

Introduction

The purpose of this report is to better understand construction and demolition (C&D) waste diversion by answering the following questions:

What are the options for addressing C&D wastes in the CAPCOG region?

What are some examples of C&D diversion that are possible in the CAPCOG region?

What are other real world examples of programs that might work in the CAPCOG region?

What are the problems faced in the diversion of C&D wastes?

Who are the regional, state, and national experts on C&D waste landfill diversion?

The diversion of construction and demolition waste in Texas, as well as the CAPCOG region, lags behind efforts in other states. Areas with higher tipping fees, such as California and the Northeastern United States have established much more aggressive goals regarding C&D diversion. The Austin area, with its strong environmental focus, has been able to develop programs such as the Green Building Program to help to educate and encourage waste minimization, but these efforts all rely on voluntary compliance.

Construction and demolition waste consists of wood, masonry, soil, rock, paving material, electrical waste, plumbing fixtures, brick, asphalt, drywall, metal, vinyl siding, and cardboard. In the CAPCOG region it is landfilled in any one of the six landfills in the region, two of which receive only Type IV, or C&D, waste. These landfills offer some of the lowest tipping fees in the state further discouraging C&D diversion.

A waste minimization and landfill alternatives study conducted by R.W. Beck for CAPCOG estimates that current landfill capacity in the region to be approximately 13 years. This calculation assumes that when one landfill in the area reaches capacity, waste that was going to that facility would be disposed of at another landfill in the CAPCOG region. Diminishing capacity for Type IV waste further exacerbates the situation. This capacity can be extended through an integrated waste management system that provides for waste minimization, diversion and recovery of construction and demolition wastes.

Construction and demolition waste stemming from both residential and business growth, has contributed significant quantities to the solid waste stream. According to the 2003 TCEQ data construction and demolition wastes represent nearly 23% of the waste stream

in the CAPCOG region. This makes it quite an attractive waste stream to focus on to increase the regional diversion rate. The following table lists the various waste streams reported to the TCEQ and total annual tonnage for 2003.

Waste Disposal by Type - 2003	
Type	Total Tons
Residential	802,308
Commercial	658,864
C&D	505,690
Institutional	91,370
Other Classes	91,630
Brush	33,242
Recreational	22,843
Total	2,205,948

Source TCEQ 2003 Landfill Database

C&D Waste Options

What are the options for addressing C&D waste and C&D landfill diversion in the CAPCOG region?

Include Permitting Requirements and/or Bid Specifications

Through the permitting process governmental entities can require contractors to recover or reuse specific percentages of their potential wastes instead of disposing of them. Permit requirements can be included in demolition, new construction, and or remodeling of existing structures. The incorporation of specifications into local building projects can also divert materials that would otherwise be landfilled.

Promote Deconstruction

Deconstruction is the process of disassembling buildings that would otherwise be demolished, generating a supply of materials suitable for reuse in the construction or rehabilitation of other structures. Deconstruction benefits include resource conservation and the diversion of materials from landfills, as well as job creation and job skill development. Deconstruction is an environmentally and socially responsible alternative to demolition that is beginning to receive attention from local policy-makers and nonprofit organizations primarily in other parts of the country.

Establish Workgroups, Commissions or Task Forces

These groups consisting of representatives of the community, waste industry, governments, trade groups, and other interested parties meet to discuss goals, methods, and to develop plans to implement construction and demolition waste reduction strategies as well as existing and potential markets.

Provide Governmental Funding and Incentives

Funding, in the form of grants or loans, can help to offset costs associated with warehousing materials, reeducating workers, and transporting materials to markets. Incentives such as rebates on permit costs, positive public media exposure, often mitigate any negative factors that may be associated with waste diversion.

Provide Technical Assistance

State and local government support can help meet these challenges in a number of ways. Providing initial funding and technical assistance for collection and distribution centers has proven successful in several U.S. cities, such as Portland, OR. Government entities could also subsidize deconstruction needs such as affordable warehousing space, job training and outreach campaigns to educate construction contractors and the public about deconstruction benefits and products. These types of efforts are helping to spur the demand for salvaged materials in other cities.

Government could adopt policies to give preference to deconstruction projects over demolition, such as expedited review and procurement incentives. Such efforts can lead to increased contractor support for deconstruction and an increase in the number of facilities that accept salvaged materials. Also, streamlining both construction and environmental permitting can help to mitigate timing problems and increase the potential for connecting urban brownfields and deconstruction projects to achieve economic and environmental goals, and can mitigate the financial pressures to tear down buildings quickly as opposed to deconstructing them.

Establish Preferential Purchasing

Recycled building products are cost-effective, reliable and easy to obtain, helping to finish the job on time and under budget. The U.S. Environmental Protection Agency (EPA) has a set of guidelines called the Comprehensive Procurement Guidelines (CPG) that is updated annually. Through CPG, the EPA designates items that must contain recycled content when purchased by federal, state and local agencies or by government contractors using appropriated federal funds. EPA research shows that items in the CPG are of high quality, widely available, and cost-competitive with virgin products.

If a federal agency spends more than \$10,000 per year on a product designated in the CPG, that agency is required to purchase it with the highest recycled content level practicable. The CPG also applies to lease contracts covering designated items.

Promulgation of Regulations

The development of regulations at the local, state or federal level helps to promote environmentally responsible waste management strategies by mandating sustainable practices that everyone must abide by. These regulations can vary from mandating diversion levels to banning items from landfill disposal.

Develop Educational Materials

By providing contractors with the information they need to divert materials that would otherwise be landfilled, increases in diversion may be realized. Information can include green building methods, job estimation worksheets, information about C&D processors, costs and local markets. By incorporating C&D diversion lessons into existing educational programs that focus on recycling, progress can be made in changing attitudes. Creating videos, in both English and Spanish, aimed at the construction industry will help to help educate their employees in the benefits and methods C&D diversion.

Promote Recycling & Reuse

Onsite grinding of C&D materials to be used on the job site helps to avoid disposal, new material and transportation costs. Materials that are not able to be ground may be offered for free or for a fee in waste exchange programs such as building salvage suppliers or the

Recycle Online Texas material exchange program operated by the Texas Commission of Environmental Quality (TCEQ)

Develop Regional C&D Facilities

The creation and operation of a regional facility, such as a C&D Materials Recovery Facility (MRF), can assist generators and buyers of materials in locating cost effective methods of disposing and purchasing of C&D materials. By being a regional facility it also helps to attract sufficient volumes of material to satisfy operational and economic requirements.

Identify New and Existing Uses for Materials Commonly Found in C&D Debris

Material	Potential Use
asphalt	road sub-base fill
concrete	Crushed and mixed to make new asphalt cement blocks; crushed and screened aggregate can be used in asphaltic concrete
dirt	Landscaping landfill cover
metal	Scrap metal dealers
wood	Timber/wood pulp: shredded for fuel, animal bedding, landscaping, manufactured building products, and compost
brick	Masonry crushed for ornamental stone
glass	Fiberglass insulation, sand blast, aggregate in asphalt reflective beads
gypsum	Soil amendment, gypsum board, absorbent media
polystyrene	Insulation
porcelain	Crushed for aggregate
corrugated cardboard	Paper mills, fuel pellets
carpet	Landfill cover
roofing shingles	Asphalt paving

Aggregate recycling rates are greatest in urban areas where replacement of infrastructure is occurring, natural aggregate resources are limited, disposal costs are high or strict environmental regulations prevent disposal. For example it is not cost effective in the Austin area to crush concrete for aggregate because of an abundant supply of virgin material locally, while it is cost effective in areas where there is no locally available supply such as the counties along the Gulf of Mexico.

C&D Options in CAPCOG Region

Are there C&D waste diversion practices already in place within the CAPCOG region that could be expanded upon?

No governmental entities were identified during the research of this report as having any mandated diversion regulations or ordinances in the CAPCOG region. There are few waste diversion activities taking place in the CAPCOG region, but they are voluntary in nature and not mandated in any way.

One nationally recognized program is the City of Austin Green Building Program. This program provides guidance and resources for individuals and businesses to adhere to sustainable practices in residential and commercial construction. Appendix B contains a chapter from their handbook that deals with material management and landfill diversion.

