These shims are employed by sliding two wedge-like components together until the desired height/lift is attained.

United McGill Corp.

P.O. Box 820
Columbus, OH 43216-0820
(800) 624-5535
(614) 443-5520

Seal-n-Save™ water base duct mastic.

Applications:

Used to seal residential duct systems, both old and new. Applied with a caulking gun or brush.

Comments:

About 95% of all homes have enough duct leakage to require sealing. Mastic reduces energy consumption and improves indoor air quality.

The Weather Company, LTD

1013 Pleasant Ave., Suite B
Wyndmoor, PA 19038
(800) 795-2040
(215) 233-0404

WeatherRx 5™ zero VOC water-based siloxane concentrate sealant for concrete masonry, stucco and wood.

Applications:

For use on sidewalks, driveways, patios and vertical masonry surfaces.

Sizes:

Concentrates in 6.4 ounce 32 ounce and 2.5 gallon sizes, that mix to provide 1 gallon, 5 gallons, and 50 gallons, respectively.

Comments:

This sealant is one of a new generation of water-based sealants with low or zero VOC emissions. The concentrated form of WeatherRx 5 reduces packaging waste.

Yemm and Hart Green**Materials**

RR 1, Box 173
Marquand, MO 63655-9610
(314) 783-5434

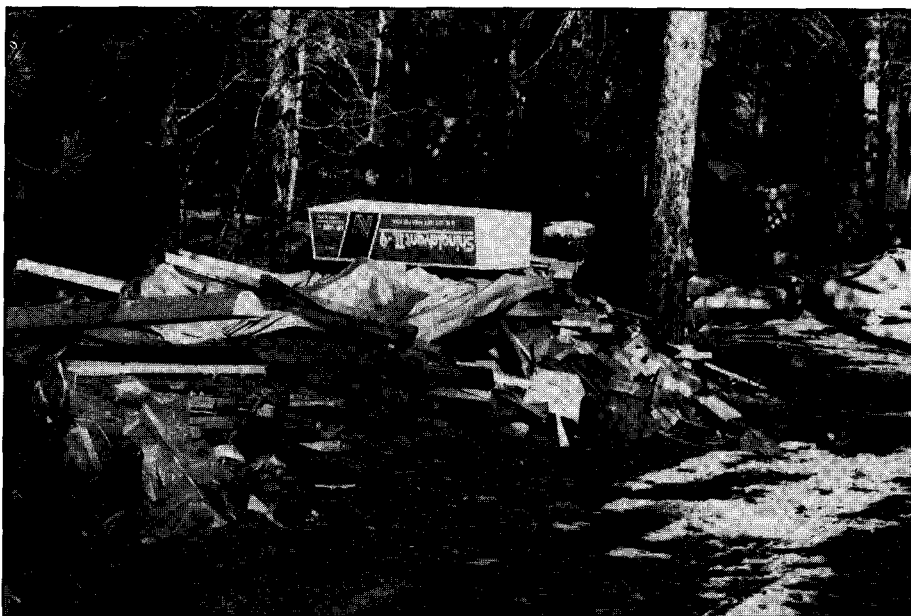
Recycled plastic panels, sheeting, and furniture.

Comments:

Yemm and Hart produces a wide variety of recycled plastic products, some of which are suitable for use in building and landscaping.

Job-Site Recycling

Building demolition and remodeling produce significant amounts of waste as existing structures and finishes are removed. New construction also produces waste in the form of scrap, defective and damaged material, and empty packaging. Much of the construction and demolition waste produced is sent



to landfills by owners and builders. At present only a small fraction of construction waste is recovered for reuse or recycling, although the potential exists to recycle or reuse a high proportion of construction waste. In fact, through implementation of job-site recycling options waste can be prevented altogether, or at least diverted from landfills. Alternatives to landfill disposal help to recover part of the value in materials formerly considered waste.

The waste stream as a whole generally consists of 20 to 25 percent construction and demolition waste. On average, at least 25% of discarded construction material is dimensional lumber, 15% is drywall, 12% is masonry and tile and 10% is waste from manufactured wood products. The other 38% is divided between cardboard, paper and plastic packaging, asphalt, fiberglass, metals and other miscellaneous materials. The magnitude of wasted material is impressive. One of the most comprehensive and referenced studies on job-site waste was done by REIC Consulting Ltd. in Toronto, Canada ((416)841-5551). Their analysis showed that the construction of an average house results in discarding the equivalent of 200 2 x 4 studs, 400 standard bricks, and 10 to 12 sheets of drywall.

Many builders are beginning to find that disposing of construction waste can be problematic. In Toronto and other municipalities, cardboard, fine paper, clean wood, concrete and rubble, drywall and scrap metal are banned from the landfill. More restrictions are being enacted in other urban areas as well. Elsewhere builders are finding the costs of disposal increasing as landfill space decreases and tipping fees rise. Paying for the disposal of construction "waste" makes up, on average, 3 to 5 percent of a builder's overall budget.

According to the National Solid Wastes Management Association, tipping fees rose an average of 30 percent in all regions of the country from 1988 to 1990, and they continue to rise. Much of the increase is attributed to the stringent requirements that the EPA's Resource Conservation and Recovery Act (RCRA), subtitle D, places upon landfill owners. Given the rising costs, builders are learning that avoiding the creation of construction and demolition waste, reusing materials and implementing jobsite recycling programs can make money, rather than adding to disposal costs.

Some contractors assume that recycling costs more in increased labor than it will save in tipping fees, and will not pursue job-site recycling unless it is required in the bid. Specifying recycling in the contract will put competing contractors on a level footing for bidding, and a contractor that offers recycling can

negotiate with the owner to have it included in all bids, to illustrate relative costs. Many references indicate, however, that recycling can be cost effective for the builder even in instances where it is not required in the specifications or by the contract.

When materials are salvaged for reuse or recycling, the owner or builder can sell those materials to offset recovery expenses. In addition, waste avoidance strategies initiated in the design phase and carried through at the construction site can reduce the materials costs of a job. Examples of such strategies are standard dimension designs on two-foot modules, accurate materials take-offs, and "just in time" delivery. When fewer materials are used at the site, the builder also has less waste to dispose of, which reduces hauling and tipping fees associated with a job.

Salvaging materials from demolition or remodeling sites requires advance planning, to locate potential markets for materials and to ensure that components are removed with as little damage as possible, and not mixed with non-reusable demolition debris. Removing materials for reuse may require more labor time during the demolition phase of a project, but some salvaged materials are high-value items that can be sold at a profit if carefully removed. (For ideas, see the chapter on Salvaged Materials.) In some areas, non-profit materials reuse facilities accept used construction materials as a tax-deductible donation.

Construction materials that are not recoverable for reuse may still be readily recyclable. At present the primary barriers to recycling are the high cost of construction labor and the perception many builders have that sorting through cut-piles and separating wastes is labor intensive and too expensive. However, many workable and profitable methods for efficient recycling have been demonstrated, and sources for information on those methods are included in this chapter.

Waste is generated by many construction activities, including not only demolition, but also framing, drywall hanging, finishing and installation of electrical and mechanical systems. When an on-site disposal system mixes a variety of discards in one "waste" bin, it cancels their recycling value by adding re-sorting cost. On-site workers should be trained to understand the proper procedures for sorting waste, and keeping the different types of waste separate. Source separated, or "clean", construction waste generally has a much higher market value than mixed waste.

Finding space on the job-site to locate separate recycling bins for each type of material can be a challenge. Materials usually have to be stored on site until a full load is available for pickup or hauling to the recycling facility. The extra cost that limited space can incur needs to be specified in the bid and contract, or recycling can become difficult for the builder. Bins also need to be located in a secure area to avoid contamination by unauthorized use. The property owner should be made aware of the materials separation and storage requirements involved in a comprehensive job-site recycling program.

The final barrier that builders must surmount is locating markets for recycled materials. Many metropolitan areas have compiled listings of haulers, materials recovery facilities, private recyclers and salvage dealers. Time spent finding out what each operation will accept and at what price is a wise investment for the competitive builder.

For every locale, different options for materials disposal, recycling and reuse will be available, and with materials sorting the options become more accessible. Disposing of wood waste becomes much easier when the wood is not mixed with drywall, cans of adhesive, or broken windows. Builders should be able to locate people or organizations willing to receive or pick up a bin of mixed dimensional lumber, trim and plywood. Present packaging methods produce many items that are inherently difficult to recycle. Cans with a residue of adhesive in them may be difficult to remove from the waste stream. Many composite materials, if not reusable, will also be relegated to the dump, due to the difficulty of separating constituent parts for recycling.

CRBT provides consulting services for builders, representatives of municipalities or manufacturers and others who wish to implement a detailed recycling plan. We also have additional information and technical briefs on job-site recycling and building material reuse.

***Pre-cycling:
Avoiding the need to
recycle by choosing and
purchasing items that
create the least waste.***

General Construction & Demolition Waste

Greater Toronto

Home Builders' Association

Attention: Steven Dupuis

20 Upjohn Road

N. York, ON M3B 2V9 Canada

(416) 391-3445

The GTHBA is actively seeking ways to implement the three Rs in residential construction and has put out a 27-page guide called Making a Molehill Out of a Mountain II. A "disposal-costs" comparison chart in the guide indicates the stimulus for their efforts, listing tipping fees in Toronto as being substantially higher than most other areas in Canada. Molehill II provides information on the various elements involved in setting up a waste reduction plan specifically for builders.

Innovative Waste Management Waste Reduction Consulting

137 Strese Lane

Apple Valley, MN 55124-9337

(612) 432-7038

Innovative Waste Management has published a Construction Materials Recycling Guidebook which identifies barriers and suggests solutions to C & D waste reduction and recycling in the Twin Cities area. This guide includes worksheets for figuring the costs and benefits of recycling on the job site as well as a directory of haulers and recyclers in the area.

Metro

Solid Waste Department

600 NE Grand Ave.

Portland, OR 97232-2736

(503) 797-1650

Portland, Oregon has conducted extensive studies of construction and demolition waste and opportunities for job site recycling. A number of guidebooks, fact sheets and published studies on job site recycling are available from Metro.

Recycling Construction and Demolition Waste in Vermont

Solid Waste Division

103 S. Main, Laundry Building

Waterbury, VT 05671

(802) 244-7831

A report compiled for the State of Vermont by C.T. Donovan Associates Inc., full of statistics on the past, present, and future of C & D recycling in Vermont. The information could serve as a useful reference for other solid waste managers and planners throughout the country.

Urban Ore, Inc.

David Stern, Information Services

1333 Sixth St.

Berkeley, CA 94710

(510) 559-4460

Urban Ore, Inc. works in conjunction with the local waste management facility in Berkeley, California, to salvage useable materials. Urban Ore has a Building Materials Exchange, which deals in construction materials dropped off by individuals or businesses, or picked up at local job sites. Urban Ore pays cash for some materials, and charges a fee to accept others. Reuseable post-consumer materials are diverted from landfills through this effort. Contact Stern to learn more about Urban Ore's local program.

WasteBusters, Inc.

Attention: Robert Langeland

1390 Richmond Terrace

Staten Island, New York 10310

(718) 351-1936

Founder Robert Langeland is salvaging doors, plumbing and lighting fixtures, hardware and other durable goods and selling them through his *WasteBusters News* newsletter. Robert hates to see valuable materials go to waste and would like to see similar ventures established elsewhere.

Wood

Big City Forest, Inc.™

1809 Carter Ave.

Bronx, NY 10456

(718) 299-1183

Big City Forest accepts both discarded wood and used pallets and reclaims the lumber to make new pallets, furniture, flooring, and other value-added wood products. In 1995 they expect to reclaim about 3 million board feet of lumber. Local initiatives like this one offer important opportunities for high-value dimensional lumber recycling.

