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Associated General Contractors of America



And You Thought You Recycled A Lot



RECYCLE THIS!

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“ Anything our industry can do to help our environment will give a lasting affect for generations to come. ”

Mark Millich, President
 JM Olson Corporation
 Greater Detroit Chapter, Inc.
 Board of Directors

It's one thing (and a very good thing at that) to do your part for the environment by recycling. Recycling newspapers saves trees. Giving those aluminum cans and glass bottles another spin makes for some lonely landfills. Every little bit counts.

Add your recycling efforts to what some Associated General Contractors (AGC) members are doing and you'll discover a whole lot of recycling going on. The construction industry as a whole recycles more material than any other industry. All it takes is one major commercial construction project to generate a good hundred thousand tons of recyclable debris. Steel, concrete, asphalt and wood are all fair game. New technology, creative thinking, and concerns for the environment pull together to make recycling just another part of the day on construction job sites everywhere.

Look around any construction site and you will see an opportunity to recycle many of the materials around you. More contractors are recycling on-site, saving money on landfill fees, new materials, and even wear and tear on trucks taking waste to the landfill. Construction recycling goes much farther and tackles much larger amounts of material than everyday recycling.



AGC MEMBERS GIVE RECYCLING A NEW NAME

RECYCLING JUST MAKES SENSE.

- **It's great for the environment.** Recycling saves natural resources and reduces waste by as much as 75 percent per construction project.
- **It's cost effective.** No landfill fees and fewer expenses for new raw materials. It pays off where any construction business feels it most — the bottom line.
- **It creates new business.** The recycling market can produce 10 times more jobs in the industry for the same cost as sending the waste to the landfill.

Read on to find out what an imploding football stadium, an abandoned airport, the 2002 Winter Olympics, and a new twist on an old power source have in common.



THANKS FOR THE MEMORIES

Since 1976, Seattle's Kingdome was ground zero for some of the area's most exciting professional sports action. Home to both the Seattle Seahawks and the Seattle Mariners, the Kingdome was where thousands of loyal fans spent many a sunny spring day and crisp fall afternoon cheering on their favorite teams.



It took less than 20 seconds for all of that to change. The day was March 26, 2000. It was a beautiful Sunday morning. One minute the stadium was standing guard over the Seattle skyline, the next it was reduced to a pile of nearly 150,000 tons of rubble. Was it an earthquake? The act of some deranged fan? No, it was the well-planned and successfully executed implosion of the largest enclosed space ever attempted.

First and Goal

Long before the blast, Dallas-based Turner Construction Company, the Public Stadium Authority, and the stadium's owner/operator First and Goal, Inc. had teamed up to put plans for a rigorous recycling plan in motion. Their goal was to recycle upwards of 85 – 90 percent of the waste generated by the demolition and the new construction of the Washington State Football/Soccer Stadium.

Nearly every nook and cranny of the Kingdome was put to good use. Stadium furnishings were either donated to local soup kitchens and other nonprofit groups or removed and auctioned off in order to raise money for the King County Parks and Recreation Department. A crew of more than 150 people spent long weeks stripping the roof (which could not be recycled because of adhesives and composite design) and gutting the interior of the building of any materials that would "contaminate" the recycling effort.

After the dust from the explosion settled, an army of massive excavators and bulldozers moved in to process the structure. Armed with attachments ranging from huge breakers and shears to pulverizers and buckets, this heavy equipment was used to chew up the rubble into one- to two-foot boulders and separate incredible amounts of rebar. The steel and rebar was loaded into trucks and taken off site to be processed and recycled. The smaller, more manageable material was sorted with concrete, asphalt, and masonry which was combined and ground down to one

CASE STUDY FACTS

► Key Players

Turner Construction Company, one of the nation's largest general building companies and long-time AGC member, along with Seattle's

Public Stadium Authority, and the stadium's owner/operator First and Goal, Inc.

► The Project

Demolish Seattle's Kingdome to make room for a new exhibition center, football/soccer stadium, and parking garage.

