



TxDOT Recycles

On the Job,
In the Road

Recovery & Reuse

Many Recycling Opportunities

- 12,000 employees
- 16,000 fleet equipment
- 525 TxDOT facilities
- 2,750 structures with 8.6 million square feet
- 80,067 centerline miles of roads
- 92 Rest Areas & TICs
- 1.1 million acres of right of way
- Average daily vehicle miles traveled
 - 475.4 million miles on state maintained highways
 - 641.0 million miles on all roadways in Texas



TxDOT Recycles *Where*

- Construction
- Maintenance
- Fleet Maintenance
- Offices
- Warehouses
- Print Shop
- & More



TxDOT Recycles

How

- Recover roadway materials & products
- Reuse those products & materials
- Use new products & materials with recycled-content
- Reduce use



TxDOT Recycles

On the Job and In the Road

Outline

- Roadway Use of Reclaimed Materials
- Workplace Recycling
- Green Purchasing



Why Recycle?

Environmental



Economic



Financial



TxDOT Recycles



Why Recycle?

A graphic showing a blue gradient background with a silhouette of mountains in the foreground. The word "Environmental" is written in white text across the middle of the graphic.

Environmental

- *Conserve water*
- *Conserve energy*
- *Conserve landfill space*
- *Conserve natural resources*
- *Reduce air & water pollution*



Environmental Reasons *better world for future Texans*



“TxDOT is a recycling leader, and takes great steps to reduce waste, improve air quality and protect our environment. We’ve made a commitment to improve the environment in Texas and reduce pollution’s effect on public health and safety. For conservation efforts to work, however, we all must do our part. Our individual actions make a huge impact. Help us – help Texas. Let’s all be good stewards of our environment.

Happy Earth Day and safe travels!”

Amadeo Saenz, former TxDOT Executive Director
Texas Transportation Forum, Earth Day, 2008



Why Recycle?



Economic

"TxDOT adheres to values that have created an entire industry out of resource conservation."

"Indeed, it's good business to be good stewards of the environment."

Michael Behrens
former TxDOT Executive Director
Transportation News, September 2003



Financial Reasons

better bottom line



Financial

- Save costs
- Generate revenue
- Improve performance
- Increase competition



Roadway Use of Reclaimed Materials



More Financial Reasons



Financial

- Reduce construction costs
- Reduce maintenance costs
- Relieve regional material shortages
- Conserve native materials
- Meet environmental standards
- Improve performance
- Reduce hauling costs
- Reduce disposal costs
- Support markets for scrap materials



Each year, TxDOT uses:

Millions of tons of materials reclaimed from:

- Roadways
- Industry
- Municipalities
- Demolition sources



Roadway Reclaimed Materials & Products Placed, FY09-FY11

>5 million tons Reclaimed Asphalt Pavement

>2 million tons Recycled Concrete Aggregate

600,000 cu yd Compost

521,000 tons Fly Ash

16,500 tons Crumb Rubber

7,800 tons Glass Traffic Beads

3,500 tons Cellulose Fiber Mulch



Recycled Concrete Aggregate



973 Materials, Austin



Recycled Concrete Aggregate



- Cement Treated Base
- Flex Base



Recycled Concrete Aggregate



- Rigid Pavement



Recycled Concrete Aggregate



- Gabions



Recycled Concrete Aggregate



- Rock Filter Dam



Recycled Concrete Aggregate



- Dry Rip Rap



Recycled Concrete Aggregate



- Select Backfill for Retaining Walls
www.reinforcedearth.com



Recycled Concrete Aggregate Makes Cents



Recycled Concrete Aggregates Make Cents

In today's environment of skyrocketing material and transportation costs encountered in road construction, recycled concrete aggregates (RCA) provide substantial savings to TxDOT and taxpayers. Natural resources are conserved, waste disposal is reduced, and air quality is improved due to reduced haul distances and reduced energy consumption. In many cases, allowing the use of RCA can be the most cost-effective choice for an aggregate source. This is especially true for those districts that do not have good, native aggregate sources. Using RCA can reduce time and expense of importing aggregates from other parts of the state.