Urban Forest Wood Works

585 West 3900 South, #6

Murray, UT 84123

(801) 266-5650

Urban Forest Wood Works uses city trees cut from the urban forest to fabricate value-added specialty wood products. Salt Lake City discards more than 500,000 board feet of wood from urban trees annually, much of it consisting of hardwood or exotic species. Urban Forest Wood Works recovers and utilizes this valuable wood. Businesses such as this one could thrive in metropolitan areas with extensive urban forest, and help to recover value from the trees cut and divert usable wood from landfills.

Wood Recycling Inc.

300 Forest Street, P.O. Box 6087

Peabody, MA 01961

Ph: (508) 535-4144

Fax: (508) 535-4252

Wood makes up roughly 25% of the waste generated at construction sites. Wood Recycling Incorporated is recycling wood fiber into composite wood products, fiber-reinforced cement mixtures, and roofing substrate. This is a good substitute for or supplement to virgin wood fibers which are commonly used in particle board.

Gypsum

New West Gypsum

20321 80th Avenue

Langley, BC V3A 4P7 Canada

Ph: (604) 888-2282

Fax: (604) 888-5126

Reclamation Technologies, Inc.

115 East Bagdad Road

Round Rock, TX 78664

(512) 388-9677

Domtar Gypsum

122 Old Dover Rd.

Newington, NH 03801

(800) 366-8274

Scrap gypsum comprises about 15% of C&D waste. If disposed of improperly it can combine with anaerobic bacteria and organic matter in a moist environment to

produce hydrogen sulfide gas. Landfill tipping fees in the U.S. and Canada are increasing at a rate which makes recycling of materials such as gypsum more attractive. These companies are finding ways to recycle gypsum waste into new wallboard and other products.

Carpet

Environmental Recycling Services Inc.

14601 W. 101st Terrace
Lenexa, KS 66215

This company offers regional collection of used carpeting and bales it for recycling. Collection services like this one are a vital link in the recycling chain, as they help to centralize recyclable materials for markets.

Partnership for Carpet Reclamation

DuPont Flooring Systems

Carolyn Wilhauer

P.O. Box 80,722

Wilmington, DE 19880-0722

The Partnership for Carpet Reclamation is a membership organization. Members across North America, throughout the carpet industry, receive containers for post-consumer carpeting. When full, these containers are collected for a fee, and the carpet is sorted and then sent to DuPont and fiberized. The carpet fiber can be used for reinforcing plastic or asphalt, or as a component of carpet cushion.

Asphalt Shingles

American Reclamation Corp.

225 Turnpike Road
Southborough, MA 01772

Ph: (508) 624-7006

Fax: (508) 481-5393

American Reclamation Corporation produces asphaltic paving mixtures from recycled mineral aggregates, recycled asphalt paving, crushed recyclable asphalt shingles, recycled soil containing petroleum products, and asphalt. These mixtures, which include 90% recycled components, are created using a cold mix asphalt emulsion process. Testing reveals that AmRec mixtures do not leach

any hazardous materials. Contact them to find out more about these products.

ReClaim Inc.

8001 N. Dale Mabry Hwy
Suite 101

Tampa, FL 33614-3211

Ph: (813) 935-8533

(800) 448-5307

Fax: (813) 933-9713

ReClaim, Inc. recycles asphalt roofing materials collected from construction and demolition projects into *RePave*, a permanent asphalt road patching material. ReClaim currently has two plants in New Jersey and plans to open two more each year for the next five years in major metropolitan areas. Each plant recycles 20,000 to 30,000 tons of asphalt per year. In the past five years, ReClaim has recycled 180,000 tons of asphalt. ReClaim works with the community to identify sources and quantities of roofing debris; the material is collected and converted into a value-added product. This is a good example of a product made from a material which would otherwise go to a landfill.

Other Roofing

Renaissance Roofing Inc.

P.O. Box 5024

Rockford, IL 61125

(815) 874-5695

Renaissance Roofing purchases used clay roofing tiles and slates from demolition contractors across the nation, and is available for roof demolition with adequate prior notice. See Salvaged Materials chapter.

Paint

Innova

P.O. Box 1747

Boyce Hot Springs, CA 95416

(707) 938-4450

Innova offers The Commercial Paint Recycler, equipment that blends usable latex paint leftovers for use as primer, base coat or top coat. The Commercial Paint Recycler requires 27 square inches of floor space, and operates on 120-volt power. It can mix up to 60 gallons of paint per

batch, and provides painters and builders with a means of reusing leftover paint.

Insulation

Big Green Marketing

P.O. Box 510

Bend OR 97709

(503) 383-0095

The Big Green Machine™ is an insulation reprocessor that allows builders and demolition contractors to grind used or scrap fiberglass batt insulation into bagged loose insulation suitable for blowing or pouring. The machine provides a means of reusing fiberglass insulation that cuts landfill costs and represents a savings over the cost of new insulation.

These are just a few of the many organizations currently recovering resources and preventing waste generation during residential and commercial construction.

Through such efforts, the building industry can decrease the amount of landfill space it uses and save money and materials.

Please contact CRBT if you know of similar recycling programs. We'd like to help our industry make the transition from "wasteful" to "resourceful" job-site practices.

Designing for Resource Efficiency

The essence of resource efficiency is the conscious reduction of our use of natural resources. Careful design and planning are imperative for successful implementation of resource efficient construction principles and practices. Three primary aspects of resource efficiency intertwine to form the basic design considerations: space efficiency, energy efficiency, and cost efficiency. An effective resource efficient design will combine these concepts with creativity, common sense, and forethought to conserve resources and energy and reduce the costs of building and maintaining a structure. Employing all the aspects of resource efficient design will produce houses that serve society's shelter needs without causing an undue demand on natural resources.

Space Efficiency

Perhaps the most obvious approach to resource efficiency is to build a smaller house. Although smaller houses generally cost less to build and operate in terms of money, resources, and energy, the national trend has been toward larger houses. In 1949, the average residence in the United States was less than 900 square feet and housed 4.2 people. The 2,000 square foot house typical in 1991 housed only 2.6 people. As our desire for personal space swells, the financial and ecological costs of construction and maintenance of that space increase dramatically. Only by reversing the trend toward larger houses can society achieve meaningful reductions in the amount of resources we allocate to constructing the built environment.

Small houses can be made space efficient, functional and livable through careful layout and design. Efficient and clever use of space can make a small house seem spacious. Long views and open plans make small houses seem larger, while including some enclosed space in designs adds necessary privacy. Not only does eliminating most interior walls and partitions make your home feel larger, but you also save the material and labor costs of framing and finishing the extra walls. Additionally, wasted space in hallways can be eliminated through design changes, and typically underutilized space can be employed for efficient built-in storage.

Besides the size of a house, the shape of a house is one of the main factors in the expense of construction. The basic rectangle is the most efficient shape for a house, and the most efficient rectangle is the square. These shapes enclose the greatest amount of floorspace with the shortest perimeter, which means less wall has to be constructed. When deciding the shape of your footprint, try to avoid complicated angles because it is much easier and less expensive to build straight walls. Thus, the fewer angles and corners there are in the plan, the less expensive the house will be, in terms of materials, labor and, consequently, money. Keep in mind that it is typically cheaper to build up than to build out. Building a two-story house generally costs less per square foot of floor area because you only have half as much foundation and half the roofing per square foot of floorspace. Starting out with the most appropriate size and shape for your house will reduce the costs of almost all aspects of construction, including the foundation, framing, roofing, and the costs of interior and exterior finish work.

Modest lifestyle changes can have a large impact on how a feeling of spaciousness or overcrowding is

perceived. Multiple uses of space and thoughtful planning of storage areas can help to create a quick-to-clean and easy-to-maintain abode that is eminently livable, yet resource efficient. We have included references for several titles on small house design that offer examples of the principles of space efficiency at work.

Making Space: Design for Compact Living

Overlook Press
Lewis Hollow Rd.
Woodstock, NY 12498
(914) 679-6838

Small Home Plans

The Garlinghouse Company
P.O. Box 1717
Middletown, CT 06457
(800) 235-5700

Small Houses

A Fine Homebuilding Book
Tauton Press
Box 5506
Newtown, CT 06470-5506

Energy Efficiency

Energy efficient building gained significant popularity during the oil shortages of the 1970's. Homeowners looked for ways to reduce heating and cooling costs, and adopted strategies like weatherstripping and adding insulation to walls and attics. Now a whole new generation of energy efficient building materials exists, ranging from structural insulated panels to super-insulated windows. Since the 1940s the thermal efficiency of insulation materials has improved steadily. Mechanical systems and appliances have also become more energy efficient over the years, and today efficient furnaces, refrigerators and other appliances offer reduced energy usage. Heat recovery systems help prevent the loss of conditioned air while providing necessary whole-house ventilation.

Energy efficiency is not only a result of materials choices, however. Design principles can also be employed to enhance the energy efficiency of buildings. Attention to window and overhang placement and orientation of a building promote daylighting and passive solar heating. Earth berming can buffer climatic extremes. Enclosed porches provide transition zones between inside and outside that reduce the loss of conditioned air. Cooling towers and well-placed windows provide opportunities for effective natural ventilation that contributes to reduced cooling costs.

The operating energy used for heating, cooling, lighting and appliances is not the only energy consumed by buildings. Buildings also represent a huge energy investment that includes the energy used in locating, extracting, processing, transporting and installing building materials. This embodied energy should be considered as part of the energy consumption attributed to a building. In an individual house embodied energy can equal as much as 30 years of operating energy.

Designers and owners can take several actions to reduce the embodied energy included in a building design. Minimally processed building materials have far less embodied energy than highly refined materials. Local products require less transportation energy than imported ones. Recycled materials generally have less embodied energy than new materials, and salvaged and reused materials require even less energy than recycled materials. Products that have a long life expectancy, yet require little maintenance, usually have less embodied energy over the life of a house than high-maintenance or short-lived products.

Cost Efficiency

Cost-effective design results from a considered combination of space efficiency and energy efficiency, blended with the selection of appropriate materials for each function. Achieving cost efficiency is integrally related to reducing the amount of material used in building. Sensible application of the ideas of resource efficient design makes building modest, comfortable, healthy and affordable homes possible.

In addition to the principles of space efficiency stated above, there are a variety of practical building techniques which reduce the overall cost of the project by reducing the amount of materials used. Clustered plumbing, for example, reduces the length of pipe required for plumbing because the rooms which require plumbing share a wall, or are in close proximity to each other. Savings can be achieved by installing the minimum required number of electrical outlets and switches, and wiring costs can be reduced by locating switches as close to fixtures as possible. In many cases, money and materials can be saved in framing by using 24 inch spacing of framing members instead of the conventional 16 inch spacing. Using premanufactured roof trusses is less expensive than stick-framing rafters, results in the use of less wood overall and reduces jobsite waste. Cost-saving strategies such as these typically use less materials than conventional building techniques, resulting in benefits to the builder and to the environment.

Summary of Resource Efficient Design Criteria

Finally, resource efficient building design comes back to a central principle: smaller houses cost less to build, in terms of money, resources and energy. Effective application of this central principle and other important facets of resource efficient design requires a comprehensive approach.

Developing a building design is a complex process that involves consideration of the energy and material resources the building will consume in its construction, operation and maintenance. Resource efficient designs reduce the amount of energy and material consumed by a building during its construction and use. The resource-conscious designer should plan for the future, as well, by considering the design's ability to adapt to changing use requirements and how the building lends itself to dismantling or remodeling at the end of its useful life.

The criteria below provide a means of evaluating the resource efficiency of a building design, as well as suggesting means of reducing the environmental cost and resource consumption of a building. These criteria offer a standard toward which a designer can reach, even if a particular design does not fulfill every criterion. This comprehensive approach allows decision makers to avoid relying on fulfillment of a single criterion as the measure of "green-ness" in a building design. If a design choice is based on "practicality" or "cost-effectiveness" or "market demand", the criteria below allow an assessment of the resource cost of that decision.

Given the relatively complex nature of the variables involved, it may not be possible to evaluate the performance of a structure relative to all of the listed criteria. Even so, this list of criteria allows at least a cursory consideration of all resources consumed through the life of the structure, and identifies areas where design improvement is desirable.