There are a few construction and demolition recyclers in the region. Examples of some of these are:

Leander based Austin Wood Recycling makes two products from materials recovered from construction sites: “Texas Native Hardwood Mulch” is made from oak and cedar while “Texas Native Top Soil” is made from recycled soils. These products are sold directly to the public and at various retail locations.

Habitat for Humanity Re-Store in Austin is an outlet for materials recovered during demolition projects as well as donated from individuals. These materials are then resold to builders and individuals looking for less expensive building supplies.

Commercial Metals in Austin is a metal recycler that purchases all types of metals including used rebar and other metals recovered during demolition projects.

Several construction projects have been the result of sustainable practices such as the Whole Foods Market and several public health clinics.

Local area landfills frequently reuse millings and rock to improve wet weather operations. Soil from construction sites is also used as daily cover.

Gypsum from drywall is used in compost operations as well other as soil amendments

Texas Department of Transportation (TxDOT) has used various inert materials, including glass, in recycled roadway construction.

Appendix B has a more extensive list of companies involved in providing construction and demolition waste services.

C&D Options outside the CAPCOG Region

What are other real world examples that may be possible within the CAPCOG region?

The City of Frisco, TX hired a consultant to research how a C&D diversion program could work in their area. The project is currently on hold until support can be garnered from other supporting municipalities that jointly own and operate the regional landfill where a proposed C&D recovery facility is planned. Frisco currently requires wood to be recycled from C&D projects. The city is considering requesting a grant for a C&D recovery program feasibility study through the North Central Texas Council of Governments.

Dublin, CA passed an ordinance requiring companies building structures worth more than \$1 million to post bond ensuring that at least half of the waste generated on the work site will be diverted from disposal. The bond level varies according to the size of the project. Both the contractor and the city keep track of recycling volumes. Nearly all contractors have been able to meet the requirements of the ordinance.

In Madison, WI a private company contracted for the recycling and reuse of materials that were the result of the construction of a new \$100 million art center in Madison and deconstruction of the previous building on the site. The results were 74% of the project being recycled or reused. The project recovered nine tons of ceiling tiles, several tons of carpet, 24 tons of fixtures and furniture from the deconstruction of the previous building. The avoided hauling and tipping fees of \$250,000 covered the additional labor costs

In British Columbia, Canada communities have used various methods to discourage C&D waste from being disposed at the landfill including boosting landfill fees for C&D wastes, lowering permit fees for house relocations and increasing fees on demolition projects to 5% of the assessed value, and doubling permit fees for demolition as opposed to deconstruction fees.

In the San Francisco, CA area, The Materials for the Future foundation worked with numerous partner agencies to facilitate deconstruction projects at 4 project sites to divert approximately 1,877 tons of material, create 181 deconstruction jobs with associated job training, provide technical assistance on deconstruction to 13 organizations, and leverage more than \$600,000 in job training and community development funding. The project initially targeted deconstruction and job training opportunities at closing military bases, but was expanded to include projects at Naval Air Station Alameda, Port of Oakland, North Fork Mill, and the Redwood Community due to long decision-making at many of the closing bases targeted.

C&D Diversion Challenges

What problems are faced in C & D waste landfill diversion?

Construction Industry

Construction and demolition companies are not geared towards waste recovery. These types of companies have historically not been concerned with recovery of materials because of limited markets for the material and the costs associated with doing so.

Tipping Fees

Low tipping fees in CAPCOG region help to discourage the diversion of waste generated in construction or demolition activities. Tipping fees, which are currently around \$18.00 per ton, are significantly lower than the national average of around \$30.00 per ton making it difficult for contractors to justify C&D recovery. Low tipping fees also make it difficult for local governments to justify building C&D recycling facilities. This can be partially addressed by locating C&D facilities at other permitted solid waste facilities thereby lowering capital equipment and operating expenses by taking advantage of economies of scale.

Housing Market

Over the past decade, the Austin Metropolitan area registered the fifth fastest growth rate in the nation. The population increased almost 46.5% between 1990 and 2000. This increase in the population has fueled the growth of the construction industry and the resulting wastes associated with construction. According to one study, a typical 2000 square foot house will generate approximately eight tons of waste during construction. The rapid growth in the area and numerous construction companies have led to increased competition between home builders and further influenced the bottom line making a change to sustainable building practices less attractive to most builders.

Contamination

Another issue affecting C&D diversion is the problem of load contamination. Various contractors at a job site make it difficult to keep loads segregated. Rolloffs in particular must be well marked with signage in both English and Spanish in order to prevent from contaminating loads of segregated materials. Contaminated loads will either face additional surcharges from processors or may be rejected entirely and landfilled.

Demolition wastes which may contain hazardous wastes or special wastes, such as lead based paint, asbestos, or contaminated soils, must also be also be tested and if hazardous segregated and disposed of in accordance with regulations.

Lack of Infrastructure

Growth in deconstruction activity in the CAPCOG region faces some challenges. The market infrastructure for salvaged building materials is limited; the current lack of a formal distribution network for materials makes it difficult to sustain a market; and affordable warehouse space is difficult to find. In addition, the current customers for salvaged goods are typically looking for specialty materials. Expanding demand for more commonplace salvaged materials will take some effort. The availability of low cost landfill space and long demolition permit waiting periods may also be disincentives to deconstruction.

Environmental Externalities

Facilities used to process C&D wastes, if not properly operated, can generate various problems to surrounding property owners including particulate emissions and noise and increased vehicular traffic.

Building Codes

Building Codes in some jurisdictions may limit or prohibit the use of recycled or reused materials such as the reuse of used wall studs.

C&D Waste Diversion Experts

Who are the regional, state, and national C & D waste landfill diversion experts on this subject?

The following are resources for expert information available to solid waste professionals who may be considering establishing a diversion program or just need additional information. This list is not meant to be inclusive of all resources available.

Regional

City of Austin (COA)

Bob Fernandez, REM, Solid Waste Services (512) 974-4331

Richard Morgan, Green Building Program (512) 482-5309

State

Texas Commission on Environmental Quality (TCEQ)

Alan Watts (512) 239-6789

G. Michael Linder (512) 239-3045

Texas Department of Transportation (TxDOT)

Woody Raine (512) 302-2422

National

Solid Waste Association of North America (SWANA)

(800) 467-9262

Construction Material Recycling Association (CMRA)

William Turley, Executive Director (630) 585-7530

Environmental Protection Agency (EPA) Region 6

Kim Youngmoo (214) 665-6788

Private Companies

Leonard Cherry, Cherry Demolition (713) 987-0000

Dave Yanke, R. W. Beck (512) 450-0991

Robert Brickner, GBB, Inc. (703) 573-5800

Summary

Other than regulations pertaining to the processing of MSW there are no specific regulations in the CAPCOG region addressing construction and demolition diversion. The only city in Texas to have attempted a mandated C&D program Frisco, Texas and currently only requires wood from C&D activities to be recycled. While processors are available in the region to process wood, metal, and a well established green building program is available, it will take a combination of education, regulatory mandates and incentives to realize an increase to the diversion rate through C&D recycling in the CAPCOG region.