► The Results

97 percent of the project waste or over a hundred thousand tons of wood, concrete, steel, and other construction materials were

recycled into the new stadium and over \$3,000,000 was saved in materials, removal, and landfill costs.





Concrete and rebar ready to be processed.

and a half inches minus gravel with a rock crusher and screen that had been set up on-site.

The Big Crunch

The recycling process itself resembled a “super-sized” curbside recycling program. Turner Construction provided containers with different labels for workers to deposit certain materials. The difference was one of scale. Instead of plastic bins, 40 cubic yard dumpsters labeled “wood,” “steel,” “concrete,” “gypsum/drywall,” and “trash” were set up in various locations around the site. Crews of workers sorted through the rubble and loaded materials into appropriate containers.

Since the grade of the new stadium had to be raised to accommodate the higher elevation of the new playing surface, the on-site rock crushing operation proved itself to be a pivotal part of the recycling effort. Much effort and expense was spared by using the huge supply of gravel (some 90,000 tons) processed from recycled gravel at the project site. This strategy alone saved Seattle’s streets and roads upwards of 4,500 trips by trucks and trailers — easing local traffic congestion and helping to maintain air quality, as well as cutting construction costs by eliminating the need to move this material on- and off-site.

A New Twist on Trash

When all was said and done, a total of 128,250 tons of waste was generated by the stadium project. Of this, only 3,420 tons were sent to a landfill. The rest, a remarkable 124,830 tons, was either reused in the new structures or recycled off-site. As a result, Turner Construction and its partners were not only able to perform a great service to the local community of Seattle and the surrounding environment, but also saved a tremendous amount of money — an estimated \$3,050,000 — along the way.

The demolition of the Kingdome and construction of the new Washington State Football/Soccer Stadium represents a shift in mentality to more efficient building practices that are becoming an important focus in the construction, architecture, and engineering industries. There’s no two ways about it — an environmentally sound project that cuts construction costs is a good deal all the way around.



The on-site rock crushing operation used in Turner's immense recycling project.

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Some Facts About Steel...

All Steel is Recycled Steel!

Long before recycling became the “in” thing to do, recycling was an integral part of the steelmaking process. It saves energy and natural resources and it lowers the cost of producing new steel.

Steel...

Strong

Durable

Stable

The building material of choice for commercial construction.

Did You Know...

Recycling steel:¹

- Saves enough energy annually to electrically power 18 million homes for an entire year.
- Saves 2,500 pounds of ore, 1,400 pounds of coal and 120 pounds of limestone per ton of steel.
- Accounted for 63 percent of the total amount of steel used for construction projects in 1999.

Recycled Steel is Everywhere!

You'll find recycled steel in:

- Appliances
- Bridges
- Cans
- Cars & Trucks
- Construction equipment
- Office equipment
- Fire hydrants
- Guard rails
- Residential and commercial construction materials
- Road signs

...and all of them can be recycled over and over again!

¹ Steel Recycling Institute.



IT'S NOT GETTING OLDER, IT'S GETTING BETTER



Denver's Stapleton International Airport opened in 1929 and by the time it closed 66 years later it had become one of the busiest airports in the United States. In 1995, it was replaced by the new state-of-the-art Denver International Airport.

With the new airport built in a completely different location, Denver officials were left with the challenge of revitalizing the massive Stapleton Airport complex. Plans gradually evolved to redevelop this valuable land into a "city within a city" to include homes, businesses, educational facilities, and beautiful open space.