Resource efficient building designs:

1. Make efficient use of limited resources

- + Create a new building only when an existing building is not available for modification and reuse
- + Reduce total resource consumption by utilizing space-efficient design principles
- + Incorporate resource efficient building materials appropriately
- + Apply materials efficiently; avoid over-engineering
- + Utilize existing infrastructure (roads, water, sewer and power lines, etc.)

- + Employ dimensions based on standard component sizes to reduce the amount of waste generated in construction
- + Enhance structural longevity by withstanding local climatic conditions and extreme events such as fire, earthquakes, hurricanes, floods.
- + Include measures for water conservation, capture and reuse
- + Preserve existing native site vegetation, and restore native vegetation where lacking
- + Combine structural products of comparable longevity, to lessen probability of having to demolish or dismantle due to failure of a single element

2. Demonstrate recyclability or reusability

- + Recycle whole buildings or incorporate individual salvaged materials
- + Allow for future adaptability or dismantling by employing screws, bolts, panels and gaskets, rather than adhesives, nails, and permanent structures
- + Include features to promote recycling of occupant waste (composting, storage of recyclables, etc.)

3. Lower energy use

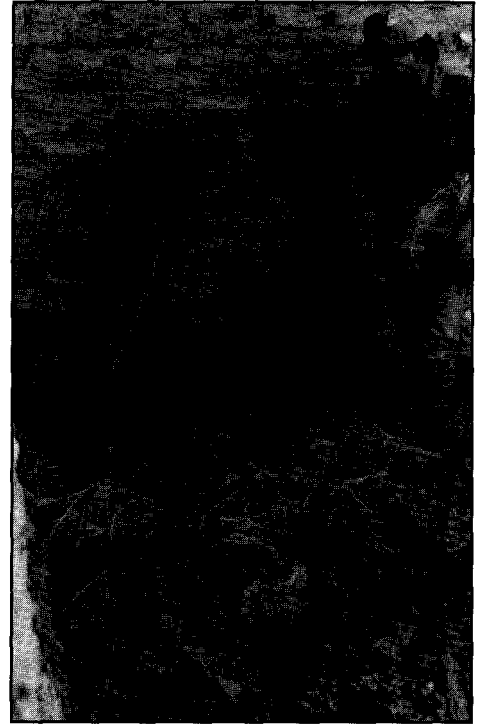
- + Use less operating energy than conventional designs
 - Include efficient mechanical systems and/or
 - Have highly insulated complete structure, including doors and windows and walls and roof and floor/foundation and/or
 - Make use of natural ventilation, heating (earth berming, passive solar etc.) and daylighting and energy efficient landscaping (shading, breeze channeling) and/or
 - Use renewable energy for electricity generation and/or heating
- + Utilize materials with a comparatively low total of lifetime energy inputs
- + Site building to require minimum additional transportation energy for materials and installers

Implementation Criteria

1. Are monetarily affordable
2. Have an appearance acceptable to homebuyers
3. Require labor and skill levels comparable to conventional designs
4. Meet applicable building codes for occupant safety
5. Are appropriate for the location, both culturally and socially

Indigenous Resources for Housing

Half of the world's houses are made of earth: clay, caliche, wattle and daub, adobe or rammed earth. Not only earth, but a variety of indigenous materials—the materials native to a particular area—can be used to build bioregionally appropriate structures. The use of indigenous resources minimizes the amount of energy required for building material transportation and can reduce the energy costs of processing, as well. Historically, houses built from indigenous materials have created design vernaculars: they share distinctive basic style or particular details with their neighbors. Local or regional styles evolved over many generations and these structures are well matched to their regional resource base, climate and cultural setting. Like historical structures, contemporary indigenous buildings draw on materials at hand, including local surface or quarried stone, the building site's excavated soil, or local wood or agricultural waste fiber. Native materials such as clay or uncut stone that require little energy or technology to process are also used.



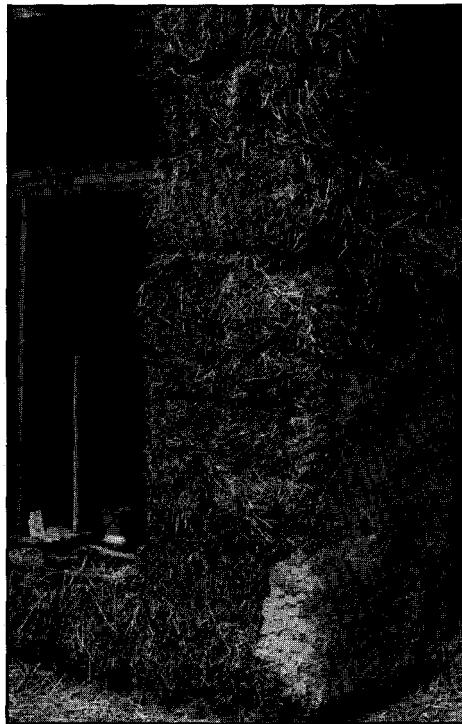
There are many creative ways to include principles of resource efficient indigenous building in home design and construction. Innovative builders have combined ancient wisdom and new technology; lessons from both nature and modern engineering in indigenous material structures of exemplary resource efficiency. A few of these systems represent an eclectic synthesis of the best of "high" and "low" technology. Some innovations are widely replicable, and this chapter relays information on particularly resource efficient indigenous building systems that can be adapted to many situations.

The systems presented in this chapter are, in some cases, radically different from conventional stick-framing or even foam-core panel construction. These are not one-to-one substitutions of a resourcefully produced building component for a conventional one in a standard design. Instead, some of these listings represent completely different methods and structural systems of building, using simple, abundant materials. Some of these building methods hearken back to ancient ways of building, and reflect systems that evolved when quick transportation and cheap energy were not readily available. By contrast, a few "indigenous" building methods make inventive use of abundant waste materials discarded by our consumer society. These resource efficient systems utilize "waste" materials such as straw or tires as building elements.

Part of the recent resurgence of interest in alternative building systems has been the perception that they are inexpensive. While houses built from indigenous materials do offer the potential of lower materials costs, the design as a whole, including roof, foundation, mechanical systems and hardware, as well as labor expenses, will govern the cost of a building project. Expensive custom homes can and have been built with indigenous materials. Low cost is not a guaranteed result of choosing indigenous materials. Most indigenous systems, as traditionally built, share the trait of being labor intensive. This can add substantially to the cost of building. Fortunately many of the indigenous building methods are easy to learn, which allows the owner the option of reducing costs by providing all or part of the required labor in a kind of "sweat equity," or hiring low-cost underskilled labor.

Although constructed of simple materials, indigenous buildings need not be utilitarian to the point of ugliness. In fact, houses of indigenous or salvaged waste materials can be elegant, unique and distinctively beautiful custom dwellings. Many of these indigenous building systems can be used to produce fairly conventional houses, and most can be applied to conform to standard building codes. Even so, indigenous materials do have some limitations and particular characteristics that the designer and builder should recognize. CRBT strongly recommends professional design and engineering for residential structures, particularly those that utilize unusual building methods. Safety and durability of structures are primary considerations.

While indigenous-material houses can be quite resource efficient, the use of indigenous building materials is not without environmental consequences. Stone and clay quarries have very site-specific impacts. The large-scale removal of fiber biomass from forest and agricultural soils also has a potential cumulative impact upon soil health, biological diversity and watersheds. Even so the use of indigenous materials can be relatively environmentally benign, compared to conventional types of building. The indigenous materials often require little processing energy beyond that contributed by human muscle power. A great potential exists to wed the best of ancient construction technologies with new materials and engineering knowledge, in order to produce affordable, durable and attractive resource efficient housing that is also bioregionally appropriate.



***Indigenous Building:
Systems utilizing highly
available materials,
quarried or harvested
on site, using minimal
mechanical energy for
transport and processing.***

Adobe and Rammed Earth Buildings

The University of Arizona Press
1230 N. Park Ave., Suite 102
Tucson, AZ 85719

Adobe/Solar Associates

847 E. Palace Ave.
Santa Fe, NM 87501

Publishers of the newsletter "The Mudslinger." Adobe/Solar Associates offers workshops and information on adobe building.

Applications:

Adobe is most economical and resource efficient when excavated on site, which requires clay soil. Suitable for one- and two-story walls.

Comments:

Eminently suitable for use in desert climates with clay soils. Adobe builders in the Southwestern U.S. are numerous. Adobe construction is perhaps the most widely used building technique in the world. It is labor intensive when using manual labor, but has been mechanized by many builders. Adobe is unfired clay pressed into blocks, sun-dried, stacked, and mortared with clay. To improve resistance to water, asphalt emulsion can be added as a stabilizer.

Dwelling on Earth Rammed Earth Works

1350 Elm St.
Napa, CA 94559
(707) 224-2532

Dwelling on Earth is a text on building with rammed earth. Rammed earth building utilizes the earth of excavation, with some additives and stabilizers if needed, to create massive and dense wall structures. Skilled crews can prepare foundations, erect forms and compact earth in the walls with relative efficiency.

Applications:

Multi-story buildings. Insulated walls improve cold climate performance.

Comments:

This system is potentially labor intensive, but can be mechanized. Earth can be spray applied and pneumatically compacted.

Earthen Building Materials:

A Bibliography

Center for Maximum Potential Building Systems

8604 FM 969
Austin, TX 78724
(512) 928-4786

Earthwood

366 Murtagh Hill Rd.
West Chazy, NY 12992

Cordwood Masonry Housebuilding text and workshops. Cordwood Masonry or Stackwood construction is a building system that creates walls by ricking cordwood and cementing it with mortar. The wood used can be of any type. Cull or small logs can be bucked to length and used. When internal voids are filled with insulation, walls provide R-values comparable to stud walls, with good internal thermal mass.

Applications:

One- and two-story walls. Has been used below grade.

Element size:

8 - 24" long log ends.

Fire rating:

Good fire resistance.

Comments:

By using cull wood and judiciously applying cement mortar, the resource intensity of these walls can be improved. It is reported that a number of cordwood structures built in the 1800s are still in use and parts of 1000 year old buildings are in evidence.

Indigenous Building Materials:

An Overview

Center for Resourceful Building Technology

P.O. Box 100
Missoula, MT 59806
(406) 549-7678

Mansion Industries, Inc.

14425 Clark Avenue
P.O. Box 2220
City of Industry, CA 91746
(818) 968-9501
(800) 423-6589

ENVIROCORTM panels made from waste agricultural fibers. Panels are compression extruded at high temperature and bonded with kraft paper using a film of thermo-setting resin adhesive. Panels are cut to be used in the PYRAMODTM structural system. Manufactured from rye or wheat straw, or sugar-cane rind, these panels provide a method of avoiding the burning of these agricultural resources.

Applications:

The panels serve as roof and walls, eliminating the need for structural framing. Pyramod houses are built from factory-prepared kits of precut Envirocor panels and adhesives.

Element sizes:

Panels are 4 3/4" thick by 4' wide in various lengths.

Resistance to decay:

Envirocor panels are resistant to mold and decay, and are immune to termite infestation.

Fire Rating:

Six inch panels achieve a 1 1/2+ hour fire rating.

Comments:

Panels have an R-value of 1.8 per inch. Pyramod houses are strong and durable, and according to Mansion Industries, they perform slightly better than stick-built houses in high winds and earthquakes. Mansion Industries focuses primarily on low-cost housing for developing countries, but also provides technology for those interested in setting up manufacturing facilities.

Monolithic Constructors, Inc.

P.O. Box 479

Italy, TX 76651-0479

(214) 483-7454

Concrete domes made from an air-inflated fabric form insulated with polyurethane foam, embedded with rebar and sprayed with shotcrete.

Applications:

For homes, churches, shops, or stores. Sold as a kit including airform and rebar hangers.

Sizes:

Variable. Domes are available in custom design.

R-value:

Domes are approximately R-60.