Appendix A

Model Construction and Demolition Diversion Ordinance

ORDINANCE NO. _____ (*Insert ordinance number*)

ORDINANCE OF THE CITY/COUNTY OF _____ (*Insert jurisdiction name*)
AMENDING THE _____ (*Insert jurisdiction name*) **MUNICIPAL CODE, ADDING**
CHAPTER _____ (*Insert chapter number*) **RELATING TO RECYCLING AND**
DIVERSION OF CONSTRUCTION AND DEMOLITION WASTE

The Governing Body of the City/County of _____ (*insert jurisdiction name*) **does hereby enact as follows:**

Chapter _____ (*insert chapter number*) **[Recycling and Diversion of Construction and Demolition Waste]** is hereby added to Title [_____] (*insert title number*) of the City/County of _____'s (*insert jurisdiction name*) **Municipal Code to read as follows:**

Chapter: _____ (*insert chapter number*) Recycling and Diversion of Construction and Demolition (C&D) Waste

Section .01 Findings and Statement of Intent

Section .02 Definitions

Section .03 Diversion Requirement

Section .04 Diversion Requirement Exemption

Section .05 Threshold

Section .06 Waste Management Plan

Section .07 Deposit Required

Section .08 On-Site Practices

Section .09 **Reporting**

Section 1.0 **Fines/Penalties**

Section 1.1 **Appeals**

Section 1.2 **Option to Revise**

Section 1.3 **Severability**

Section .01 : Findings and Statement of Intent

RESOLVED, by the Governing Body of the City/County of _____, (*insert jurisdiction name*) Texas, that:

WHEREAS, the City/County of _____ (*insert jurisdiction name*) is required to prepare, adopt and implement source reduction and recycling plans to reach landfill diversion goals, and is required to make substantial reductions in the volume of waste materials going to the landfills, or face fines up to \$10,000 per day;

WHEREAS, in order to meet these goals it is necessary that the City/County promote the reduction of solid waste, and reduces the stream of solid waste going to landfills; and

WHEREAS, waste from construction, demolition, and renovation of buildings represents a significant portion of the volume of waste presently coming from the City/County of _____, (*insert jurisdiction name*) and much of this waste is particularly suitable for recycling and reuse;

WHEREAS, the City's/County's commitment to the reduction of waste requires the establishment of programs for recycling and salvaging of construction and demolition (C&D) waste;

WHEREAS, certain types of projects are exempt from these requirements;

NOW, THEREFORE, THE Governing Body OF THE CITY/COUNTY OF _____, (*insert jurisdiction name*) TEXAS, ORDAINS THAT:

Chapter _____ (*insert chapter number*) is added to the _____ (*insert jurisdiction name*) Municipal Code.

Section .02.: Definitions

(Note to jurisdictions: It is suggested jurisdictions include a list of definitions in the ordinance, for example, covered projects, exempt projects, and types of activities that qualify as diversion.

Section _____.03.: Diversion Requirement

It is required that at least _____ (*insert waste diversion goal here*) of waste tonnage from construction, demolition, and renovation waste shall be diverted from disposal. (*Note to jurisdictions: it is encouraged that the goal be at least 50 to 75%, but the goal needs to reflect the jurisdiction's conditions. Also, some jurisdictions set separate goals for demolition projects than for construction projects, or individual diversion goals for each material type, some of which could be higher than 75%, e.g., for concrete/asphalt.*)

Section _____.04.: Diversion Requirement Exemption

- a. Application: If an Applicant for a Covered Project experiences circumstances that the Applicant believes make it infeasible to comply with the Diversion Requirement, the Applicant may apply for a diversion requirement exemption at the time that he or she submits the Waste Management Plan (WMP) required under Section _____.06 (Waste Management Plan) of this Ordinance.
- b. Meeting with Compliance Official: The WMP Compliance Official shall review the information supplied by the Applicant and may meet with the Applicant to discuss feasible ways of meeting the diversion requirement. Upon request of the jurisdiction, the WMP Compliance Official may request that staff from _____ (*insert agency name*) attend this meeting or may require the Applicant to request a separate meeting with this agency. (*Note to jurisdictions: this will be a local agency that provides waste diversion assistance.*) Based on the information supplied by the Applicant and, if applicable, the _____ (*insert agency name*) agency listed above, the WMP Compliance Official shall determine whether it is feasible for the Applicant to meet the Diversion Requirement.
- c. Granting of Exemption: If the WMP Compliance Official determines that it is infeasible for the Applicant to meet the Diversion Requirements, he or she shall determine the maximum feasible diversion rate for waste generated by the project and shall indicate the new diversion requirement the Applicant shall be required to meet, and will inform the Applicant in writing of the new requirement. The Applicant shall then have _____ (*insert number of days*) days to resubmit another WMP, which is in compliance with the new diversion requirement. If the Applicant fails to resubmit, or if the resubmitted WMP does not comply with Section _____.06 (Waste Management Plan), the WMP Compliance Official shall disapprove the WMP in accordance with Section _____.06 (Waste Management Plan).

Section _____.05.: Thresholds for Covered Projects

(Note to jurisdictions: Consider options one through three. In addition to the options presented, many other variations are included in the sample ordinances on the Board's Web page. For example, some jurisdictions include multi-family structures only over a certain number of units. As a general rule, demolition activities generate significantly larger amounts of C&D waste per dollar than new construction activities, so you should

consider setting a lower threshold for demolition projects and a higher one for projects not including demolition. However, in some areas of the state, demolition contractors routinely recycle their project waste, so you may want to first determine if that is true for your jurisdiction, and for what size of project, before requiring that demolition projects be subject to the ordinance.)

Option One (Threshold Based on Project Cost)

- A. Covered Projects (Construction and Renovation): All construction and renovation projects within the City/County, the total costs of which are projected to be greater than or equal to \$_____, (*insert threshold dollar amount*) shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any construction or renovation activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of Chapter _____ shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section_____ (Fines/Penalties) below.
- B. Covered Projects (Demolition): All demolition projects within the City/County, the total costs of which are projected to be greater than or equal to \$_____, (*insert threshold dollar amount*) shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of Chapter _____ shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties) below.
- C. Non-Covered Projects (Construction and Renovation): Applicants for construction and renovation projects within the City/County whose total costs are less than \$_____ (*insert threshold dollar amount*) are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project- related construction and demolition waste.
- D. Non-Covered Projects (Demolition): Applicants for demolition projects within the City/County whose total costs are less than \$_____ (*insert threshold dollar amount*) are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project- related demolition waste.
- E. City/County-sponsored Projects (Construction and Renovation): All City/County-sponsored construction and renovation projects whose total costs are equal or greater than \$_____, (*insert threshold dollar amount*) shall be considered “Covered Projects” for the purposes of this Chapter, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. City/County sponsored projects whose total costs are less than \$_____ (*insert threshold dollar amount*) shall be considered Non-Covered projects and are not required, but shall be encouraged, to divert at least _____ (*insert*

diversion requirement percentage) of all project- related construction and demolition waste.

- F. City/County-sponsored Projects (Demolition): All City/County-sponsored demolition projects whose total costs are equal or greater than \$_____, (*insert threshold dollar amount*) shall be considered “Covered Projects” for the purposes of this Chapter, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. City/County sponsored projects whose total costs are less than \$_____ (*insert threshold dollar amount*) shall be considered Non-Covered projects and are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project- related demolition waste.

- G. Deconstruction/Recovery Interval for Covered Demolition Projects - Optional (*use in conjunction with covered demolition projects language B or F*): Every Covered demolition project shall be made available for deconstruction, salvage, and recovery prior to demolition. It shall be the responsibility of the applicant to recover the maximum feasible amount of designated recyclable and reusable materials prior to demolition. In order to provide sufficient time for deconstruction, salvage, and recovery, no demolition may take place until a period of _____ (*insert number of working days*) working days has elapsed from the date of issuance of the demolition permit. Recovered and salvaged designated recyclable and reusable material from every project shall qualify to be counted in meeting diversion requirements of Section _____03 (Diversion Requirement). Recovered or salvaged designated recyclables and reusable materials may be given away or sold on the premises, or may be removed to reuse facilities for storage or sale.

- H. Compliance with this Chapter shall be listed as a condition of approval on any construction, renovation and or demolition permit issued for a Covered Project.

Option Two (Threshold Based on square footage)

- A. Covered Projects (Construction and Renovation): All construction and renovation projects within the City/County that are _____ (*insert threshold size*) square feet or greater shall comply with Chapter _____ shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of Chapter _____ shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties) below.

- B. Covered Projects (Demolition): All demolition projects within the City/County that are _____ (*insert threshold size*) square feet or greater shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of

the terms of Chapter _____ shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties) below.