TxDOT has researched and used RCA with good success for about 15 years. In just the last two years alone, TxDOT saved approximately 1.8 million tons of virgin aggregates by incorporating RCA in cement treated base, flexible base, continuously reinforced concrete pavement (CRCP), fiber dams, gabion walls, concrete traffic barriers, flowable fill and select backfill for mechanically stabilized earth walls. This equates to an estimated savings of \$12.6 million from reduced or eliminated landfill and virgin aggregate associated costs. Savings from using RCA has the potential to increase tenfold based on current availability of RCA.

ENGINEERING PROPERTIES

Compared to virgin aggregates, RCA typically have a higher percentage of material passing the No. 200 sieve, lower specific gravity, higher water absorption, higher sulfate soundness loss and higher Los Angeles Abrasion loss. The minus No. 4 fraction typically has a low plasticity index and high alkalinity. Item 6, "Control of Materials," of the Department's 2004 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges requires that it be certified as a nonhazardous recyclable material (NRM) in order to be used on TxDOT projects. The RCA producer must meet the requirements of departmental material specification DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines."

ITEM 247, FLEXIBLE BASE

RCA can be used on TxDOT projects when specified on the plans as Type D under Item 247, "Flexible Base," of the Department's 2004 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges. In addition to the requirements specified in DMS-11000, Item 247 requires contractor-furnished RCA to be free from reinforcing steel and other objectionable material. It can have a maximum of 1.5% deleterious material and 3000 ppm of soluble sulfates. The Engineer may also require separate dedicated stockpiles. RCA typically increases the optimum moisture requirement when used as a flexible base. Because of its high absorption properties, it can potentially lose strength if not protected from moisture. When allowing Type D as an option, it is recommended that strength and wet ball mill requirements be specified (such as in Grade 1). An alternative is to specify Item 276, "Cement Treatment (Pavement)," to reduce or eliminate the potential for loss of strength and water absorption of RCA.