Comments:

This building method is fairly resource intensive and uses many nonrenewable resources, but it is an interesting design concept appropriate for some applications. These structures should be extremely long lasting.

"The Last Straw"**Out on Bale (un) Ltd.**

1037 East Linden Street

Tucson, Arizona 85719

(602) 624-1673

-or-

Plastered Straw Bale**Construction**

The Canelo Project

HCR Box 324

Canelo, AZ 85611

-or-

The Straw Bale House

Chelsea Green Publishing

Company

P.O. Box 428

White River Junction, VT 05001

Several publications on strawbale construction are available. A number of organizations offer workshops on strawbale building, and there are professional designers and builders who specialize in strawbale structures. Strawbale construction utilizes bales as building blocks in wall assemblies. The bales are stacked on a solid foundation, secured together and protected with stucco.

Applications:

A low cost, low technology approach to home construction. This technology is well suited for areas with high seismic risk, extreme climate, and where straw resources are available.

Element sizes:

Uses standard straw bales of approximately 60 pounds.

Resistance to decay:

Straw bale houses built at the turn of the century in Nebraska show very little sign of decay.

R-value:

2' thick walls can provide R-45.

Fire Rating:

Unlike wood, straw contains up to 60% silica which acts as a natural fire-retardant and the density of the compressed bale walls further prevents combustion. Fire and pest resistance is quite high once the walls are stuccoed.

Comments:

Straw is a byproduct of annually renewable crops that is often burned as agricultural waste. The "Nebraska style" construction uses bales in a load-bearing wall. The ease of strawbale construction lends this method to owner-building and also to underengineering. Professional engineering consultation is advisable.

Solar Survival Architecture

Michael Reynolds

P.O. Box 1041

Taos, NM 87571

(505) 758-9870

"Earthship" earth-sheltered, adobe-finish houses use recycled tires, cans and bottles as substrate for exterior and interior walls. Rows of tires are packed with earth and set in place in a staggered fashion to create a thermal-mass structure for the three-foot thick exterior walls. The tires are stacked around window and door frames. Interior walls use cans as "bricks" to create sculptured surfaces. All surfaces are finished with adobe. These houses, conceptualized by architect Michael Reynolds, use one of this country's most problematic waste resources - tires, as well as bottles and cans.

Applications:

These houses seem best-suited to southern regions where rainfall is

low and adobe construction has been used for centuries, although work has been done to adapt the design for wet and cold climates.

Resistance to decay:

Excellent.

Fire Rating:

Not mentioned.

Comments:

Waste tires are plentiful, and it seems these homes could be built at relatively low material cost, using unskilled labor, with locally available earth and tires.

Stone Container Corporation

2021 Swift Drive

Oak Brook, IL 60521

(708) 574-9551

Low cost housing units made from corrugated fiberboard panels assembled with nuts and bolts. A cost-effective housing solution to inadequate housing caused by disasters, low economic conditions or emergency relocations.

Applications:

These structures are attached to 2" x 6" lumber set upon a level foundation surface such as concrete.

Element sizes:

Panels are 2' wide in lengths of 5 1/2' or 8'.

Fire Rating:

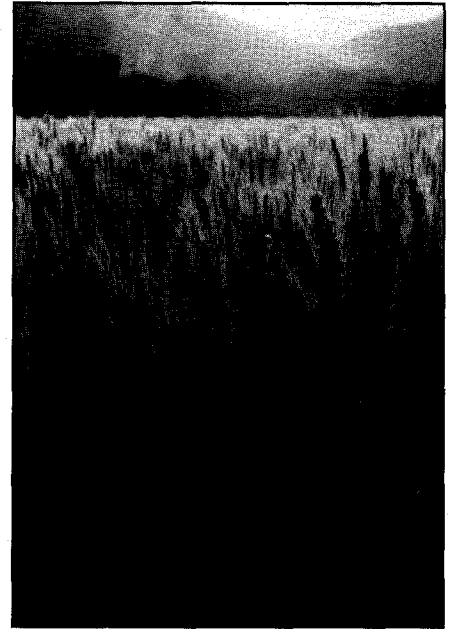
Not specified.

Comments:

Basic shelters can be assembled in 1/2 day by three workers. Panels are wax impregnated for water resistance, and further weather protection can be achieved by painting the exterior. Board components are bonded with an acrylic adhesive.

Managing Resources

The construction of buildings necessitates the consumption of resources. What kind of resources are used depends both on societal tastes and upon which resources are available, at what price. How long the supply of a given resource will last is in turn dependent upon the rate of consumption and the way resources are managed. Current consumption patterns dictate that supplies of some conventional construction resources will be exhausted in the not-too-distant future. If society hopes to have long-term continued use of these resource, we must carefully examine the implications of our resource utilization, and craft management strategies that provide for both responsible use and resource safeguarding. This section explores some of the issues and opportunities involved in the management of the resources most applicable to construction: wood, agricultural fiber, minerals and waste resources.



Forests and Timber

As North America was settled, plentiful wood supplies over much of the continent fostered the development of wood-intensive building methods that have evolved over time into today's accepted industry standards. Yet the nature of the wood resource base is changing, and the timber industry is necessarily advancing from historical production practices to new harvest methods, more efficient wood utilization and new generations of wood-based products. These changes are affecting the way forests are managed, as well.

A History of Forestry in the U.S.

The pre-colonial American forests covered over 850 million acres of the country in unbroken stands of conifer and deciduous trees. The first European colonists had little regard for the dark impenetrable forests and used fire to push back their domain. Eventually some enterprising people cut boards using whipsaws and between 1625 and 1631 sawmills began to appear in Virginia and Maine. Lumber became a major commodity for trade with Europe in exchange for weapons and other manufactured goods. During this time the growing lumber industry also supplied materials for a booming shipbuilding industry. By the time of the Revolutionary War, colonial shipyards were producing 100 ships per year.

With the rapidly expanding colonial population, wood gained new importance as fuel. The iron furnaces and glass factories, as well as home heating and cooking, needed large amounts of wood. Ben Franklin commented in 1774 that "wood, our common fuel which within these three hundred years might be had at any man's door, must now be fetched near [160 kilometers] to some towns, and makes a considerable article in the expense of families".

By the turn of the 19th century, the US used more wood for fuel than any other purpose. By the year 1880, nearly 400 cubic feet of wood were burned for fuel by each US resident. With the high demand for fuel wood and millions of acres being cleared for agriculture, the US forest land base was reduced to less than 580 million acres in 1900.

The US Forest Service

Public outcry over the fate of American forests slowed cutting by the turn of this century. With the arrival of European forestry ideas and the subsequent creation of forest reserves, the US Forest Service was born through the actions of Gifford Pinchot and Theodore Roosevelt in 1905. The Forest Service conserved forest, but also managed for timber harvest and watershed concerns. After World War II demand for lumber boomed and the Forest Service shifted to a timber production management approach. As part of this approach, new policies were developed to reduce the annual acreage lost to fire.

The National Forest Management Act of 1976 changed management policies again by mandating multiple use and sustained yield, the concepts that ensure the simultaneous protection of fish and wildlife, soil, watershed, outdoor recreation, range, timber and wilderness. They require that each of these uses receive full and equal consideration in the management of the national forest, so that the benefits of each will continue over time.

Too often in the past, sustained yield has been thought of only in the context of timber. However, just as it means the cutting of only as much timber as will grow back in the current cycle, it also implies sustained maintenance of wildlife, watersheds, range, and other forest values. A related concept, non-declining even-flow, limits the amount of timber cut during a planning period to an amount which can continue to be harvested through successive planning periods without interruptions or fluctuation. Old growth forests, however, create a problem for forest managers. Old growth stands are viewed as unproductive, but problems arise with converting those unproductive stands to vigorous young stands while still upholding the principles of sustained yield. The sheer volume of wood in old growth forests makes non-declining even-flow management virtually impossible. In addition, over the years we have come to better understand the undisturbed old growth community and its ecological role, and have come to recognize the rich and unique biological diversity of this forest.

Private Industry-Owned Forest

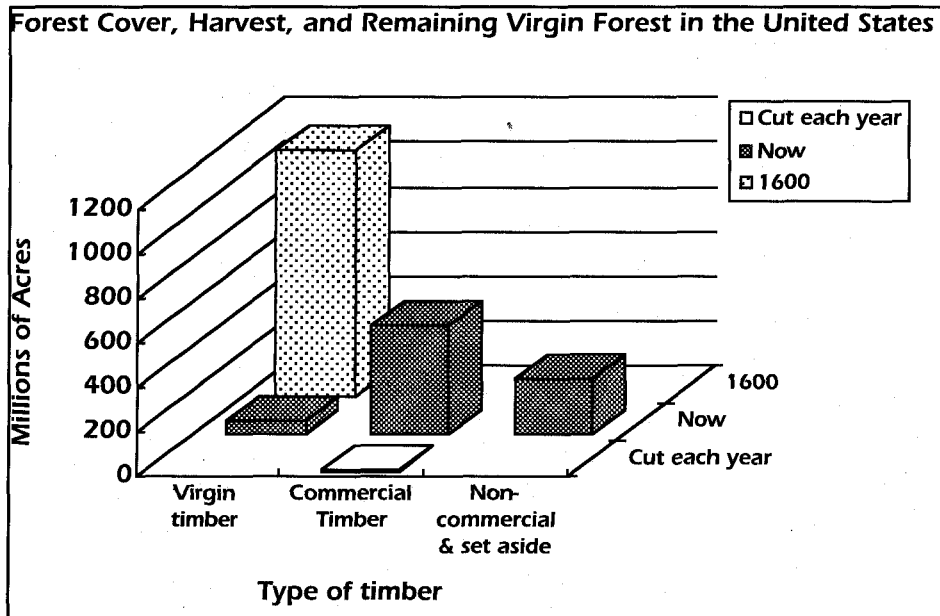
The U.S. Forest Service estimates that 483 million acres of land in the U.S. are "commercial timberland", meaning that they are capable of producing industrial volumes of wood. The ownership of this vast timber base is comprised of four groups:

1. The Forest Service: steward of the National Forests
2. Other public: including Bureau of Land Management, other federal agencies, Native American tribes, and states
3. Industry: forest products companies intensively managing lands for timber output
4. Other Private: families and individuals who own forested land

Many wood products companies depend at least in part on public land timber sales but, generally speaking, the private wood products industry owns the nation's most productive timberland. Although the forest industry manages only about 20% of the nation's timber base, they are responsible for supplying the bulk of wood products used by society.

The wood products industry is incredibly diverse with market shares spread between 45,000 competing large and small companies. The forest products they provide are divided into two major categories: solid wood and paper. Most companies focus on just one product, but in recent years large wood companies have diversified because the demand for paper has remained strong in spite of economic conditions, while the demand for lumber is extremely sensitive to economic cycles. Secondly, raw material demands for paper are low, while lumber and plywood manufacturing require trees of certain minimum size and age. As the forests are being cut over the percentage of wood available and suitable for manufacture into solid wood products is falling.

The two major timber producing regions of this country are the Pacific Northwest and the Southeast. Major differences and economic rivalries exist between the regions. The Southeast, with fast growth rates,



flat terrain, and relative closeness to the timber market (the Northeast and Central United States), can produce lumber more cheaply than the Pacific Northwest. The Northwest, however, still contains old growth timber and thus produces "clear" tight grained lumber, desirable in many applications of wood working and construction. In the coming years with the shrinking average size of Northwest trees, the Southeast may take the upper hand.

In general, industry lands are intensively managed and

harvested. Yet even these practices do not supply enough logs to satisfy demand, particularly when the voracious international market is added to the equation. In Washington, for example, where no restrictions on the export of private raw logs exist, foreign ships made 229 stops at Grace Harbor in 1988. More than one-third of Washington's timber went overseas without any processing in domestic mills. Export of raw logs from industry-owned lands creates a domestic supply void that increases demand for logs from public lands.