- C. Non-Covered Projects (Construction and Renovation): Applicants for construction and renovation projects within the City/County whose projects are _____ (*insert threshold size*) square feet or less are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project-related construction and demolition waste.
- D. Non-Covered Projects (Demolition): Applicants for demolition projects within the City/County whose projects are _____ (*insert threshold size*) square feet or less are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project-related demolition waste.
- E. City/County-sponsored Projects (Construction and Renovation): All City/County-sponsored construction and renovation projects that are _____ (*insert threshold size*) square feet or greater, shall be considered “Covered Projects” for the purposes of this Chapter, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subjected to the provisions of this Chapter. City/County sponsored construction and renovation projects that are less than _____ (*insert threshold size*) shall be considered Non-Covered projects and are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project-related construction and demolition waste.
- F. City/County-sponsored Projects (Demolition): All City/County-sponsored demolition projects that are _____ (*insert threshold size*) square feet or greater, shall be considered “Covered Projects” for the purposes of this Chapter, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subjected to the provisions of this Chapter. City/County sponsored demolition projects that are less than _____ (*insert threshold size*) shall be considered Non-Covered projects and are not required, but shall be encouraged, to divert at least _____ (*insert diversion requirement percentage*) of all project-related construction and demolition waste.
- G. Deconstruction/Recovery Interval for Covered Demolition Projects - Optional (*use in conjunction with covered demolition projects language B or F*): Every Covered demolition project shall be made available for deconstruction, salvage, and recovery prior to demolition. It shall be the responsibility of the applicant to recover the maximum feasible amount of designated recyclable and reusable materials prior to demolition. In order to provide sufficient time for deconstruction, salvage, and recovery, no demolition may take place until a period of _____ (*insert number of working days*) working days has elapsed from the date of issuance of the demolition permit. Recovered and salvaged designated recyclable and reusable material from every project shall qualify to be counted in meeting diversion requirements of Section _____ .03 (Diversion Requirement). Recovered or salvaged designated recyclables and reusable materials may be given away or sold on the premises, or may be removed to reuse facilities for storage or sale.

H. Compliance with this Chapter shall be listed as a condition of approval on any building or demolition permit issued for a Covered Project.

Option Three (Progressive Threshold): (Note to jurisdictions: In this approach, a jurisdiction can choose to establish a threshold in phases, by first targeting specific types and sizes of projects to be subject to the ordinance, in order to stimulate markets for the recovered materials and divert materials from projects that generate the most waste. Then, once markets have been established, the types or sizes of projects covered by the ordinance can be expanded. For example, a jurisdiction may choose to: First target only large projects to allow C&D markets time to develop, and then expand the types of projects subject to the ordinance to include smaller projects by gradually decreasing the minimum square footage threshold or dollar amount threshold for complying with the ordinance.)

- A. Covered Projects (Construction and Renovation): The _____ (*insert time frame*) the ordinance is in effect, all construction and renovation projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties), below.
- B. Covered Projects (Construction and Renovation): The _____ (*insert time frame*) the ordinance is in effect, all construction and renovation projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties), below.
- C. Covered Projects (Construction and Renovation): The _____ (*insert time frame*) the ordinance is in effect, all construction and renovation projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties), below.

- D. Covered Projects (Construction and Renovation): The _____ (*insert time frame*) the ordinance is in effect, all construction and renovation projects within the City/County that are _____ (*insert lowest final threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any construction or demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in _____ (Fines/Penalties), below.
- E. Covered Projects (Demolition): The _____ (*insert time frame*) the ordinance is in effect, all demolition projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in _____ (Fines/Penalties), below.
- F. Covered Projects (Demolition): The _____ (*insert time frame*) the ordinance is in effect, all demolition projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in _____ (Fines/Penalties), below.
- G. Covered Projects (Demolition): The _____ (*insert time frame*) the ordinance is in effect, all demolition projects within the City/County that are _____ (*insert threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in _____ (Fines/Penalties), below.
- H. Covered Projects (Demolition): The _____ (*insert time frame*) the ordinance is in effect, all demolition projects within the City/County that are _____ (*insert lowest final threshold amount here*) shall be considered Covered Projects, shall comply with Chapter _____, shall submit a Waste Management Plan prior to beginning any demolition activities, and shall be subject to the provisions of this Chapter. (*For ordinances including Fines or Penalties, insert the following text*) Failure to comply with any of the terms of this Chapter shall subject the Project Applicant to the full range of enforcement mechanisms set forth in Section _____ (Fines/Penalties), below.

- I. Deconstruction/Recovery Interval for Covered Demolition Projects - Optional (*use in conjunction with covered demolition projects language E, F, G & H*): Every Covered demolition project shall be made available for deconstruction, salvage, and recovery prior to demolition. It shall be the responsibility of the applicant to recover the maximum feasible amount of designated recyclable and reusable materials prior to demolition. In order to provide sufficient time for deconstruction, salvage, and recovery, no demolition may take place until a period of _____ (*insert number of working days*) working days has elapsed from the date of issuance of the demolition permit. Recovered and salvaged designated recyclable and reusable material from every project shall qualify to be counted in meeting diversion requirements of Section _____.03 (Diversion Requirement). Recovered or salvaged designated recyclables and reusable materials may be given away or sold on the premises, or may be removed to reuse facilities for storage or sale.
- J. Compliance with this Chapter shall be listed as a condition of approval on any building or demolition permit issued for a Covered Project.

Exemptions:

A diversion deposit and a Waste Management Plan shall not be required for the following (*select from the following samples and/or include your own*):

1. Work for which a building or demolition permit is not required.
2. New residential projects of less than \$_____ (*insert dollar amount*) in value.
3. New non-residential construction projects of less than \$_____ (*insert dollar amount*) in value.
4. Residential alterations of less than \$_____ (*insert dollar amount*) in value.
5. Non-residential alterations of less than \$_____ (*insert dollar amount*) in value.
6. Roofing projects that do not include tear-off of existing roof.
7. Work for which only a plumbing, only an electrical, or only a mechanical permit is required.
8. Projects where no structural building modifications are required.
9. Emergency demolition required to protect the public health and safety.

While not required, it shall be encouraged, that at least _____ (*insert diversion requirement percentage*) of all project-related construction and demolition waste from Exempt projects be diverted.

Section .06.: Waste Management Plan

Prior to starting the project, every applicant shall submit a properly completed “Waste Management Plan” (WMP) to the WMP Compliance Official, in a form as prescribed by that Official, as a portion of the building or demolition permit process. The completed WMP shall contain the following:

- A. The estimated volume or weight of project waste to be generated by material type;
- B. The maximum volume or weight of such materials that can feasibly be diverted via Reuse or Recycling by material type;
- C. The vendor(s) that the applicant proposes to use to haul the materials;
- D. Facility(s) the materials will be hauled to, and their expected diversion rates by material type;
- E. Estimated volume or weight of construction and demolition waste that will be disposed.

Because actual material weights are not available in this stage, estimates are used. In estimating the volume or weight of materials as identified in the WMP, the Applicant shall use the standardized conversion rates approved by the City/County of _____ (*insert jurisdiction name*) for this purpose. Approval of the WMP as complete and accurate shall be a condition precedent to the issuance of any building or demolition permit. If the applicant calculates the projected feasible diversion rate as described above, and finds the rate does not meet the diversion goal, the applicant must then submit information supporting the lower diversion rate. If this documentation is not included, the WMP shall be deemed incomplete.

- a. Approval: No building or demolition permit shall be issued for any Covered Project unless and until the WMP Compliance Official has approved the WMP. Approval shall not be required, however, where emergency demolition is required to protect public health or safety. The WMP Compliance Official shall only approve a WMP if he or she determines that all of the following conditions have been met:
 - i. The WMP provides all of the information set forth in this section.
 - ii. The WMP indicates that _____ (*insert required diversion goal*) percent of all C&D waste generated by the project shall be diverted (or new diversion goal set in accordance with the Applicant’s approved Diversion Exemption request); and
 - iii. The Applicant has submitted an appropriate Deposit for the project (*If a deposit is required by the ordinance*).
- b. Non-Approval: If the WMP Compliance Official determines that the WMP is incomplete or fails to indicate that at least _____ (*insert required diversion goal*) percent (or new diversion goal set in accordance with the Applicant’s approved Diversion Exemption request) of all C&D waste generated by the project will be diverted, he or she shall either:

- i. Return the WMP to the Applicant marked “Disapproved”, including a statement of reasons, and will notify the building department, which shall then immediately stop processing the building or demolition permit application, or
- ii. Return the WMP to the Applicant marked “Further Explanation Required.”