Welcome to the World's Biggest Recycling Project

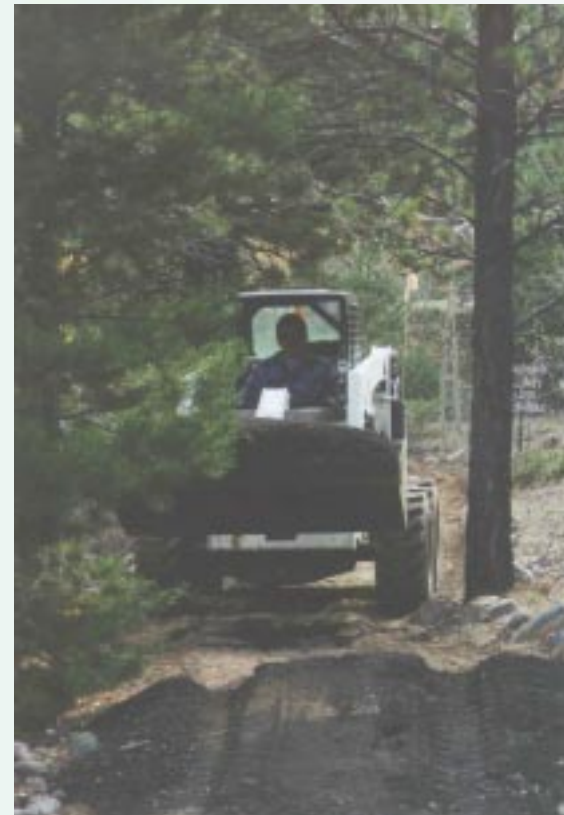
Before that could happen, however, something had to be done with the existing infrastructure. That's where Recycled Materials Company, Inc. (RMC) came into the picture. They were charged with the task of cleaning up one of the nation's largest brownfields and making constructive use of the materials removed and the land left behind.

Since August 1999, RMC has operated at Stapleton under a permit that allows exclusive access and removal rights of on-site aggregates. Under terms of their contract with the Colorado Department

of Aviation, RMC has six years to remove concrete runways and taxiways, averaging 24 inches thick and covering 975 acres. Putting this into perspective, that is the equivalent of recycling nearly 10,000 miles of two-lane road or highway. When the dust settles, six million tons of aggregate (concrete and asphalt) will be recycled, marketed and consumed.

Not Only Does It Work, It's Better

Products resulting from this operation range from sand to 'Staplestone,' which is large concrete blocks suitable for retention walls, barriers, and other landscaping projects. Regardless of the end size of the recycled aggregate, one truth rings clear, "we never want to produce a product we have to apologize for," Mark Wachal, president of Recycled Materials Company, Inc. confirms. He recognizes that "many people consider recycled products 'used' or 'substandard' which makes quality control all the more important."



RMC donated recycled asphalt from Stapleton to Easter Seals Colorado to pave wheelchair trails at their summer camp as part of the Colorado Contractors Association's (CCA) Community Project 2000/01.

CASE STUDY FACTS

► Key Players

AGC member
Recycled Materials
Company, Inc. of
Arvada, Colorado.

► The Project

Removing and
recycling concrete
runways and
taxiways at the now
defunct Stapleton
International Airport;

a project involving
roughly the
equivalent of 10,000
miles of two-lane
highway.

► The Results

Everything is reused
at the "world's largest
recycling project,"
including six million
tons of recycled

concrete aggregate
that is equal to, or
of higher quality
than, comparable
virgin aggregates.



Some Facts About Concrete...

Did you know...

- Approximately 200 miles of concrete pavement are recycled each year?²
- Approximately 5,996 tons of concrete can be reclaimed from every one mile of concrete pavement with an average thickness?³
- 44 states now use recycled concrete as a road base?⁴

Popular uses of large blocks of recycled concrete include:

- Erosion control material
- Shoreline protection material

Primary uses of recycled crushed concrete are:

- Base material for roads
- Base material for footings and foundations
- Landscaping material
- Drainage material placed around underground pipes
- Aggregate in new asphalt or concrete

Recycled concrete cuts costs!

No transportation fees for hauling used concrete to landfills! Saves about \$0.15 per ton per mile!

No landfill disposal fees! Saves up to \$100 per ton!

² U.S. Environmental Protection Agency.

³ U.S. Department of Transportation, Federal Highway Administration and U.S. Environmental Protection Agency.

⁴ Interagency Working Group on Industrial Ecology, Materials and Energy Flows.

Recycled Materials Company, Inc., an active member of the Colorado Contractors Association, Inc. (CCA) since 1976, received CCA's 1999 Environmental Excellence Award for their Stapleton project.