Forest Management for Production

What is forest management? According to Lawrence Davis and K.N. Johnson: Forest Management aims at increasing growth and protecting against losses. Meeting these objectives involves fire management, insect and disease management, stand regeneration, stocking control, and fertilization. This paradigm regards the trees as the sole component of the forest, usually ignoring wildlife, water quality, and other forest values. Forest management is usually substituted for natural succession in order to increase a forest's output. Generally speaking, the interest of the landowner dictates desirable forest outputs and what management regimes are used to obtain them. For example, a forest managed for saw logs will differ greatly from a forest managed for paper pulp.

Intensive forest management changes the character of a forest. While natural succession relies on fire as an agent of change—clearing brush and dying organic material, creating diversity and genetically strong forests—timber harvesting is the agent of change in the managed forest. Harvesting creates change but cannot establish new forest as quickly and efficiently as fire. Furthermore, diversity is greatly reduced when an even-aged, single species managed forest grows in the place of a natural stand. In addition, logging operations often select the largest and strongest trees leaving the poorer ones to regenerate the forest. However, today second growth forests are beginning to meet the demand for much of the country's wood fiber, and consequently more attention is being directed toward maintaining long-term forest health.

Timber Utilization Contrasts

Due to easy availability and the relatively low price of timber, American lumber manufacturers have historically wasted a large amount of wood. Today with higher prices and demand, nearly all parts of the tree are used in some form or another, but a disproportionate amount of each tree - usually one third to

two thirds – is turned into lower-value pulp or chips. This is in part due to thick saw blades with a wide kerf and also due to low demand for structural lumber smaller than two by two inches, that could be produced from small-diameter trees. The typical sawmill in the West recovers only about 6.5 board feet for every cubic foot of log entering the mill. Log sizes are smaller in the East, and it is more difficult to cut dimensional lumber from smaller logs, so the recovery factor there is less than 6.0 board feet per cubic foot. On average, then, about half of the volume of saw timber milled in the U.S. is wasted or used for low value products.

In Japan, by contrast, where wood is scarce, saw blades are very thin and structural lumber may be smaller than one inch by two. Recovery there is typically 90 to 95 percent of the whole log. This means that US mills require three or more logs to produce the same volume of lumber the Japanese can produce from two logs, according to Cascade Holistic Economic Consultants. This is the main reason the Japanese market will pay two to three times more for imported whole logs than for US-milled dimensional lumber.

Lumber Consumption in the US

In the United States more than 60 percent of lumber and 75 percent of plywood go to build and remodel homes and offices. Over 90 percent of new single family homes are wood framed. North America is one of the few places in the world where such a large percentage of homes is built of wood. According to studies, construction of the average single family home uses approximately 12,500 board feet of wood. Larger dimensional lumber that has traditionally been used for building, such as 2 x 10s and 2 x 12s, is becoming more expensive due to the decreasing national inventory of large trees.

Dimensional lumber consumption has not significantly increased over the past 80 years in the U.S. because plywood has replaced many lumber uses. Now new and more efficient technologies such as oriented strand board are in turn replacing plywood, and engineered wood beams serve as a substitute for solid wood beams. Steel and aluminum have also been substituted in many structural applications where wood was once used. The wood products and construction industries are learning to make effective use of smaller, younger and fast-growing trees. Technology must be kept up to date in harvesting, milling and utilization practices in order to reduce environmental damage and waste and maximize many values to be gained from the national timber base.

Agricultural Resources

Given the increasing concern over sustainability of timber harvest levels and the expected rise in cost of wood products, people are looking to other resources that could supply fiber for building materials. Agricultural fibers, derived from both alternative and commonly grown crops, show much promise as raw material for the manufacture of building products. At present the potential of agricultural fiber products is largely unrecognized, and in fact some useful agricultural fibers are currently considered waste.

One example of an underutilized agricultural fiber with construction applications is cereal straw. This straw, a by-product of wheat, oat, rice, barley and other crop harvest, is often burned in the field because there is little market for it and tilling it back into the soil is laborious. This straw burning practice contributes to air pollution problems in many heavily agricultural regions. These problems can be averted by harvesting the straw for use in building.

Standard straw bales can be used as structural building blocks, or as insulative infill in post and beam structures. The insulation value of the air in the hollow straw stems is also utilized by innovative systems that use straw as the insulation in structural panel systems. Smaller straw fibers form natural lignin bonds under heat and pressure to produce sheet-style products similar to the medium-density-fiberboard made from wood fiber. These straw products show potential as sheathing and in finish applications such as cabinetry. Still other products combine straw fiber with materials such as cement, to take advantage of the insulation, workability and light weight the straw offers.

Other crops also produce fibers with potential applications in construction. Kenaf and hemp are both plants with long, strong fibers that could be utilized in the manufacture of composite building products currently made from wood fiber. Many potential uses for these crops are only beginning to be identified. Additional plant fibers, such as sisal and jute, are used to make durable natural floor coverings. Soybeans can be used to make plastic, and other agricultural products and byproducts have adhesive properties that may be useful in building product manufacture.

Technology utilizing agricultural fibers in the production of new building materials shows much promise, but it is still important to consider the relative resource efficiency of these materials. Just as careful stewardship of the forests is vital to the continuity of the wood resource, stewardship of the soil is necessary to ensure the long-term viability of crop production. In many cases straw is considered an agricultural waste and burned in the field, so harvesting this fiber and using it to manufacture building products is relatively resource efficient. However, the continued harvest and removal of this biomass contributes to depletion of soil fertility, and eventually to decline in soil health. It is important to ensure that harvest cycles are alternated with cycles of biomass return, to promote soil health and continued productivity.

Straw and other fibrous crops are usually grown as large-area monocultures that decrease local biodiversity and require supplemental irrigation, fertilizers and pesticide application. Industrial agriculture mines the land similar to the way early industrial timber companies mined the forest. In order for agricultural fibers to provide a long-term resource-efficient building material supply, agriculture must be conducted in a resource-efficient manner that allows for long-term stewardship of the soil resource. Practices such as crop rotation, cover cropping and organic farming all contribute to the viability of long-term cultivation and fiber utilization.

Mineral Resources

Most buildings are made up of a variety of materials, including not only renewable fibers, but also mineral resources such as metals, glass, concrete and petroleum-based plastics. In addition, the energy required to process raw resources into building materials is derived largely from fossil fuels, which are another type of mineral resource. Geologist John Wolfe estimates that extracting the different types of mineral materials and fuels used for construction of an average-size house produces a cumulative excavation equal to the volume of the house.

The mineral resources and fossil fuels extracted and used for building are non-renewable, and in some cases the supplies of virgin resources are dwindling. As supplies of some mineral resources decline, more-abundant alternatives are being sought, as well as ways to use limited materials in an efficient and selective manner. Fortunately, not all the mineral resources used in construction are rare. Seventy-five percent of the structures on Earth are made from earth, demonstrating that plentiful substances such as clay and stone have practical applications in construction. Modern technology allows builders to combine efficient and limited use of rare non-renewable materials with abundant materials, in order to provide practical housing that performs well.

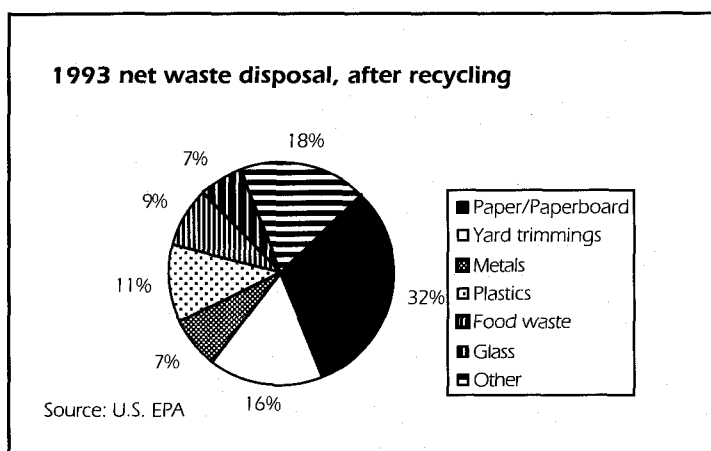
If the building industry is to continue to use non-renewable materials, the concern of recyclability becomes paramount. Limited resource supplies can be stretched dramatically by reuse or recycling of the products fabricated from that resource. Unfortunately, recycling rates for most materials are presently far lower than the rates required to sustain current levels of consumption, and recycling is difficult or impossible for some material configurations or following some types of consumption. Yet recycling is a vital aspect of prolonging the supply of non-renewable materials, and avoiding waste of limited resources.

Waste Resources

The perception of abundant natural resources has contributed to the United States becoming one of the most wasteful countries in the world. Figures from the US Environmental Protection Agency show that the per capita generation of waste in the United States was 4.4 pounds per day, up significantly from the 1960 level of 2.2 pounds. For a national population of 261 million, this amounts to a yearly waste production of 206.9 million tons.

Well over half of this waste is currently sent to landfills for disposal by burying. Landfill disposal has become increasingly expensive and problematic in recent years, however, as leachate and contamination problems with existing landfills are revealed, and communities band together to resist siting of new landfills. Interstate, and even international, trade in garbage is becoming more common as governments look for somewhere to dump the waste generated by their citizenry. Yet the answer may not lie in building bigger, safer landfills. The materials in the waste stream can be viewed as underutilized resources, and methods sought to recover these resources.

One resource traditionally recovered from waste has been energy. Incineration of waste produces heat energy that can be harnessed to provide power, and this is the fate of around 15% of the nation's municipal solid waste. Yet not all waste is suitable for incineration, and many health concerns arise from the pollution produced by waste incinerators. Today incineration consumes only half the percentage of the waste stream that it accounted for in 1960.



Some materials are diverted from the waste stream for recycling or composting. The percentage of goods in municipal solid waste recovered for recycling or composting has been steadily increasing, and in 1993 accounted for 21.7% of the total waste generated. Materials recovered from waste for second uses include aluminum, steel, glass, paper and paperboard, yard trimmings, and plastic packaging. Recovery rates for these materials range from a high of 53% for aluminum to only 4% for plastic packaging. Clearly, then, many recyclable materials are still left in the waste that goes to landfills.

The nation's landfills are becoming a materials repository that is richer in metal than any ore deposit, and that contains vast quantities embodied energy. Each material diverted from a landfill results not only in a lessening of the demand burden placed on natural resources, but also represents conservation of the energy used in processing that material. Recycling materials generally requires significantly less energy than processing virgin resources. Municipal solid waste that is now landfilled is actually a largely-overlooked source of manufacturing feedstocks. More manufacturers are beginning to take advantage of recycled feedstocks, and purchase of the products they make from recycled materials helps to sustain and encourage diversion of waste for recycling.

Apart from recycling, the amount of waste going to landfills can be reduced by achieving a more efficient initial utilization of materials. The amount of waste generated per capita can be reduced by consciously "precycling." Precycling involves selection of durable, reusable materials with minimal packaging. Reusing materials instead of disposing of them is another aspect of precycling. Finally, increased efficiency in manufacturing processes themselves prevents industrial waste. Combined precycling and effective recycling help to avoid the creation of waste and foster the efficient use of resources.

Energy

(This Section is adapted from an article that first appeared in Home Energy, Volume 12, Number 1, January/February 1995)

Energy is something that Americans consume every day in vast quantities, mostly without considering its source. Yet the production of energy causes huge environmental impacts, ranging from open pit coal mines and dammed rivers to oil spills and air pollution. The majority of the energy used by Americans is supplied by fossil fuels that are environmentally costly to extract, and that cause serious air pollution through their combustion. Furthermore, these fuels are a finite resource. By cutting the amount of energy consumed, society has a chance to extend the fossil fuel resource, and to reduce the environmental degradation caused by energy production and consumption. In order to reduce energy consumption, especially by improving energy efficiency, we as a nation must first recognize how we use energy.