Section .07 Deposit Required

(Note to jurisdictions: Some jurisdictions base the deposit amount on project type, e.g., new construction, demolition, or renovation. In deciding whether to utilize a deposit as part of your ordinance, be aware that general law cities and counties may have some limitations on their use of this enforcement mechanism. You should check with your city attorney’s office or county counsel’s office before making any decisions on how to proceed.)

As a condition precedent to the issuance of any permit for construction or demolition for a Covered Project, the Applicant shall post a deposit (cash, letter of credit, performance or surety bond, money order) in the amount of \$_____ (*insert deposit amount*) for each estimated _____ (*insert applicable standard of measurement; e.g., ton of waste, square footage, project cost, fixed amount, etc.*) waste, but not less than _____ (*insert minimum deposit amount*). The deposit shall be returned, without interest, in total or pro-rated, upon proof of satisfaction by the WMP Compliance Official that no less than the required percentage of construction and demolition waste tonnage generated by the Covered project has been diverted from disposal and has been recycled or reused or stored for later reuse or recycling. If a lesser percentage of construction and demolition waste tonnage than required is diverted, a proportionate share of the deposit shall be returned. The deposit shall be forfeited entirely or to the pro-rated extent that there is a failure to comply with the requirements of this chapter. The City/County may, by formal resolution, modify the amount of the required deposit.

Section .08. : On-site Practices

During the term of the Covered project, the Applicant shall recycle and reuse the required percentage of waste, and keep records of the tonnage or other measurements approved by the City/County that can be converted to tonnage amounts. The WMP Compliance Official will evaluate and may monitor each Covered project to determine the percentage of waste salvaged and recycled or reused from the Covered project. For Covered projects including both construction and demolition, diversion of materials shall be tracked and measured separately. To the maximum extent feasible, project waste shall be separated on-site if this practice increases diversion. For construction and/or demolition projects,

on-site separation shall include salvageable materials (e.g., appliances, fixtures, plumbing, metals, etc.) and dimensional lumber, wallboard, concrete and corrugated cardboard.

Section ____ .09. : Reporting

Within _____ (*insert number of days*) days following the completion of the demolition phase of a Covered project, and again within _____ (*insert number of days*) days following the completion of the construction phase of a Covered project, the applicant shall, as a condition precedent to final inspection and to issuance of any certificate of occupancy or final approval of project, submit documentation to the WMP Compliance Official that proves compliance with the requirements of Sections____.06 (Waste Management Plan) and _____.03 (Diversion Requirement). The documentation shall consist of a final completed WMP showing actual waste tonnage data, supported by original or certified photocopies of receipts and weight tags or other records of measurement from recycling companies, deconstruction contractors, and/or landfill and disposal companies. Receipts and weight tags will be used to verify whether waste generated from the Covered project has been or are to be recycled, reused, salvaged or disposed. The applicant shall make reasonable efforts to ensure that all designated recyclable and reuse waste salvaged or disposed are measured and recorded using the most accurate method of measurement available.

To the extent practical, all construction and demolition waste shall be weighed in compliance with all regulatory requirements for accuracy and maintenance. For construction and demolition waste for which weighing is not practical due to small size or other considerations, a volumetric measurement shall be used. For conversion of volumetric measurements to weight, the applicant shall use the standardized conversion rates approved by the City/County for this purpose.

If a Covered project involves both demolition and construction, the report and documentation for the demolition project must be submitted and approved by the WMP compliance official before issuance of a building permit for the construction phase of a Covered project. Alternatively, the applicant may submit a letter stating that no waste or recyclable materials were generated from the Covered project, in which case this statement shall be subject to verification by the WMP Compliance Official. Any deposit posted pursuant to Section _____.07 (Deposit Required) shall be forfeited if the applicant does not meet the timely reporting requirements of this section

Section ____ .10 Fines/Penalties

(Note to jurisdictions: Some jurisdictions have adopted C&D ordinances that do not include mechanisms for fines or penalties. Others have initially implemented an ordinance without the use of fines or penalties and then added them after a specified time period, or added them when it was determined that compliance with the ordinance could be more effective with fines or penalties used as an enforcement mechanism. General

law cities and counties need to consult state regulations, as well as their respective legal counsel, prior to determining the dollar amounts to use in this section.)

Option One. Fines According to Degrees of Infraction

Violation of any provision of this Chapter may be enforced by civil action including an action for injunctive relief. In any civil enforcement action, administrative or judicial, the City/County shall be entitled to recover its attorney’s fees and costs from an Applicant who is determined by a court of competent jurisdiction to have violated this Chapter.

- A. Violation of any provision of this Chapter shall constitute an infraction punishable by a fine not to exceed \$ _____ (*insert dollar amount*) for the first violation, a fine not to exceed \$ _____ (*insert dollar amount*) for the second violation within _____ (*insert time frame*), a not fine not to exceed \$ _____ for each additional violation within (*insert time frame*). There shall be a separate infraction for each day on which a violation occurs. Where the violation is the failure to achieve the diversion requirement applicable to the project and the construction and demolition materials from the project have already been disposed, the violation shall be deemed to have ceased after a period of _____ (*insert time frame*) days. The City/County shall recover costs and attorneys’ fees incurred in connection with enforcement of this Chapter.
- B. Enforcement pursuant to this section shall be undertaken by the City/County through its _____ (*insert compliance official*) and the City/County Attorney.

Option Two- Misdemeanor Violation

Each violation of the provisions of this Chapter shall constitute a misdemeanor, and shall be punishable by imprisonment in the County jail for a time period not to exceed _____ (*insert time frame*) months, or by fine not exceeding _____, (*insert fine amount*) or by both such fine and imprisonment. Each day that a violation continues shall be deemed a new and separate offense.

Section ____ .11.: Appeals

(Note to Jurisdictions: Cities/Counties may want to provide for appeals of any determinations made under this Article pursuant to their existing procedures and those of the department responsible for making WMP determinations. Determinations subject to appeal would include, but not necessarily be limited to: (1) the granting or denial of an exemption; (2) whether the applicant has acted in good faith; and (3) the amount of deposit to be released.)

Section ____ 12.: Option to Revise

Beginning _____, (*insert date*) the City/County will evaluate the Recycling and Diversion of Construction and Demolition Waste Ordinance to determine its effectiveness in reducing the amount of C&D waste disposed. In this determination, the City/County will consider issues such as the amount of C&D waste disposed, volume of C&D activity, markets for C&D waste, and other barriers encountered by applicants. If

the City/County determines the C&D disposed had the potential for diversion, then the City may amend these provisions and implement the necessary measures to divert more C&D waste

Section .13.: Severability

If any section, subsection, subdivision, paragraph, sentence, clause, or phrase of this ordinance, or any part thereof, is for any reason held to be unconstitutional, invalid, or ineffective by any court of competent jurisdiction, such decision shall not affect the validity or effectiveness of the remaining portions of this ordinance or any part thereof. The City/County Governing Body hereby declare that it would have passed each section, subsection, subdivision, paragraph, sentence, clause, or phrase of this Ordinance irrespective of the fact that one or more sections, subsections, subdivisions, paragraphs, sentences, clauses, or phrases be declared unconstitutional, invalid, or ineffective. To this end, the provisions of this Ordinance are declared severable.

Appendix B

Sustainable Building Sourcebook Materials: Construction Waste Management

by the Austin Energy [Green Building Program](#), Copyright 2003

Main chapters:

Introduction	Commissioning	Community	Energy	Health and Safety
Materials and its subchapters	Testing	Water	Green Building Design Tools	
View the Sustainable Building Sourcebook's entire Table of Contents (98K)				

CSI Numbers: 01505 Construction Waste Management, 01710 Cleaning

Introduction:

In the United States, construction and demolition debris (the waste produced in the course of constructing, renovating, and demolishing buildings) accounts for 10 percent to as much as 30 percent of the total municipal waste stream. This debris is composed of excess building materials that contain valuable resources and embodied energy from their production and transportation to the jobsite. Once materials have been consigned to the landfills, these resources are virtually impossible to recover. Recognizing and fully utilizing building materials' value is the foundation of construction waste management. Both architects and contractors can greatly impact the amount of construction waste generated on the site.