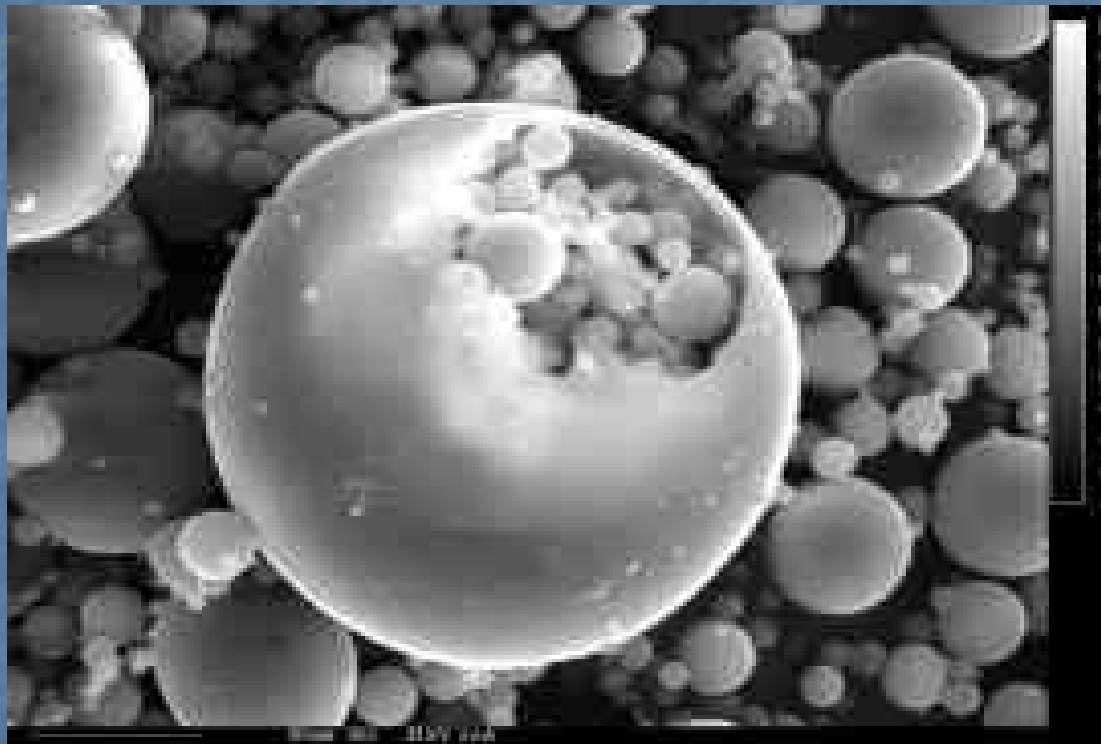
ITEM 421, HYDRAULIC CEMENT CONCRETE

RCA can also be used as a coarse aggregate in Item 421, "Hydraulic Cement Concrete," as long as it meets the specification requirements. CRCP constructed with RCA has a long history of good performance. Positive effects for pavements are higher creep values and lower modulus of elasticity. Although RCA can cause the final concrete to have a higher coefficient of thermal expansion (CTE) due to the attached old mortar, experience has eliminated this as a concern and CTE requirements are waived when RCA



Fly Ash

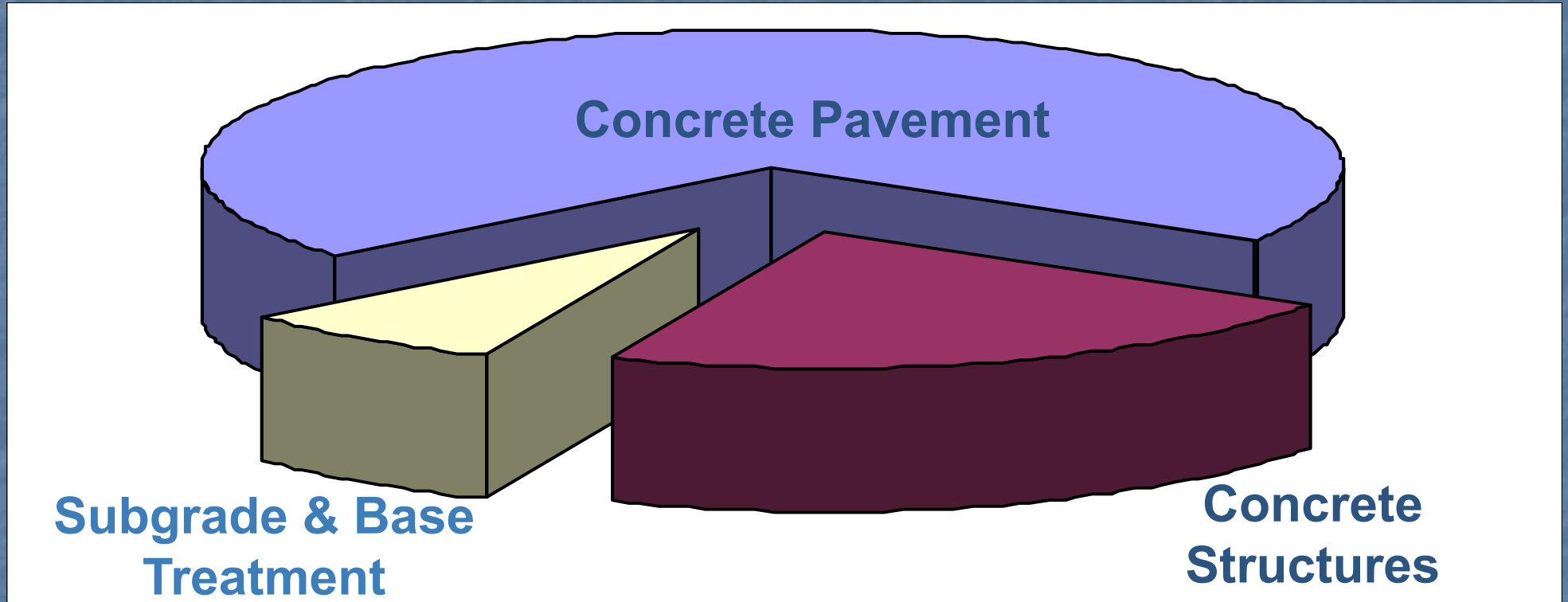
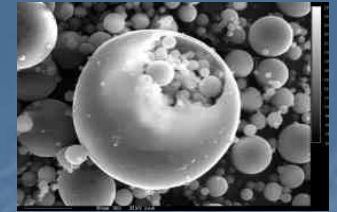
- *FY11 Usage - 178,520 tons*