This recycled product is clean, not contaminated with wood, paper, drywall or other construction/demolition debris. In fact, studies performed by the Colorado School of Mines found that the recycled concrete aggregate is equal to or of higher quality than comparable virgin aggregates. Rick Givan, RMC Operations Manager, says it best: "We have broken the recycle barrier. Not only does it work, it's better."

"Agencies are finally recognizing the performance and use of these products, and that they are not a lesser quality," Wachal explains. In fact, as of early 2001, RMC has supplied recycled products from Stapleton to the Federal Aviation Administration (FAA), Colorado Department of Transportation (CDOT), the U.S. Army Corps of Engineers, and various municipalities. The primary user of this recycled concrete is Aggregate Industries of Colorado which already operates a batch plant (ready-mix concrete) at Stapleton and has an asphalt plant in the works.

And the Winner Is...The Environment

Everything is reused at the "world's largest recycling project." For example, many years ago after Stapleton Airport had closed, a fall storm downed many trees and branches in the Denver area. Because there was available space at Stapleton at that time, the branches and trees were mulched and stockpiled at the former airport. RMC is now using by-product from washing the aggregate and mixing it with those wood chips to produce topsoil amendment that will be used in the Stapleton re-development. Wachal jokes, "the only things we don't market on this project are the dust and the noise."

The benefits of this project are numerous. RMC has found a way to utilize what would otherwise become a waste product filling landfills and disposal spaces. Since this operation stays on-site at the former airport (the product is recycled and stockpiled on-site),



there are minimal hauling costs added to the price of the recycled product. Better yet, on-site recycling saves wear on trucks and reduces time workers have to be stuck in traffic. Finally, as Wachal explains, RMC's project at Stapleton "produces recycled aggregate that saves or extends the life of other aggregates and raw materials."

The Future is Now

Members of RMC have been called on to consult for other projects both nationally and internationally. In April 2000, Russian engineers visited the RMC staff at Stapleton in order to apply to operations in Russia what RMC has learned.

In another year, Recycled Materials Co., Inc. staff expect projects such as this to be pretty much routine. They expect ready-mix and asphalt producers to find more uses for the recycled products. Contractors around the country will see new alternatives when confronted with a closed military base, warehouse or factory center, ship port, or other recycling "opportunity."

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The 16,000-pound weight dropped by RMC's guillotine breaker makes the initial cracks in concrete runways averaging 24 inches thick.

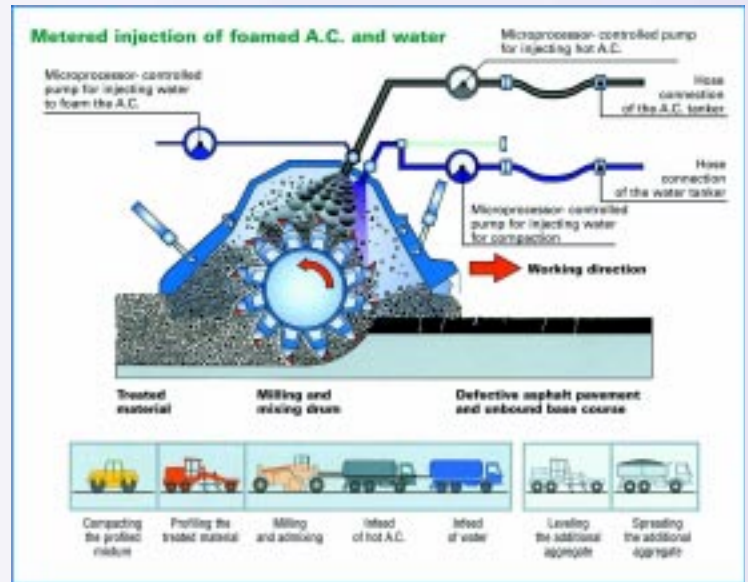
Rick Givan, RMC Operations Manager,
says it best:

“ We have broken the recycle barrier.
Not only does it work, it's better. ”

RECYCLING GOES HIGH-TECH

The construction industry has always been challenged by design engineers and end users alike to meet a higher standard of quality and durability. When it comes to pavement, one longtime AGC member is rising to the challenge. Independence Excavating, along with its partner Carron Asphalt Paving, has formed a new company, called Flex Tech Resources, Ltd. devoted solely to providing alternative pavement solutions. This company was formed in response to growing concerns about deteriorating pavements. The goal is to recycle existing pavements in place and produce a stabilized base-course without the added costs of total removal and replacement.