Construction waste management is the process of planning and implementing the handling and disposal of building materials on a construction site. It involves applying the conservation hierarchy: reduce, reuse, and recycle to construction materials and methods. Research, training, and development of a construction waste management plan are integral parts of this process.

At-A-Glance Notes:

Technology : Technology is quickly developing for recycling of materials into reconstituted building materials. Unfortunately, few new technologies are available locally. Reuse of excess waste materials

requires some additional effort and coordination with a salvage company, non-profit organization, or materials reseller.

Suppliers: There are salvage companies, recycling companies, nonprofit organizations, and materials resellers in the Austin area that can reuse or recycle some of the construction waste generated on site.

Cost: There is some additional cost in developing a construction waste management plan until the new process is established. However, long-term savings can result from construction waste management practices. For instance, donations to nonprofit organizations that specialize in reuse of construction materials can result in tax deductions. Reusing and recycling instead of landfilling can reduce waste disposal fees. Minimizing waste through the efficient design and use of materials also results in cost savings. However, local phenomena, such as low tipping fees, transportation costs, abundant resources, and the lack of companies using recycled materials as raw materials, make recycling of some materials that are not directly reusable too expensive to be feasible at the present time. For example, concrete recycling (for use as aggregate) is occurring in Houston but locally abundant aggregate currently makes concrete recycling unfeasible in Austin.

Financing: No financing issues.

Public Acceptance: Strong public concern for the environment and belief in waste minimization and recycling gives the builder who employs a construction waste management plan a positive image with the client.

Regulatory: Building codes limit the use of used materials (i.e., reused studs) as structural members unless stamped by an engineer or architect. Non-structural materials such as trim or siding are not regulated. Concrete rubble and other materials used for fill must be free of trash, petroleum products, and any materials that will decay or degrade over time.

Considerations:

Eight thousand pounds of waste are typically thrown into the landfill during the construction of a 2,000 square foot home. Most construction waste goes into landfills, increasing the burden on landfill capacity and operation. Waste from solvents or chemically treated wood can result in soil and water pollution. Reusing and recycling materials, instead of landfilling them, extends local landfill life, preserves natural resources, reduces pollution, and saves energy.

Thorough planning is the key to a successful construction waste management strategy. However, planning starts well before any materials are ordered or need disposal. The building's architect should base the design on standard sizes and materials to eliminate waste on site. For instance, designing walls to use full sheets of drywall instead of having to cut sheets eliminates both time in cutting the material and the resulting waste.

In general, using scraps throughout the construction process can save money and allows materials to

be used efficiently. Additionally, using high quality materials to produce engineered products, such as finger-jointed studs, reduces rejects. This approach can reduce the amount of material needing to be reused or recycled and bolster profitability and economy for the builder and customer.

Another key element to consider is the training of construction workers. Workers should be instructed on material use and handling and waste minimization. Materials will be received and handled differently on site, when using a construction waste management plan. On site separation of reusable and recyclable materials from other materials will require training, signage, and follow-up. Bins must be monitored periodically to prevent waste mixing as a result of crews or passersby contamination. However, once separation habits are established, on site separation can be done at little or no additional cost.

Many construction materials that are still usable can be donated to nonprofit or other material reseller organizations. This keeps the material out of the landfill and allows the embodied energy of the product to be retained.

Construction waste management does not include hazardous substances such as asbestos, lead, PCBs (Polychlorinated Biphenyls), mercury, radioactive materials, and CFCs (chlorofluorocarbons). These materials need to be handled by trained hazardous materials specialists. Improper removal and disposal can result in extreme human and environmental health impacts.

Guidelines:

Reduce Consumption and Waste

The first step in the conservation hierarchy is to reduce or minimize both consumption and waste. Reduction involves minimizing excess and leftover materials as well as doing more with less. For instance, using concrete as a finished floor instead of tile eliminates the need for both the tile and its adhesive. Careful storage of materials away from weather and pilfering to prevent loss is a waste minimization strategy.

Setting Goals and Incentives

Setting goals is necessary groundwork for a successful construction waste management plan. Establishing construction waste management goals for a project allows results to be measured and communicated. In order to garner greater participation, establish incentives such as hardhat stickers, t-shirts, and snacks/meals for workers who excel at meeting construction waste management goals.

Reuse

The next step is reuse, which involves finding another use for leftover and surplus materials either on or off site. It includes reusing excess materials on site or selling/donating materials to a used building materials supplier or salvage company. Reuse can also be applied to materials that were salvaged during deconstruction/demolition or remodeling projects. These materials can be stored for use on site

or sold/donated for use by a third party.

The contractor should designate an on-site party (or parties) to be responsible for instructing workers, overseeing, and documenting results of the construction waste management plan for the project. Additionally, construction waste management goals and results should be discussed at all on-site gatherings including pre-construction, weekly project, and safety meetings.

Waste Minimization/Reduction and Reuse Guidelines

General

The Contractor and Subcontractors should exercise the following waste minimization practices to the greatest extent possible:

- Careful takeoffs and tight ordering
- Return of over-ordered materials to supplier (if not required by owner for maintenance and repairs). If a supplier will not take materials back, donate leftovers (see [Resources](#)).
- Careful installation to avoid tearing out and redoing
- Use of centralized cutting area(s) to facilitate the use of cutoffs rather than cutting into new material when only a small piece is required (studs, gypsum board, insulation, etc.)
- Proper on-site storage of new materials to prevent damage

Cardboard and Paper

Avoid excessively packaged materials and supplies. However, be sure packaging is adequate to prevent damage and waste.

Minimize the number of blueprints and reproductions necessary during the design and construction process.

Drywall

Order drywall in optimal dimensions to minimize cut-off waste. Drywall is available in different lengths, and designed dimensions should correspond to standard sizes.

Large drywall scraps can be set aside during hanging for use as filler pieces in areas such as closets.

Although technology does exist for recycling drywall into textured wall sprays, acoustical coatings, gypsum stucco, fire barriers, or agricultural products, there are currently no local markets. Large pieces of drywall (full to half sheets) can be donated (see [Resources](#)). Some composting operations want to use gypsum from the drywall as a soil amendment.

Reuse joint compound buckets for tool or material storage by clients or crews.

Insulation

Install leftover insulation in interior wall cavities or on top of installed attic insulation if it cannot be used on another job.

Lumber

Optimize building dimensions to correspond to standard lumber dimensions.

Modify framing details to optimize lumber use and reduce waste and inform the framing contractor of your plan.

Develop detailed framing layouts to avoid waste when ordering and cutting lumber.

Store lumber on level blocking under cover to minimize warping, twisting, and waste. Avoid losing scrap wood in soil; it can attract termites to the building.

Set aside lumber and sheathing/composite board cut-offs that can be used later as blocking, spacers in header construction, etc.

In remodeling, evaluate whether salvaging used lumber is possible.

Save small, untreated wood scraps to use as kindling for clients or crewmembers.

Larger pieces of leftover lumber (6' or more in length) can be donated. (see [Resources](#))

Save clean sawdust for use in compost piles or around gardens. Avoid sawdust that might contain painted or treated wood. This should be bagged separately. Untreated bagged sawdust may be donated (see [Resources](#)). Minimizing sawdust and small wood scraps from getting buried in the soil also reduces the attraction of your site to termites.

Masonry

Estimate masonry material needs carefully to avoid waste.

During construction, collect, stack and cover brick and other masonry materials to prevent soiling or loss.

Clean concrete chunks, old brick, broken blocks and other masonry rubble can be buried on-site during foundation backfilling.

Salvage usable bricks, blocks, slate shingles, tile and other masonry materials from remodeling and

construction. Store for future jobs or divert to salvage operations (See [Resources](#)).

Check to see if your masonry supplier will accept the return of materials in good condition.

Metals and Appliances

During remodeling, separate old appliances and metal building materials, such as aluminum siding and roofing, metal ductwork, and conduit for reuse.

