Construction

Sector At-a-Glance	
Number of Companies:	700,000*
Value of Construction:	$850 Billion**
Number of Employees:	6.5 Million*

*Source: U.S. Census Bureau, 2001[1]
**Source: U.S. Census Bureau, 2002[2]

Profile The construction sector[3] comprises general and specialty contractors, which are predominantly small businesses that can be found across the country. The construction sector can be divided into three major segments:

- Building construction;
- Heavy and civil engineering construction, including highways, bridges, and other public works; and
- Specialty trade contractors, such as plumbing, mechanical, and electrical contractors.

In the last ten years, employment in the construction sector increased more than 40%.[4] New orders for construction materials and supplies in 2003 totaled $420 billion, which is nearly 11% of total U.S. manufacturing orders.[5]

Building Process Contractors perform a wide variety of activities, from building roads to golf courses to buildings. While the production processes for the construction sector vary greatly depending upon the project, the following steps are often standard across projects:

- Project planning and design;
- Permitting;
- Material selection;
- Demolition and/or excavation;
- Security;
- Construction; and
- Inspections.

Partnership The Associated General Contractors of America (AGC) has formed a partnership with EPA's Sector Strategies Program to improve the environmental performance of the construction industry. AGC's 35,000 members represent all segments of the construction industry except single-family housing.[6]

Key Environmental Opportunities The construction sector is working with EPA to improve the industry's performance by:

- Managing and minimizing waste;
- Encouraging green construction;
- Improving water quality;
- Reducing air emissions; and
- Promoting environmental management systems.

Managing and Minimizing Wastes

Construction provides opportunities for recycling wastes and reusing byproducts.

Construction and Demolition Debris

Construction and demolition (C&D) debris refers to materials produced in the process of construction, renovation, and/or demolition of buildings, roads, and bridges. C&D debris typically includes concrete, asphalt, wood, gypsum wallboard, paper, glass, rubble, and roofing materials. Land clearing debris, such as stumps, rocks, and dirt, may also be included in some state definitions of debris. In most cases C&D debris is non-hazardous.

C&D debris is a significant issue in the U.S. because of the enormous volume generated. In 1996, the construction, renovation, and demolition of buildings generated more than 136 million tons of C&D debris.[7] Although 20-30% of C&D debris is recovered for processing and recycling, the majority (70-80%) ends up in municipal solid waste landfills or in special C&D landfills.[8]

Green construction projects have demonstrated that, in some instances, 70% or more of C&D debris can be recycled, with resultant savings in landfill space, virgin resources, and disposal costs.[9] As a result, EPA and its partners are seeking ways to encourage recycling of C&D debris. EPA's Resource Conservation Challenge (RCC) is promoting research and development of best practices for C&D debris reduction and recovery.[10] In addition, the Sector Strategies Program, RCC, and AGC are gathering data on the extent of C&D recycling and strategizing how best to encourage greater recycling rates.

Beneficial Reuse of Industrial Byproducts

The construction sector is also exploring the potential for beneficial reuse of its byproducts, as well as those of other sectors. Examples include hardwood byproducts, plant trimmings, sewage sludge, steel slag, and spent non-hazardous foundry sand.

Case Study: Beneficial Reuse by Kurtz Brothers, Inc.

An estimated 80% of spent sand from foundries, valued at approximately $125 million, is landfilled each year. Kurtz Brothers, Inc., a contractor in Independence, OH, diverted more than 150,000 tons of non-hazardous spent foundry sand from landfills by using it in several recent construction projects for the Ohio Turnpike Commission. For example, Kurtz Brothers utilized nearly 54,000 tons of spent foundry sand in a terraced, landscaped embankment near a bridge over the Cuyahoga River.[11]

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Encouraging Green Construction

In the U.S., residential and commercial buildings account for:

- 36% of total energy use;
- 65% of electricity consumption;
- 30% of greenhouse gas emissions; and
- 12% of potable water consumption.[12]

Buildings built to "green" standards use natural resources like energy, water, materials, and land much more efficiently than conventional buildings. As well as being environmentally preferable, green buildings can also be cost-efficient. A recent study found that some investments in green buildings have paid for themselves 10 times over through reduced operations, maintenance, and utility costs.[13]

The Leadership in Energy & Environmental Design® (LEED) Green Building Rating System is a nationally accepted standard for green buildings. In order to be LEED® certified, a building project must demonstrate performance in five areas: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality.[14] Many federal agencies and private customers now require all new construction or major renovations to meet LEED® requirements.