One of the major uses for energy is building construction and operation. According to the Environmental Resource Guide produced by the American Institute of Architects, more than 30% of the energy consumed in the United States goes to making and maintaining buildings. This energy total includes both operating energy – the energy required for space heating and cooling, water heating and utilities for a building – and embodied energy in the physical structure.

Most people are familiar with the concept of improving the energy efficiency of buildings by reducing the operating energy they use. It is a common claim that energy efficiency measures can reduce the operating energy of an individual building by 60% or more over a conventional building. While many countries have directed major efforts toward reducing operating energy, comparatively little attention has been focused on recognizing or reducing the embodied energy of structures.

Embodied energy is an assessment that includes the energy required to extract a resource, plus the energy used in primary and secondary manufacturing activities to provide a finished product. There is embodied energy in any processed product, from a plastic drinking cup to a car. In embodied energy terms, buildings represent a huge, relatively long duration energy investment.

Reducing the embodied energy of buildings has the potential to significantly reduce energy consumption, because every building is a complex combination of many processed materials, each of which contributes to the building's total embodied energy. The energy required to extract and process the raw material for an individual component, as well the energy used to transport the finished product to the job site and install it, all become part of the embodied energy cost of the completed structure. Furthermore, energy involved in maintaining an individual building component, and finally removing it and disposing of it or recycling it at the end of its useful life, can all be part of the embodied energy equation for a particular building material, depending on how the embodied energy is quantified.

The quantification of embodied energy for any particular material is an inexact science, requiring a "long view" look at the entire manufacturing and utilization process, and filled with an infinite number of potentially significant variables. Consequently, the complexity of embodied energy calculations is frustrating even for scientists, and it is easy for the individual homeowner, builder, designer or government specifier to become discouraged at the difficulty of obtaining accurate figures. As though the figures for materials weren't confusing enough, calculations of embodied energy will be different for each job site. Factors such as distance of the site from manufacturer, distance from railhead, and even distance that tradespeople must travel to and from the site during construction are all part of the embodied energy equation. Furthermore, the type of fuel used in processing and transporting materials can affect the amount of embodied energy contained in the final product. Two products of identical appearance may have very different embodied energies, depending on where and how they were made, and where and how they will finally be used.

Given these complexities, the builder bent on reducing energy consumption is faced with learning as much as possible about the potential materials options, and then basing decisions on the probable relative embodied energies of these materials given the information available. Fortunately, precise figures are not

absolutely necessary for informed decisions on which building materials to use in order to lower the embodied energy in a structure. The specifier or builder need only recognize the potential differences in relative embodied energy to make wise material and system choices. A few general rules of thumb apply, and some conclusions about embodied energy content can be reached with only a small amount of information on the products involved.

For example, the embodied energy in recycled building materials is generally less than that contained in new materials. Recycling provides easily obtainable manufacturing feedstock. In other words, there is very low extraction energy associated with recycled materials. Although manufacturing with recycled feedstocks can involve transporting, cleaning and sorting the recycled materials, this often requires far less energy than manufacturing with a virgin resource. In addition, the embodied energy of a manufactured material can be lowered by reducing the energy required in any stage of its production. For example, the processing energy of lumber is greatly reduced by air drying it instead of kiln-drying it.

Reusing materials, or even reusing entire buildings by retrofitting them, reduces the total amount of embodied energy even more than using recycled materials. Although reusing materials often requires intensive cleaning and frequently entails repair, it represents a means of attaining significant embodied energy savings, as well as resource savings. Builders and specifiers can achieve significant embodied energy savings in buildings by incorporating as many salvaged and reused building components as practical.

Another means of reducing the embodied energy in a building over its lifetime is to choose durable, long-lived building materials. Durable materials tend to have lower embodied energy than disposable or short-lived materials. Although less-durable materials may not involve as much energy in their manufacture, the need for frequent replacement, combined with the need to dispose of the product following removal, result in a higher total embodied energy over the life of the structure.

Embodied energy of a structure can also be reduced by building with indigenous, or local, materials. In addition to their lower transportation energy costs, indigenous materials usually involve less processing energy than conventional construction materials. Using materials like local stone for patios involves less embodied energy than concrete or treated wood patios and decks. Some builders go so far as to build entire structures of indigenous materials, such as adobe, strawbales, straw-clay mixes or rammed earth. These forms of building tend to have significantly less embodied energy than conventional stick-framed construction.

After all the rules of thumb have been applied, the best hope of reducing embodied energy in buildings comes down to the reasoned actions of responsible individuals. Environmentally-aware builders, designers and homeowners can usually identify building products with relatively low embodied energy. Building components made from recycled materials, or minimally processed local materials, tend to have less embodied energy than building products that are highly engineered, imported, or made from virgin resources. Choosing durable building products that require little maintenance will also help builders reduce the amount of embodied energy in a structure. It is only by addressing both components of energy usage—the operating and the embodied—that Americans can reduce the vast amount of energy consumed by buildings.

Additional Information Sources

Please send us information you may have on resource efficient materials, systems, or organizations that you do not find in this Guide.

Alternatives to Lumber and Plywood in Home Construction

Prepared by NAHB for
U.S. Department of Housing and
Urban Development,
Washington, D.C. 20410

American Solar Energy Society
2400 Central Avenue, Unit G-1
Boulder, CO 80301
(303) 443-3130

Builders for Social Responsibility

Contact: Chuck Reiss
RR 1, Box 1953
Hinesburg, VT 05461
(802) 482-3295

Building With Nature

Networking Newsletter
Contact: Carol Venolia
P.O. Box 369
Gualala, CA 95445
(707) 884-4513

Center for Maximum Potential Building Systems

8604 F.M. 969
Austin, TX 78724
(512) 928-4786

Canada Mortgage and Housing Corporation

682 Montral Road
Ottawa, Ontario K1A 0P7
Canada
(613) 748-2000

Cost Effective Home Building

National Association
of Home Builders
Home Builder Press
1201 15th St. NW
Washington, DC 20005

Eco-Home Network

4344 Russell Ave.
Los Angeles, CA 90027
(213) 662-5207

Energy Source Directory

Iris Communications
258 East 10th Ave., Suite E
Eugene, OR 97401-3284
(503) 484-9353

Environmental Building News

RR 1, Box 161
Brattleboro, VT 05301
(802) 257-7300

Environmental By Design

Kim Leclair and David Rousseau
Volume I: Interiors
Hartley & Marks, Inc.
79 Tyee Drive
Point Roberts, WA 98281

Environmental Resource Guide

American Institute of Architects
Committee on the Environment
1735 New York Avenue, NW
Washington, DC 20006
(202) 626-7463

Green Builder Program

City of Austin Environmental and
Conservation Services Department
206 E. 9th St., 1 Suite 17.1021
Austin, TX 78701

International Institute for Bau-Biologie & Ecology, Inc.

P. O. Box 387
Clearwater, FL 34615
(813) 461-4371

Loompanics Unlimited Building with Junk and Other Good Stuff

P.O. Box 1197
Port Townsend, WA 98368
(206) 385-5087

National Center for Appropriate Technology

P.O. Box 3838
Butte, MT 59702
(406) 494-4572

Pacific Northwest Ecobuilding Network

Jeffrey Learned
P.O. Box 6465
Kent, WA 98031
(206) 850-7456

Rocky Mountain Institute

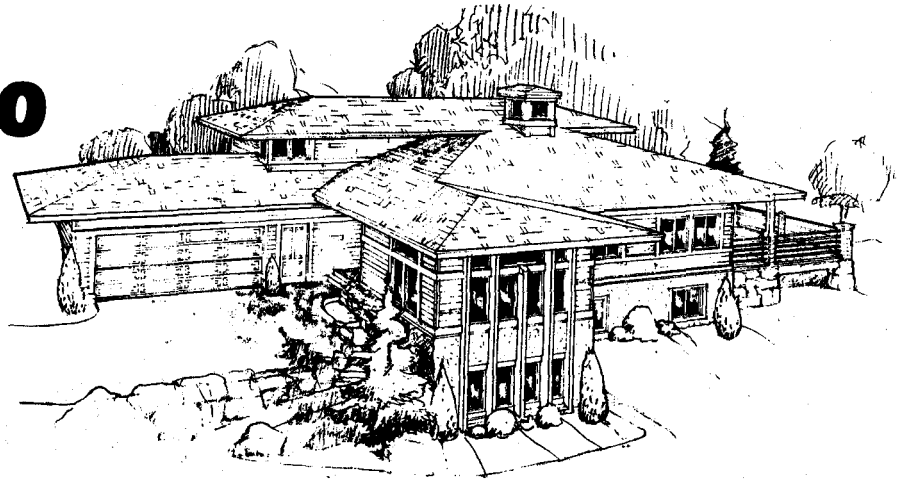
1739 Snowmass Creek Rd.
Snowmass, CO 81654-9199
(970) 927-3128

Solar Energy International

P.O. Box 715
Carbondale, CO 81623
(970) 963-8855



ReCRAFT 90



So, how well do these new products work?

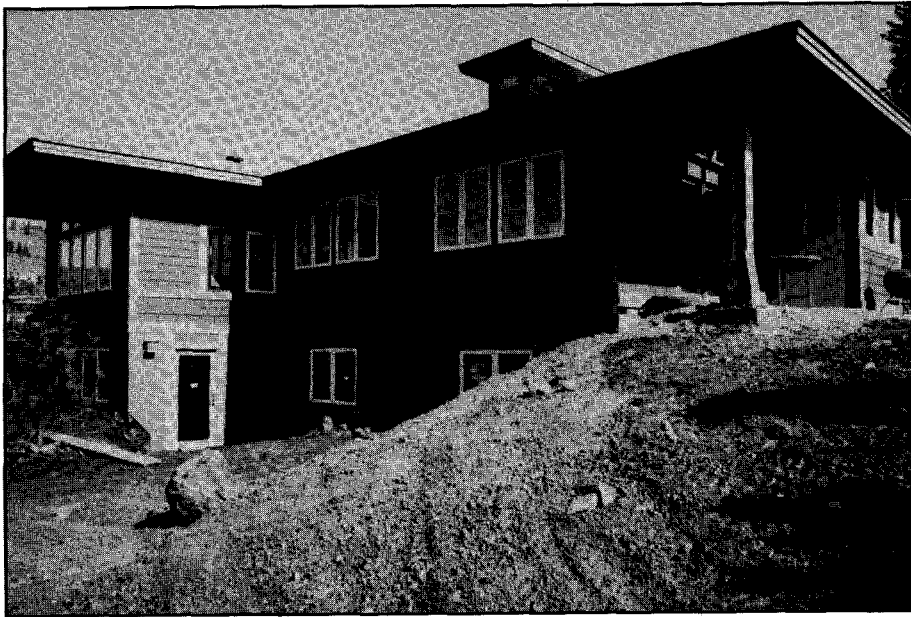
ReCRAFT 90 is the first of the Center for Resourceful Building Technology's demonstration projects. ReCRAFT 90 was built in Missoula, Montana, and was completed in the spring of 1992. It demonstrates new products and systems that exemplify an efficient use of resources in their manufacture.

ReCRAFT 90 is an attractive, very energy efficient custom home. This 2400 square foot house was designed specifically for a cold northern climate and is bermed into a southwest facing hillside. This orients the high-performance windows to allow natural daylighting, while optimizing energy efficiency. ReCRAFT 90 has a low-infiltration design, which includes a whole-house ventilation system to provide fresh indoor air. The careful selection of interior finish materials also promotes a healthy living environment.

We have published a booklet about the construction of this house, entitled ReCRAFT 90: The Construction of a Resource Efficient House. This 56-page booklet recounts the experiences of working with the more than forty different products that were used in the house. We found out which ones were fragile and which ones were so tough they required special saw blades. We found some that we liked and some that we wouldn't recommend. This hands-on knowledge was not easy to come by. We hope that our experience can help you to achieve favorable results on your building project by anticipating differences that could otherwise turn into difficulties.