Using a relatively new process known as full depth reclamation (FDR), an existing pavement along with a predetermined portion of underlying materials is completely blended in place to produce a long-lasting foundation for the new pavement surface. FDR conserves previous investments of in-situ (in-place) materials and resolves the issue of costly and unfriendly environmental disposal.



Full depth reclamation works by utilizing state-of-the-art, high horsepower road reclaimers with computerized additive systems and new engineering technologies. FDR differs from other methods of pavement recycling in that the milling drum always penetrates completely through the asphalt section into the underlying base layers. This eliminates deep pavement cracking and other sub base problems. FDR also provides an ideal opportunity to add stabilizing agents to further enhance the characteristics of the reclaimed material. Depending on the new sub base design, additives such as lime, cement, fly ash, asphalt emulsions or foamed asphalt can be used. Additional granular material can also be added to improve gradation. This process results in strong flexible

bases capable of withstanding repeated heavy loading in many varying environments.

Currently many of the advantages of the full depth reclamation process are being realized in the private market and low to medium volume traffic roadways. Looking ahead, this may well be the type of exciting innovation that contractors and tax-paying citizens can use to bring recycling to the forefront of the construction industry.

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ON THE ROAD AGAIN

Much like other regions of the country, the Salt Lake Valley is quickly depleting its currently permitted aggregate reserves. This is a concern for companies like AGC member Granite Construction Company, and is good cause for taking action to make the most of available resources. Since recycling asphalt and concrete products minimizes the demand for liquid asphalt and virgin aggregates, and since it is an environmentally safe and structurally sound method of rebuilding roads, it was a foregone conclusion that recycling was the way to go.

For many years now Construction Products Company (CPC), a subsidiary of Granite Construction, has run a permanent recycling facility year-round, including a portable facility that can be moved between plants as needed. Eight years ago its doors were opened to the public as a cost-effective and environmentally smart alternative to dumping waste in landfills.

The Road to the 2002 Olympics

When Salt Lake City was chosen as host for the 2002 Winter Olympics, efforts to get the city ready moved into high gear. One project involved completely demolishing a 17-mile section of Highway I-15 and reconstructing it with several new lanes added in each direction, in addition to constructing 140 bridges. The I-15 project was a joint venture involving several AGC members — Granite Construction Company of Salt Lake

City, Utah; Peter Kiewitt & Sons, Inc. of Omaha, Nebraska; and Washington Group International, Inc. of Boise, Idaho. The Utah Department of Transportation (UDOT) oversaw the entire project. As it commenced in 1997, it represented the largest public project ever attempted.

Asphalt, a naturally environmentally safe product, makes one of the best building materials for highway construction. According to Tom Case, materials manager for Granite's Utah Operation and

former chairman of Utah AGC's Aggregates Council, "Recycled road base was an excellent product for the I-15 project. It provided a strong foundation for the new highway while making efficient use of previously processed construction materials."



I-15/I-80 Interchange known as the "Spaghetti Bowl."

CASE STUDY FACTS

► Key Players

Granite Construction Company, Peter Kiewitt & Sons, Inc., and Washington Group International, Inc. — all AGC members.

► The Project

One of the largest public projects ever attempted as of 1997. The project involved reconstructing and

widening 17 miles of interstate highway and building 140 new bridges.

► The Results

Over 150,000 tons of recycled asphalt and concrete road base was used to complete the project.





Bridge deck construction of the I-15/I-80 Interchange.

That's why the I-15 project, which will be completely finished after four years, used over 150,000 tons of recycled asphalt and concrete road base for the entire project. The demand was so great that CPC couldn't recycle it fast enough!