Consider holding a salvage sale of usable items during the construction process.

Miscellaneous

Branches and trees from land clearing can be stored separately and chipped for use on site to create landscaping mulch. Composting operations also will accept branches and trees.

Old nickel cadmium batteries from portable power tools should be disposed of properly (see [Resources: General Assistance](#)).

Donate clean, reusable building materials such as cabinets, doors, windows, tile, wood, plywood, drywall, light fixtures, bathtubs, sinks, mortar mix, hardware, latex paint, nails, screws, electrical and plumbing supplies (see [Resources](#)).

Paints, Stains, Solvents and Sealants

Donate unused portions (see [Resources](#)) or save unused portions for your next job.

Plastic and Vinyl

Minimize waste of vinyl siding, flooring, and countertop materials by ordering only quantity needed.

Recycling is a system of collecting, sorting, and processing discarded materials for use as raw materials in the manufacture of new products. If construction materials cannot be reduced or reused, then they should be recycled (pending local market availability). Some materials can be recycled directly into the same product. Others can be reconstituted into other usable products. Recycling is not usually economically feasible unless a facility using recycled resources is located near the material generation source.

What to Reuse and Recycle

Before collecting construction waste for reuse or recycling, identify who will accept it. This is important in designating the type of waste to separate and in making arrangements for drop-off, collection, and storage of materials. In Austin, materials that can be reused include:

- appliances and fixtures
- asphalt (for road repair)
- brush, trees, and land clearing debris (for compost and mulch)
- fixtures
- lumber and plywood
- masonry (bricks, concrete masonry units, etc.) and concrete rubble (for fill)
- roofing
- windows and doors

In Austin, materials that can be recycled include:

- carpet (usually in a renovation, check with new carpet installer)
- cardboard and paper
- metals (including copper piping, wire and flashing, aluminum siding, flashing and guttering, iron and steel banding from bundles, nails and fasteners, galvanized flashing and roofing, rebar, and aluminum beverage cans)
- plastics (numbered containers, bags, and sheeting)

Materials Storage Area

Designate a specific area to facilitate separation of materials for potential reuse, recycling, and return. This area should be kept neat and clean. Bins or areas for all materials to be separated should be provided. Bins should be clearly labeled with the material to be collected in both English and Spanish in order to avoid contamination of materials. Pictures and symbols can also accompany verbiage. (For example: *METAL RECYCLING ONLY* and *UNICAMENTE METAL PARA RECICLAR*.) Signage should be easy to read from a distance and from the angle of the disposer. Signage does not have to be elaborate but should be sturdy and removable for use on other bins as needed.

Bins should suit the site -- craneable for multi-story projects, small and mobile for quick moving or hard-to-get-at projects, or sectioned with dividers for smaller quantity projects. They should be monitored periodically for contamination so that the problem can be more readily corrected and preventative measures implemented. The area should be in a location out of the way of construction traffic but provide adequate space for pick-up and delivery and convenience to workers. Protection from rain and pilfering may be required.

Select Conversion Table		
Material	Cubic Yards to --->	Tons

Wood	300 lbs/cy	6.7 cy/ton
OCC (loose)	30-100 lbs/cy	20-50 cy/ton
Drywall	400 lbs/cy	5 cy/ton
Mixed Waste	350 lbs/cy	5.7 cy/ton

Source: NAHB, 1997

Resources:

Components/Materials/Systems:

See "Demolition Contractors" in Yellow Pages for salvage companies.

Firms by Service Type

Landfills

These are regional landfills accepting mixed debris and garbage. Separated materials are accepted where noted; all landfills accept clean fill and rubble. Landfill owners that also provide hauling services are listed again in the Haulers section. Fees listed are for comparison purposes only.

City of Austin Landfill

10108 FM 812

(1 mi. E. of Hwy. 183 at Pilot Knob)

512-243-1200

M-F 8-5, separate brush and clean wood area, diversion area for resaleable items, Type IV Landfill for Construction and Demolition

County of Williamson Landfill

600 County Rd. 128

(15 mi. E. of I-35, left on Hwy. 79 at Hutto)

512-759-8881

M-F 8-5, Sa 8-3, fee: \$5.70/cy mixed debris, \$4.70/cy brush, separate brush area

Longhorn Community Landfill

A Waste Management Inc. Company

9708 Giles Ln.

(5 mi. E. of I-35 on Hwy. 290 E.)

512-272-4329

M-F 7-6, Sa 7-4, fee: \$6.15/cy, separate brush area

Sunset Farms Landfill
(Browning-Ferris Inc.)
9912 Giles Ln.
(5 mi. E. of I-35 on Hwy. 290 E.)
512-272-4327
M-F 4-6, Sa 4-3

Texas Disposal Systems
7500 FM 1327
(3 mi. E. of I-35 on FM 1327,
1 mi. S. of Onion Creek Parkway)
512-243-0400
M-Sa 7-7 (or dusk), separate brush and clean wood area, areas for source-separated metal, diversion area for resaleable items, will take clean drywall for composting

Travis County Landfill
9600 FM 812
(183 S toward Lockhart, E. on FM 812)
Austin, TX 78719
512-243-6301
M-F 6-5:30, Sa 6-12:30, Type IV Landfill: accepts all non-putrescible & non-hazardous waste. Maintains a separate area for brush and clean wood which is ground and used at the landfill primarily as ground cover and secondarily for irrigation control

Haulers

All of these companies divert materials from landfill when possible. Most of these companies provide both containers and pickup services, some provide same-day site pickup. Larger firms that can provide 20-40 cubic yard rolloffs are noted.

AA Disposal
512-388-7851
Trailers available, will separate landclearing, some rubble and metal

Action Disposal
512-251-4810
20, 30, 40-yard containers available, material separation on request by client

Browning-Ferris Industries, Inc.
512-247-5647
20, 30, 40-yard containers available, separate containers for OCC

Capital City Rolloffs, Inc.

512-288-2070

20, 30, 40 yard containers available, separate containers for OCC, metal, land clearing and clean wood

Central Texas Refuse

512-243-2833

20, 30, 40 yard containers available, material separation on request by client, handles rolloff services for Round Rock Refuse

He Haul

512-326-4285

Trailer service, material separation depends on job needs

IESI (owns and operates Travis County Landfill)

512-282-3508

20, 30 and 40-yard rolloff containers, compactors, commercial front load containers and residential garbage carts

Source-separated material handling for OCC, metal, glass, land clearing, wood, concrete, asphalt, non-asbestos tile and bricks

Longhorn/WMI Disposal

512-272-4341

20, 30, 40-yard containers available, separate containers for OCC, metal, glass

Reconstruction Specialties Co.

512-335-9733

Limited containers available, primarily land clearing

Texas Disposal Systems

512-243-4100

20, 30, 40-yard containers available, separate containers for OCC, paper, land clearing and wood, metal

U Call We Haul

512-331-5929

Trailers available, separates OCC and metal

Special Services

These companies provide construction and demolition waste related services.

Austin Sustainable Business Council

PO Box 161482

512-773-6886

A non-profit public partnership of members promoting change toward innovative business practices that improve efficiency and profitability.

Jer-Met Metal Brokerage

Drapers Cv.

512-267-1818

Distributor and reseller of construction and demolition debris and recycling equipment.

Recycling Sciences, Inc.

1600 W. Stassney Ln.

512-326-1303

Manufacturer of stainless steel liquid waste handling systems, especially paints and solvents.

John Lopez

512-209-4993

Demolition and salvage company

Pit Materials (formerly B&G Environmental)

6005 FM 973 South

Del Valle, TX 78617

512-247-6881

Contact: Steve Garner

512-785-9740

Recycles concrete, asphalt, non-asbestos tile, bricks, CMU block (w/o rebar)

Triad Building Maintenance

2938 East 12th Street

Austin, TX 78702

512-385-1189

Contact: Adrian Neely, Owner

Construction and demolition waste consultation and management.

Firms by Material Type

Land clearing

Land clearing debris includes stumps, trees and brush. It is primarily processed into mulch or a compost base. These companies receive and process land clearing debris as noted.