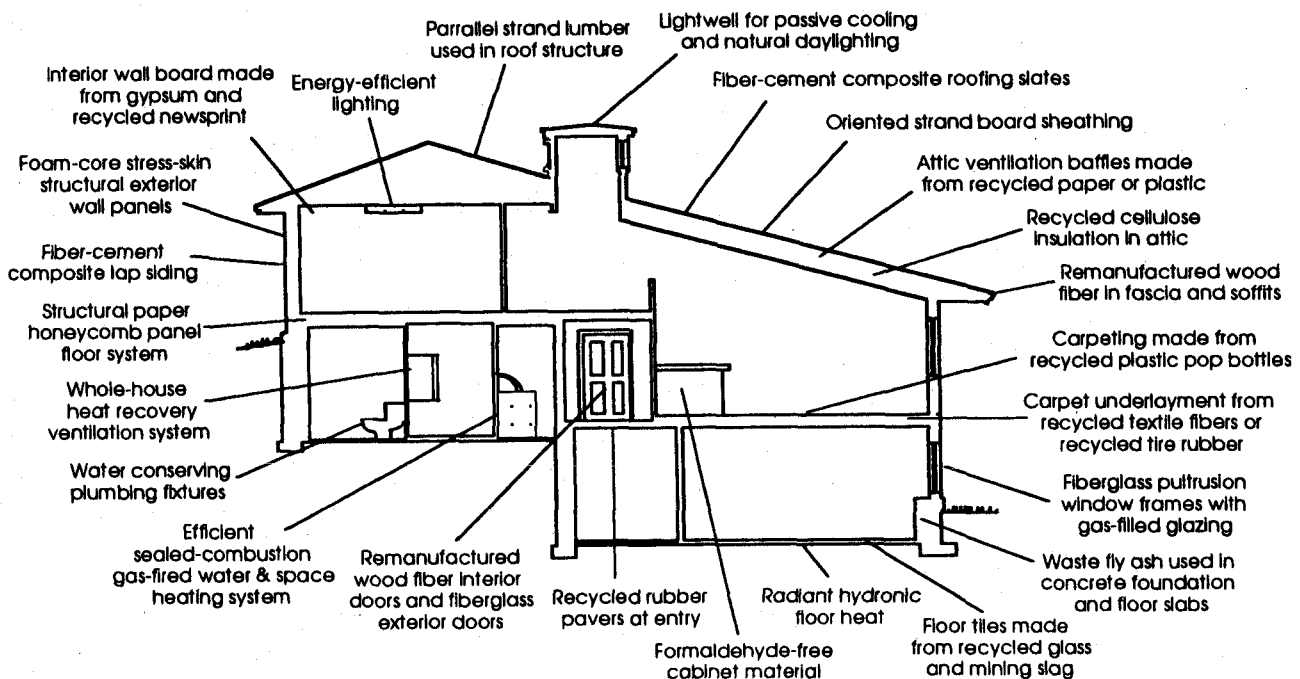
You can order the ReCRAFT 90 handbook for \$12.50 (including shipping and handling) from CRBT.

ReCRAFT 90 is a CRBT demonstration project. ReCRAFT 90 was built in Missoula, MT and was completed in the spring of 1992. It demonstrates new products and systems that exemplify an efficient use of resources in their manufacture.



Throughout this house are products that:

- *Demonstrate a more efficient use of wood*
- *Provide an alternative to traditional wood products*
- *Are manufactured from recycled resources*
- *Have been re-used instead of being thrown away*
- *Provide water and energy efficiency in the house*
- *Are healthy to live with*



CRBT Services

Professional Services

We offer professional services in the following areas:

- Building Design and Construction
- Public Involvement and Awareness Programs
- Building Industry Demonstration Projects

I. Building Design and Construction

Resource Efficient Materials and Products:

Our services support a resource efficient approach to building by using appropriate building design, materials, and construction. CRBT can:

- Review plans and suggest cost-competitive resource efficient materials
- Recommend products made from recycled materials such as municipal recyclables, or agricultural and industrial wastes
- Recommend appropriate replacements for dimensional lumber and means of using less lumber and other materials
- Recommend sources of wood products from sustained yield forests and demolition and salvage

Energy and Water Efficiency:

We provide technical assistance and support in all aspects of building energy and water conservation, including:

- Fresh air ventilation / Infiltration control
- Draft free construction
- Sun tempered designs
- Solar technologies
- Water conserving designs and materials
- Efficient appliances

Healthy and Non-Toxic Environments:

We can recommend affordable strategies for maintaining clean indoor air and water. Our approach stresses:

- Reduction of pollutant sources
- Effective air filtration and controlled ventilation
- Natural, comfortable daylighting
- Ensuring clean, safe water
- Selection of materials which are non-toxic in use and manufacture

Environmentally Responsible Buildings and Sites:

We can assist in developing an integrated approach which protects the environment through a set of best management practices. These have been field tested in construction projects and found to be effective and workable. They include:

- Construction waste minimization and recycling
- Surface water management
- Low-impact site preparation
- Erosion control and pollution prevention
- Naturescaping

II. Public Involvement and Awareness Programs

CRBT understands the importance of establishing partnerships with public and private organizations, including city and regional governments, electric utilities, building trade associations and neighborhood associations to support and promote public awareness of sustainable building. We offer expertise in public educational programs from the informal to the formal, including:

- Seminars and workshops on resource efficient and indigenous building
- Educational and informational text creation
- Program and curriculum development

III. Demonstration Projects

CRBT, emphasizing a hands-on team building approach, supports local demonstration projects. Our services include:

- Defining project goals and objectives
- Assisting with building and site design
- Identifying and selecting materials
- Information on low-impact construction techniques
- Assisting to identify local sponsors and supporters
- On-site and remote technical assistance
- Project documentation, evaluation and analysis

***Our services support
a resource efficient
approach to building
by using appropriate
building design,
materials,
and construction.***

Publications

- Guide to Resource Efficient Building Elements, \$25
- ReCRAFT 90: The Construction of a Resource Efficient House, \$12.50
- Indigenous Building Materials: An Overview, \$8
- Strawbales as a Building Element, \$8
- Affordable Resource Efficiency, \$8

All prices include shipping/handling.
Send for a current list of titles and prices.

Library

The Center for Resourceful Building Technology maintains a reference library of books, periodicals, research reports and other information on resource efficient building. Information on topics including recycled materials, energy efficiency, indigenous building materials, job-site recycling, and materials research is available to the public during office hours. Staff members may be available to respond to information requests by phone or to refer callers to other appropriate information sources.

**Center for
Resourceful
Building
Technology**



Fostering Efficient Resource Use.

Manufacturer & Product Index

Symbols

3-10 Insulated Forms, L.P. 11
440 CarpetBoard 63

A

A.E.R.T. 75, 79
AAB Building System 11
ABT Co. Building Products 42
ABTco, Inc. 58
ADO Products 47
 Adobe and Rammed Earth Buildings 92
Adobe/Solar Associates 92
Advance Foam Plastics 24
Advanced Building Systems 24
Advanced Concrete Technologies 9
Advanced Environmental Recycling Technologies 79
 Advent collection 56
Aeolian Enterprises 75
AFM Corporation 11, 24
Aged Woods 68
 AggreTel™ 79
Agriboard Industries 25
 air krete® 51
Albany Woodworks 68
Alchem 25
Aldan Lane Company 75
All American Foam Products 24
All-Seal Insulation 47
All-Weather Insulation Co. 47
Allied Foam Products 24
Alpine Structures 18
 Alternatives to Lumber and Plywood 102
American Cellulose Manufacturing 48
American Cem-Wood Products 37
American ConForm Industries 11
American Environmental Products 47
American Fly-Ash Co. 14
American Insulation 47
American Reclamation Corporation 85

American Rockwool 49
American Solar Energy Society 102
American Sprayed Fibers 51
American Standard 58
American Tire Recyclers 74
Amoco Foam Products 50
 Amofam®-RCY 50
Anthony Forest Products Co. 18
APC International 25
Applegate Insulation Manufacturing 47
AquaPore Moisture Systems 77
Arctic Insulation 47
Armstrong World Industries 58
ARRC 77

B

BARRIER System 25
 Baseclad™ 49
Bathcrest 58
Bayou Ash 14
 BCI™ Joist 18
Bedford Industries 75
Big City Forest 84
 Big Green Machine™ 85
Big Green Marketing 85
Big Sky Insulations 24
Big Timberworks 68
Blaine 68
 Blue Ribbon™ OSB 32
Boise Cascade Corporation 18
Bomanite Corporation 74, 79
Bonded Insulation Company 47
Bonsal, W.R. 62
Branch River Foam Plastics 24
Brickyard 68
BTW Industries 75
Buchner Panel Manufacturing 58
Builders for Social Responsibility 102
 "Building with Junk and Other Good Stuff" 102
 Building With Nature 102

C

C-Max Technologies 80
C.T. Donovan Associates 84
Cal-Shake 37
CAN-CELL Industries 47
Canada Mortgage and Housing Corporation 102
Canelo Project, The 93
CanFibre Group Limited 32
Carlisle Tire & Rubber Company 74
Carrysafe 75
Cascades Re-Plast 75
Castlegate Entry Systems 55
 Catawba® Hardboard siding 42
Catrel USA 79
Celadon 37
Celfortec 50
Cell-Pak Inc. 47
Cellin Manufacturing 47
 Cemwood Shakes™ 37
Center for Maximum Potential Building Systems 92, 102
Central Fiber Corporation 47
Centre Mills Antique Wood 68
CertainTeed Corporation 37, 49
Champion Insulation 47
Chemical Specialties 80
Chris Craft Industrial Products 62
 Cladwood® 44
Classic Products 37
Clayville Insulation 47
Coastal Millworks 68
Collins and Aikman 75
 Comfort Base™ 63
 Commercial Paint Recycler 85
Compak Systems Limited 32
 COMPLY® 33
Conklin Authentic Antique Barnwood 68
Conklin Metal Industries 37
Contact Lumber 58
Contech Admixtures 14
Contour Products 24
 Contumax 80
 Cordwood Masonry 92
Core Form™ 12

Corr-A-Flex 78
 Cost Effective Home Building 102
CraftMaster 48
 Craftsman Line 62
Crowe Industries Ltd. 38
Cunningham Brick Company 75
 Cycle II paint 59

D

Delta Lumber & Millwork Co. 69
 Dendamix™ 51
 Diamond Snap-Form™ 11
Dodge-Regupol 61, 63, 74
Domtar Gypsum 32, 84
 Donolite 78
Duluth Timber Company 69
Dura Post and Dura Bord 75
DURA Undercushions Ltd. 63
 Dura-Bloc 76
 Dura-Lagg 76
Durable Mat Company 63
Duratech Industries, Inc. 76
 Duratron® 62
Durisol Materials Limited 9
 Duro-Guard 9000-B 64
Durox Building Units Limited 13
 Dwelling on Earth 92

E

E-Z Form 12
Eagle One Golf Products 64
Eagle Panel Systems 25
Eagle Recycled Products 76
Earth Safe 76
 Earthen Building Materials 92
 Earthship 93
Earthwood 92
 Easiwall 29
 Easy-ply® roof decking 32
Eco-Container Corporation 61
Eco-Home Network 102
 Eco-Tile™ 64
 EcoPanels 58
EEE ZZZ Lay Drain Company. 77
Eiger Building Products 38
 EigerShake™ 38
El Dorado Velvet Tile 64
 Eliminator-PF 56
 Elite® doors 55
Ener-Grid 9
 EnerBlock™ 10
Enercept 26
Energ Corp 12
Energy Control 47
Energy King 48
 Energy Source Directory 102
Energy Zone Manufacturing 48
Engineered Panel Technologies 27

Envirelon™ 62
 ENVIROCORT™ 92
 Environ™ 59
 Environmental Building News 102
 Environmental By Design 102
Environmental Plastics 76
Environmental Recycling 76
Environmental Recycling Services 85
 Environmental Resource Guide 102
Environmental Specialty Products. 80
Environmentally Safe Products 50
EnviroSafe Products 76
Envirowood 76
 Envirowood™ 75
Eternit 38, 42
Evanite Fiber Corporation 32
Everest Roofing Products 38
 Everlast 74
EX: Inc 61
EZ-Shim 80