Asphalt Recycling 101

The process of asphalt recycling is fairly simple. It starts when chunks of asphalt from demolished highways or parking lots are delivered to an asphalt plant site. There the asphalt chunks are crushed, screened into usable products, and fed into the asphalt plant in regulated amounts to ensure that the quality of the new asphalt is as good or better than asphalt without any recycled material. Then it's time for the good-as-new product to hit the road again!

CPC's recycled asphalt pavement, some 100,000 tons of it in the year 2000 alone, is used in all types of products. It has proven itself a high-quality product for use in everything from parking lots and roadways to airport runways and highways.

Asphalt to the Rescue

Asphalt recycling benefits everyone — whether they realize it or not. Before recycling, massive piles of asphalt chunks would simply be buried at a landfill. Now, advancements in recycling are helping to save dwindling landfill space. Recycling asphalt also saves on the amount of new liquid asphalt and aggregates needed for producing new asphalt concrete. This helps preserve scarce petroleum products and avoids waste of these precious natural resources. Not to mention that recycling also lowers the cost of producing asphalt products — savings enjoyed by contractors and taxpayers alike.

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Some Facts About Asphalt...

Did You Know...

- Asphalt pavement—including roads, streets, parking lots, and airport runways—is 100% recyclable?
- The quality of recycled asphalt pavement is as good, or even better, than brand new pavement, even when recycled the second and third time?
- The existing 4 million miles of U.S. roads hold a 270 billion-gallon petroleum reserve?⁵

3 Good Reasons to Recycle Asphalt

- 1 Saves money for local governments and other purchasers.
 Cities, states and counties that recycle asphalt pavement save taxpayers over \$300 million a year.
- 2 Conserves resources such as natural aggregates and petroleum products.
 Recycling asphalt minimizes the demand on sources of oil, a non-renewable resource.
- 3 Protects the environment.
 Asphalt is an environmentally safe product — so safe, in fact, that it is used to line water reservoirs and pipes that provide drinking water to communities.

Asphalt Never Dies, It Just "Re-Surfaces!"

⁵ National Asphalt Pavement Association.

⁶ Ibid.

“ Being a leader in the recycling effort is extremely important to preserving these much-needed natural resources. ”

Tom Case, material manager for Granite Construction's Utah Operation and former chairman of Utah AGC's Aggregates Council.

BACK TO THE FUTURE WITH WOOD

East Tennessee faces the same challenges found elsewhere when it comes to electrical power – namely, limited supplies and rising prices. That’s what made the idea of constructing a unique power plant – one that generates electricity by burning recycled wood – so appealing to a manufacturer needing to expand its electric plating facility.

Already feeling the pinch of tight landfill space, Merit Construction, Inc., an AGC contractor based in Knoxville, Tennessee, welcomed the opportunity to create a facility that would use discarded wood waste and scraps as a fuel source. The Merit Construction team handled the construction work while sub-contractor Interstate Mechanical Contractors, Inc. took care of the intricate piping of the power plant.

Knock on Wood

When up and running at full capacity, the plant can consume 200 tons of recycled wood per day, meet its current power needs, and have electricity to spare. The primary source of the plant’s recycled “fuel” comes from the area’s paper and pulp industries, with 25-ton loads of this otherwise useless waste arriving on a regular basis. Since the pulp and paper industry’s supply of wood chips is more costly than other fuel sources, the company is looking into other areas of possible supply.



An up-close look at the “walking floor machine” that controls constant feeding of wood chips to the gasifier. The wood gasification process provides fuel to a steam boiler that drives a turbine, which in turn generates electric power for the facility.

So far, a cost-effective means of sorting wood from commercial construction sites has yet to be developed. However, Merit Construction has agreed to provide two dumpsters — one designated for wood and one for all other construction waste on all construction sites where sufficient wood waste is

present. Once sorted, transportation would be the only expense for the wood-filled dumpster. This does not cost any more than it would to haul the debris to landfills and it actually eliminates the dumpster tipping fee at the landfill.