Austin Wood Recycling

4950 RR 1431

512-259-7430

No pallets or cut-offs, hauling services available

Chittins' Chipping Co.
5804-B Circulo Dr.
512-267-4274
On-site chipping services

Reconstruction Specialties Co.
13071 Pond Springs Rd.
512-219-1954
Limited containers available

Trees Unlimited
2304 Hancock Dr., Ste. 6B
512-452-6620
On-site mulching

Whittlesey Recycling
9405 Dessau Rd. & 16813 N. IH 35
512-836-7423, 512-251-5695
M-F 7-5, Sa 7-3 & M-F 7:30-5, Sa 8-5 drop-off services

Clean Fill and Rubble (concrete)

Clean fill is earthen material free of garbage, concrete or asphalt, oil and other petroleum contamination, as well as any organic material such as trees or brush.

Landfills commonly accept clean fill and rubble for road and berm improvements. These companies provide diversion for clean fill as backfill excavation or site leveling. Call ahead for dumping fees and hours of operation.

Marcelo's Sand & Loam
800 Dalton Ln.
512-385-5205

Rio Materials Inc.
(Also Falcon Hauling)
3901 Norwood Ln.
512-247-3400

Rogers Materials
15000 IH 35
512-312-1730
Only small chunks of asphalt

Schumakers Enterprises Inc.

(Also Austin Sand & Gravel)
901 Dalton Ln.
512-385-5379

Dimensional Wood

These companies handle and process large quantities of dimensional wood as noted. Clean, site separated wood is strongly preferred.

Del Valle Recycling
1713 E. Hwy 71
512-385-4617
M-F, a wide variety of lengths for sale

Habitat for Humanity Re-Store
310 Comal St.
512-478-2165
T-F 10-6, Sa 8:30-6, a wide variety but low quantity of dimensional lumber, including trim and hardwoods for sale

Roadrunner Pallet Recycling
13609 N. IH 35
512-990-1090
Pallets only

Texas Disposal Systems
7500 FM 1327
512-243-4100
Separate containers may be available, dimensional wood is ground with land clearing debris for compost

Metal

These companies are able to receive large quantities of metal scrap as noted, buying some metals depending on market prices.

AMP Recycling
1704 W. Howard Ln.
512-251-3407
M-F 8-5, non-ferrous and ferrous, containers and pickup service available

Austin Metal and Iron
1000 E. 4th St.
512-477-4640

M-F 7:30-4:30, Sa 7:30-11, ferrous and non-ferrous, containers and pickup available for structural steel

Commercial Metals

710 Industrial Blvd.

512-442-2384

M-F 8-4:30, non-ferrous and ferrous, containers and pickup service available

DNT Recycling

705 W. St. Johns Ave.

512-467-0063

M-F 8:30-5:30, non-ferrous only, small containers and pickup available

Double D Recycling

14003 Rock Cliff Dr. Leander.

512-259-5683

M-F 8:30-5:30

Gardner Iron and Metal

1201 E. 4th St.

512-477-3900

M-F 7-4

Non-ferrous only

On the Road Salvage

4826 E. Cesar Chavez St.

512-389-1119

Ferrous and non-ferrous, drop-off and pickup only available for contractors, call for arrangements, limited containers available

River Salvage

2818 N. FM 973

512-926-8250

M-F 7-5

Ferrous and non-ferrous, limited containers available

Whittlesey Recycling

9405 Dessau Rd. & 16813 N. IH-35

512-836-7423, 512-251-5695

M-F 7-5, Sa 7-3 & M-F 7:30-5, Sa 8-5, ferrous and non-ferrous, large quantities preferred

Gypsum (drywall)

Gyp Monster

9013 Tuscany Way, Ste. 110

Austin, TX 78754

512-326-5576

www.gypmonster.com

Provides machinery and consulting for on-site gypsum wallboard scrap processing and disposal

Habitat for Humanity Re-Store

310 Comal St.

512-478-2165

T-F 10-6, Sa 8:30-6, prefers half to whole sheets of reusable drywall, no small scraps

Used Building Materials

These companies receive and resell usable building materials.

Action Lumber, Salvage and Demolition

1424 South Loop Dr.

Killeen, TX

512-752-9759

M-F 9-5, primarily residential dimensional wood for resale, limited availability of other building materials

Arthur Abernathy

Creedmore, TX

512-496-1067

Accepts used ceiling tiles and lumber to be re-sawn or mulched then resold as bedding or mulch, will also accept small amounts of non-painted gypsum board to be mulched and used as soil amendment.

City of Austin Landfill

10108 FM 812

512-243-1200

M-F 8-5, construction and demolition material only

Habitat for Humanity Re-Store

310 Comal St.

512-478-2165

T-F 10-6, Sa 8:30-6, a wide variety of building materials, pickup service available

Texas Disposal Systems

7500 FM 1327

512-243-0400

M-Sa 7-7 (or dusk), diversion area for resalable items includes some building materials

Paper

These companies focus on paper fiber such as newspaper and office paper but may accept similar grades of paper from construction projects depending on type and quantity.

Austin Recycling Co.
10047 E. Hwy 290
512-272-9344
Primarily a residential drop-off facility

Balcones Recycling
2416 E. 6th St.
512-472-6200
May provide container depending on material type and quantity

BFI Recycling
4712 Bolm Rd.
512-385-7600
May provide container depending on material type and quantity

Ecology Action
707 E. 9th St.
512-322-0000
Primarily residential and office drop-off

Recycling Opportunities
40109 Industrial Park Circle
512-863-7968
Call for services

Old Corrugated Cardboard

These companies handle and process OCC. Many of these companies can also provide OCC containers.

Austin Recycling Co.
10047 E. Hwy 290
512-272-9344
Can receive separated OCC

Balcones Recycling
2416 E. 6th St.
512-472-6200
May provide container depending on material type and quantity

BFI Recycling
4712 Bolm Rd.
512-385-7600
May provide container depending on material type and quantity

Ecology Action
707 E. 9th St.
512-322-0000
Receives and bales OCC

Plastic

These companies receive and market select types of plastic. Call in advance to make arrangements for large quantities.

Poly Resource Recycling
6406 Burlison Rd.
512-385-0030
Focus on industrial and commercial sources of plastic

General Assistance:

City of Austin Solid Waste Services
Commercial Waste Reduction Assistance Program
Bob Fernandez
P.O. Box 1088
Austin, TX 78767
512-974-4331
www.ci.austin.tx.us/sws
bob.fernandez@ci.austin.tx.us

Free consulting services for businesses to reduce waste and associated costs. Also provides hazardous waste disposal services for Conditionally-Exempt Small Quantity Generators (CESQG) (i.e., businesses generating less than 220 pounds of hazardous waste in a month).

Texas Commission on Environmental Quality (TCEQ)
G. Michael Lindner
P.O. Box 13087
Austin, TX 78711
512-239-3045
mlindner@tceq.state.tx.us
Construction and demolition waste recycling assistance

Publications

Environmental Building News

E Build Inc.

122 Birge St. Ste. 30

Brattleboro, VT 05301

802-257-7300

www.ebuild.com

Recycling Plus Program Manual: A Best Practices Manual for Construction Jobsite Recycling

Distributed by the Clean Washington Center (Publication # CDL-96-1)

Attn. Publications

2001 Sixth Ave. Ste. 2700

Seattle, WA 98121

206-587-5520

Reducing Construction and Demolition Waste, Guide to Resource Efficient Building Elements

By the NCAT/Center for Resourceful Building Technology

P.O. Box 100

Missoula, MT 59806

406-549-7678

www.montana.com/crbt

Residential Construction Waste Management: A Builder's Field Guide

By the National Association of Homebuilders Research Center

400 Prince George's Blvd.

Upper Marlboro, MD 20774

301-249-4000

www.nahbrc.com

WasteSpec: Model Specifications for Construction Waste Reduction, Reuse, and Recycling

By the Triangle J Council of Governments

P.O. Box 12276

Research Triangle Park, NC 27709

919-549-0551

Construction & Demolition Waste Diversion Report

Capital Area Planning Council of Governments

June 2005

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