Green construction practices, such as using recycled materials, recycling C&D debris, and preventing stormwater pollution, are essential elements in green building design. EPA and AGC are working together to make a variety of green construction resources available to the sector through the Web. The EPA-sponsored Construction Industry Compliance Assistance Center provides an overview of green buildings and will soon include links to state and local green building programs.[15] AGC's Environmental Services Web page also offers resources, including the "Green Construction Bible" and a tutorial about the LEED® rating system.[16]

Case Study: Green Construction of EPA Buildings

EPA recently completed the construction of two green buildings – the New England Regional Laboratory (NERL) in Chelmsford, MA, and the National Computer Center (NCC) in Research Triangle Park, NC.

During the construction of NERL, Erland Construction Inc., of Burlington, MA, diverted an estimated 200 tons of materials from a landfill, including approximately 250,000 pounds of fly ash and almost 8,000 yards of blasted ledge, which were processed on-site and then used in the building, the road's subgrade, and a retaining wall.[17]

During planning and construction of NCC, Skanska USA Building, Inc.:

- *Oriented the building to reduce heating and cooling loads;*
- *Designed landscaping to reduce heat islands;*
- *Consolidated parking areas to minimize site disturbance;*
- *Utilized building products made from recycled content; and*
- *Shipped many materials back to their original manufacturers or to recycling facilities, rather than to a landfill.*[18]

Improving Water Quality

Stormwater runoff from construction activities can have a significant impact on water quality. EPA regulations require operators of construction sites one acre or larger to obtain authorization to discharge stormwater under a National Pollutant Discharge Elimination System construction stormwater permit. Such permits typically include best management practices (BMPs) to reduce erosion and sediment runoff. Examples of BMPs include:

- Installing silt fencing;
- Providing vegetative buffers along waterbodies;
- Covering or seeding all dirt stockpiles; and
- Protecting storm drain inlets to filter out trash and debris.

Reducing Air Emissions

Many construction vehicles and equipment, such as earth moving equipment, generators and compressors, are powered by diesel engines. Exhaust from diesel engines contains particulate matter (PM), nitrogen oxides (NO_X), and toxic air pollutants. Together, construction and mining equipment account for 46% of total nonroad diesel emissions.[19]

On a national basis, the strategy for controlling air pollution from diesel engines involves low-pollution requirements for new diesel engines and rules covering the fuel used by these engines. Diesel engines on existing equipment will not be subject to the new regulations, yet may remain in operation for another 25 to 30 years. Therefore, EPA and its partners are encouraging firms to retrofit existing diesel vehicles with pollution controls through the Voluntary Diesel Retrofit Program. This program seeks immediate emission reductions by promoting innovative retrofit technologies, idle reduction, cleaner fuels, and cleaner engines.[20]

Case Study: Diesel Retrofit Partnership

To achieve statewide reductions in NO_X and PM, the California Air Resources Board established a $68 million fund to assist contractors in re-powering their heavy-duty diesel equipment with new engines capable of meeting more stringent NO_X and PM standards. In 2001, AGC of California teamed up with California Caterpillar Dealers to organize a seven-year project called "Re-powering for Tomorrow" to utilize state funds to re-power equipment. Over the course of the project, participants expect to reduce annual NO_X emissions by 1,200 tons and annual PM emissions by 90 tons.[21]

Promoting Environmental Management Systems

Interest in environmental management systems (EMS) is increasing rapidly within the construction sector. To date, three individual construction companies have been accepted into EPA's National Environmental Performance Track. In addition, AGC is a Performance Track Network Partner committed to encouraging top environmental performance through EMS.[22]

To increase EMS adoption by its members, AGC is currently developing an EMS Implementation Guide for the construction industry. Once the Guide is complete, the Sector Strategies Program will partner with AGC to train contractors across the country in EMS.

Many construction companies see EMS as a valuable tool for performance improvement.

Case Study: EMS at Skanska USA Building

In 1998, Skanska USA Building, Inc., made a company-wide commitment to implement an ISO 14001-compliant EMS. Through its EMS, Skanska:

- *Increased recycling and reuse of construction materials, for a savings of close to $1 million;*
- *Diverted 980 tons of debris from landfills (all from one construction site);*
- *Minimized soil erosion on all of its construction sites; and*
- *Reduced air emissions through 220,000 automobile miles avoided in one year by encouraging employees to carpool and ride mass transit.*[23]