F

FASWALL 9
 Fiber Frame™ 56
Fiber Master/ ThermoCon 48
Fiber Technology 18
 FiberBond™ 33
Fiberwood 48
 Fibretrel™ 79
Fibreworks 61
FIBREX Inc. 49
 Fibron™ 55
Field Support and Supply 76
 Fire Free™ 40
 Firetest™ 59
FischerSips™ 26
 Flex-Tuft™ 64
Flexco Co. 64
 FlexTech 74, 79
Foam Laminates of Vermont 26
Foam Products Corporation 27
Foam-Tech 50
Forbo North America 61
Futurebilt 26

G

G.R Plume Company 69
 Gang-Lam® LVL 19
 GE Noryl® resin 38
 Geoblock 78
Georgia-Pacific 18, 32, 38, 42, 55, 63
Gerard Roofing Technologies 38
Gifford-Hill & Company 14
Glass Aggregate Corporation 77
 Glazecote™ 58

Global Recycled Products 64
 GNI™ Joists 19
Goodwin Heart Pine Company 69
 GP-Lam™ 18
 Grand Passage® 55
 Grasspave2 78
 Gravelpave2 78
Greater Toronto Home Builders' Association 84
Green Builder Program 102
Green Paint Co. 58
Greenblock Company Ltd. 12
Greenwood Cotton Insulation Products 51
Gridcore 58
 Grit Top Tiles 65
 Gyproc® 32

H

Hamilton Manufacturing 48
Hammer's Plastic Recycling Corporation 76
 Hardipanel™ 43
 Hardiplank™ 43
 Hardishake® 39
 Hardisoffit™ 43
Harditex Sheets 43
Harmony Exchange 26
 Heat Mirror™ 56
Hebel Corporation 14
Hendricksen Natürlich Flooring 61, 62
Hexcomb 30
Hexagon Honeycomb Corporation 30
Holnam 14
Homasote Company 26, 32, 63
Huebert Fiberboard 51
Humane Manufacturing Co. 39
Husky Panel Systems 42

I

I.C.E. Block™ 13
Icynene 51
Image Industries 62
IN-CIDE TECHNOLOGIES 48
 Indigenous Building Materials 92
 Inner-Seal® 33, 43
 InnoPlast GP™ 80
Innova 85
Innovative Formulations Corporation 39
Innovative Plastic Products 80
Innovative Waste Management 84
Insteel Construction Systems 27
Insul-Mor Manufacturing 48
Insul-Tray 47
Insulated Building Systems 24
Insulated Masonry Systems 9

Insulform 12
Insulspan 27
 Intégra® block wall system 10
 Integrity™ 55
International Cellulose 48
**International Institute for Bau-
 Biologie & Ecology 102**
International Permalite 52
Into the Woods 69
Invisible Structures 78
Iowa Recycled Plastics 33
IpoCork 61

J

J Squared Timberworks 69
**J-DECK, Inc. Building Systems
 27**
J.L. Powell & Co. 69
Jager Industries 19
**James Hardie Building Products
 39, 43**
Jeanell Sales Corp. 76
Jefferson Lumber Company 69
Jeld-Wen 55
Joinery Co., The 69
JTM Industries 14

K

K & B Associates 12
Keeva International 12
Kept, Inc. 76
 KEPTech 76
 KEPTwood 76
Korwall Industries 27

L

Lafarge Corporation 14
**Lancaster Colony Commercial
 Products 64**
 Last Straw 93
 Legsaver 64
 Lifecycle 75
Lite-Form 12
Loompanics Unlimited 102
**Louisiana-Pacific 19, 33, 39,
 43, 48**
 Low-E Insulation 50

M

Major Paint Co. 59
 Making a Molehill Out of a Mountain
 II. 84
 Making Space 87
**Mandish Research International
 78**
Mansion Industries 92
Marlite 59
Marne Industires 24
Marvin Windows and Doors 55
Maryland Clay Products 75
Masonite Corporation 43, 55

Mat Factory 74
Mats Inc. 64
MaxiTile 39
Maxwell Pacific 70
Mayse Woodworking Co. 70
Meadowood Industries 33
Mearl Corporation 14
 Medex 80
Medite Corporation 80
 Medite II 58, 80
Met-Tile 39
**Metal Sales Manufacturing
 Corporation 40**
Metro 84
Metropolitan Ceramics 61
 Micro-E Insulation™ 50
 Microllam™ 20
Mid-America Industries 24
Mid-Atlantic Ash Co 15
**Midwest Fly Ash & Materials
 15**
Milgard Manufacturing 55
Millenium Group 80
Mineral Specialties 15
 Mirrorfab 39
 Mirrorseal 39
MITek Industries 19
Mobil Chemical Company 76
Modern Insulation 48
 Moisture Master® 77
 Moistureshield™ 55, 79
Monex Resources 15
Monolithic Constructors 93
Mountain Fiber Insulation 48
Mountain Lumber Co. 70
Multi-Bloc 77
Multi-Tech Ltd. 64
Murus Co. Building Systems 27

N

Nailer® 80
Nascor Incorporated 19, 28
**National Association of Home
 Builders 102**
**National Center for Appropriate
 Technology 102**
National Minerals 15
 Nature Guard® 39, 48
Nebraska Ash Company 15
 Neutralite 81
Neutralysis Industries 81
New England Slate Co. 70
New West Gypsum 84
No Fault Industries 64
Nordic Builders 51
**North American Panel Systems
 27**
**North American Cellular Con-
 crete 14**
North Fields Restorations 70
**Northern Insulation Products
 48**
 NovaWood 76
Nu-Woll Insulation 48

O

Oak-Over® 58
Obex 76
On Track 70
Open Joist 2000 19
**Oregon Strand Board Co.
 33, 43**
Oscoda Plastics 64
Ottawa Fibre 50
Out on Bale (un) Ltd. 93
**Owens Corning Fiberglas
 Canada 49**
**Owens Corning Fiberglas Co.
 55**

P

P & N Recycling 70
P.K. Insulation Mfg. Co. 48
Pacemaker Plastics Co. 24
Pacific Mat Co. 65
**Pacific Northwest Ecobuilding
 Network 102**
Palmer Industries 51
 Parallam® 20
ParPac 48
**Partnership for Carpet Reclama-
 tion 85**
Peachtree Doors 55
Pease Industries 55
Perma Flake Corporation 48
Perma "R" Products 28
 Permatek™ 37
Phenix™ Biocomposites 59
Phoenix Brick 75
Phoenix Recycled Plastics 76
Phoenix Scientific 75
 Pine-Neer® 58
Pioneer Millworks 70
 Plastered Straw Bale Construction 93
Plastic Lumber Company 76
Plastic Pilings 76
Plastic Tubing 78
Ply-Trim 44
Poly-Foam 24
Porter, W.H. 28
 Posi-Strut® 19
 Power Beam™ 18
Pozzolanic International 15
Premier Building Systems 24
Presto Products Co 78
 PrimeTrim™ 42
Promat 74
 Protect-All 64
 PYRAMOD™ 92

R

R-control® 24
 R-FORMS® 13
 R.E.D.-PAK 77
Radva Corporation 28
Rammed Earth Works 92
Rasmussen Paint Co. 59

RB Rubber Products 63, 74
RCM International 65
Re-Con Building Products 40
Rebel Building Components 19

Rebound 74
ReClaim Inc. 85
Reclamation Technologies 84
 Recy-Tile 77
Recycled Plastic Industries 76
Recycled Plastic Man 77
Recycled Plastics 81
Recycled Polymer Associates 77

Recyclemaid 76
 Recycling Construction and Demolition Waste in Vermont 84
 Recywall 77

Reddi-Form® 13
 Redi-Lam™II 20
Redi-Term Insulation 48
Regal Industries 48
Renaissance Roofing 70, 85
Renewed Materials Industries 77

RePave 85
RePlas Products 77
RePlastec 81
 Resincore® 34
Revere Copper Products 40
Rocky Mountain Institute 102
Rodman Industries 34
 Roof-Gard™ 39
Rosboro Lumber Co. 20
Roxul 49
RTS Company 40
 Rumber 77
 Rustic Shingle 37

S

Saf Dek™ 64
Sanders Enterprises 77
Santana 59
Schmucker Manufacturing Co 28
Schuller International 50
 Seal-n-Save™ 81
Shelter Enterprises 28
 Silent Floor® 20
Simplex Products Division 34
Simpson Door Company 56
 Small Home Plans 87
 Small Houses 87
 SmartBlock™ 11
Smurfit Newsprint Corp. 44
 Softpave™ 74
Solar Energy International 102
Solar Survival Architecture 93
Solomit Strawboard 59
Sorbilite 81
 Sourcebook for Sustainable Design 102
Southern Cellulose 48
Southwall Technologies 56

SpaceJoist™ 21
Sparfil Blok International 10
 Sportsturf 74
 Stackwood 92
Standard Structures 20
 Stile™ 40
Stone Container Corporation 93
Stoneware Division 62
Stramit USA 29
 Straw Bale House 93
 StructureWall™ 29
 Structurwood® 34
Suburban Insulation 48
Summitville Tiles 63
Suncoast Insulation Manufacturing Co. 48
Suntek 56
 Super Joist™ 19
 Supergreen™ Foam 50
Superior Hardwoods 71
Superior Walls of America, Ltd. 10
Superior Wood Systems 20
Superlite Block 10
Superwood 77
Supradur 40
Sure Fit Shims 81
 SWI-Joists 20
Sylvan Brandt 71
 Syndecrete™ 59
Syndesis Studio 59

T

Talisman Mills 62
Tascon 48
Taylor Perma-Door 56
 Tec-Lam™ 20
Techbuilt Systems 29
Tecton Laminates Corp 20
Temple-Inland Forest Products 44
Tennessee Cellulose 48
Terra-Green Technologies 62
Therma-Tru Corporation 56
Thermal Foams 24
ThermaLock Products 10
 Thermastructure® 28
Thermo-Kool of Alaska 48
Thermo-Pak Mfg 48
 Thermo-ply 34
Thermoguard Insulation Co. 48
Thermotech 21™ 29
Tile Cera 62
Tile Roofs 71
Tile Search 71
 Timbermax® 18
 TimberStrand® 20
Timberweld 20
Tiresias 71
 Traffic Tiles™ 62
 Trex™ 76
Tri-Cell Corporation 30
 TRIDECK 30
 Trim Joist™ 19

Trimax of Long Island 77
 TrimCraft™ 44
 TRIPANEL 30
Trus Joist MacMillan 20
Truswal 21
 TTS WOOD I® joist 19
 TUPST™ stress-skin panels 26
Turtle Plastics 65

U

U.S. Ash Co. 15
U.S. Building Panels 29, 37
UC Industries 13
Unadilla Laminated Products 21
United Fibers 48
United McGill Corp. 81
United Resource Recovery 78
Urban Forest Wood Works 84
Urban Ore 84
Ursa Structural Systems 27
USG Interiors 49

V

Vermont Stressskin Panels 29
 VERSA-LAM™ 18

W

W.A.M. Inc. 13
Waccamaw Clay Products 75
Wallframe 28, 29
WasteBusters 84
 Wearlon® 62
Weather Company 81
 Weatherstone 44
 WeatheRx 5™ 81
Wenco Windows 56
Werzalit of America 44
West Materials 10
Western Ash Company 15
Weyerhaeuser 34
What Its Worth 71
Willamette Industries 21
Winter Panel Corp 29
Winter Seal Vinyl 56
Wisconsin EPS 24
Wolverine Technologies 44
Wood Cellar, The 71
Wood Recycling Inc. 84
Woodhouse 71
Woodless International 13
Woods Company 71
 WSI Joists™ 21

Y

Yemm and Hart Green Materials 81

Z

Zappone™ Manufacturing 40