CASE STUDY FACTS

▶ Key Players

AGC member Merit Construction, Inc., a commercial and industrial general contractor, did the construction work and

subcontracted with Interstate Mechanical Contractors, Inc., another Knoxville, Tennessee-based AGC member, to do the mechanical work.

▶ The Project

Building a wood-powered manufacturing facility for an electric plating company.

▶ The Results

200 tons of wood by-products and waste are recycled every day, while conventional fuels such as

gas, oil, and coal are saved and landfill dumping is avoided.



In addition, Merit Construction has met with local homebuilders to encourage them to develop programs to collect their wood scraps from large residential projects.

Other industries, such as wood truss manufacturers, log home suppliers, and modular home manufacturers, have also indicated an interest in sending their waste to the power plant. These added suppliers would help, but would not eliminate the need for purchasing pulp-industry wood chips, due to the sheer volume of material needed.

A Smart Move

Merit Construction sees this project as a “win – win – win” situation for the environment, the public, and their client. The fact that a recycling facility they built has the potential to solve a major construction site recycling problem is icing on the cake!



Wood chips are brought to the power plant by the truckload on a regular basis. When up and running at full capacity, the plant can consume 200 tons of recycled wood per day.

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Wood chips are sorted by size and fed to the walking floor machine to begin the process of generating power with recycled wood.

Some Facts About Wood...

Did you know...

- When construction sites are cleared, the trees, shrubs, and even the grass are recycled?
- 500 wood processing plants are located in the United States?⁷

Recycled Wood Goes a Second Round As

- Particle board, chip core, or laminates
- Animal bedding, mulch or decorative landscaping material
- Pulp and paper products

Why recycle construction waste?

- Reduce disposal and landfill costs
- Generate income for construction projects
- Reduce costs to clients
- Creates new jobs

You Do the Math!

Fees for wood recycling average \$40 to \$60 per ton compared to regular landfill disposal prices of \$70 to \$84 per ton. Saving Trees Saves Money!

Wood pulp is found in ...

- Rayon material
- Laundry detergent
- Camera film
- Tires
- Transmission belts

Recycled wood – it’s not just for fireplaces!

⁷ American Forest & Paper Association.

ALL OR NOTHING

Typical North American construction projects generate up to 2.5 pounds of solid construction waste per square foot of floor space. That's 250,000 pounds or over 700 cubic yards of waste on a 100,000 square foot building. Staggering numbers, considering that the U.S. alone constructs millions and millions of square feet each year.



As part of the Ford Field stadium project, more than 25,000 cubic yards of concrete and more than 1,000 tons of structural steel were removed and recycled.

While the construction industry has made great strides in understanding the need to recycle these wastes, each construction company continually faces the same question: Are we part of the problem or part of the solution? One AGC member, JM Olson Corporation, has made a company-wide commitment to recycling construction wastes on every job site. Considering that JM Olson construction projects produce an estimated 5,500 tons (or over 32,000 cubic yards) of waste per year, this is no small commitment.

Olson's plan calls for 60 percent of these construction wastes to be recycled and reused. They work in conjunction with their waste-hauling contractors to sort out recyclable materials such as concrete, wood, cardboard and metal.

These recycled construction materials are made useful again in a variety of ways. For instance, the concrete is typically crushed and used as aggregate for road construction. Wood is chipped, dyed and used as landscaping mulch. Cardboard is reprocessed into

recycled paper products. Metals such as structural steel are also reprocessed. Only after all usable materials are reclaimed is the remaining non-recyclable construction waste sent to a landfill.

One Olson renovation project involved salvaging enormous amounts of materials from the selective demolition of the historic 1,000,000-square-foot Ford Field Warehouse in Detroit. As part of the Ford Field football stadium project, more than 25,000 cubic yards of concrete and more than 1,000 tons of structural steel were removed and recycled.

Years ago, most construction waste would have ended up in landfills. With landfill space at a premium and the dawning realization that construction waste can be recycled into useful products, companies like JM Olson are finding better ways to be part of the solution.

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“As more corporations make commitments to our environment, more will follow.”

Mark Millich, President
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