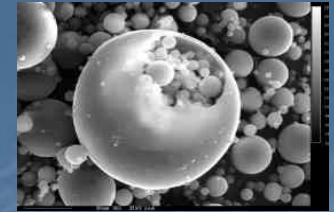
Microscopic view



Fly Ash



Fly Ash



- *Subbase and Base Courses – base material, stabilization*
 - Adds strength and durability
 - Adds resistance to sulfates



Reclaimed Asphalt Pavement

RAP

Applications

- Flex Base
- Flexible Pavement
- Pavement Edges



Reclaimed Asphalt Pavement

Financial savings

Recent TxDOT study found:

- Every additional 1% RAP in the mix reduces hot mix price \$0.25/ton
- \$25/ton value in hot mix



Recycled Asphalt Shingles



Recycled Asphalt Shingles



Compost



- *Benefits*

- Accelerates revegetation
- Reduces storm water runoff & erosion
- Protects water quality



Scrap Tires & Rubber



In FY11, TxDOT:

- Used 3,298 tons of rubber binder in seal coats.



Scrap Tires & Rubber

- *Asphalt-Rubber Surface Treatments
(Chip Seals, Seal Coats)*

- 5 to 15% rubber in asphalt binder
- Adds durability
- Holds aggregate



Scrap Tires & Rubber

Recycled-Rubber Content Products

- Joint fillers
- Crack sealant
- Delineator posts
- Guard rail spacer blocks



Scrap Tires & Rubber *Tire Bales*



Portable Tire Baler



Baling Tires



Scrap Tires & Rubber *Tire Bales*

Embankment repair



36,000 scrap tires in
360 bales



Scrap Tires & Rubber *Tire Bales (& compost)*



More Municipal & Industrial Byproducts


- Sand blast material
- Foundry sand
- Drill cuttings
- Glass cullet
- Filter cake
- Print toner
- Toilets



Green Purchasing



State and Federal Green Purchasing Policies

- Texas Commission on Environmental Quality (TCEQ)
 - Health & Safety Code § 361.426. Governmental Entity Preference for Recycled Products 
 - TCEQ rules: 30 TAC §328.7 (4) Definitions of Recycled Products 
- Texas Government Code
 - § 2155.442. Preference for Energy Efficient Products 
 - § 2155.443. Preference for Rubberized Asphalt Paving 
 - § 2155.445. Preference for Recycled, Remanufactured, or Environmentally Sensitive Products 
 - § 2155.446. Purchase and Use of Paper Containing Recycled Fibers 
 - § 2155.447. Purchase of Recycled Oil 
 - § 2155.448. Expenditures for 1st Choice items 
- Texas Comptroller of Public Accounts (TCPA)
 - 1 TAC §113.8(b)(4), (5), (6), & (7) – TCPA rules on green purchasing preferences 
 - TCPA rules: 1 TAC §113.136 & §113.137 – 1st Choice 
 - TCPA Purchasing Manual
 - Preferences (.pdf) 
 - Recycled, Remanufactured, and Environmentally Sensitive Products (.pdf) 
- Federal Green Purchasing Program – Office of the Federal Environmental Executive 

Make the Smart Choice:
Buy Recycled

GSD C
TxDOT Fc
Distribution C
Standard S
Busine
Online Manual
TxDC
Staw
of Mainten
Faciliti
Pool Vehicle
Pool Ve
and Do
Custome
for Box Hauling
Headquart
Location
TxDOT C
Automatic
TxDOT Ir

Green Product Purchasing Preferences

This table lists by NIGP Code green products as defined by federal agencies. Xs in the "Preference Policies" columns at right indicate state purchasing preferences that apply to the green product.

To read the policy, click on the Internet link for the corresponding Preference Policy. For more product-related information, click on the links in the "Green Products" columns.

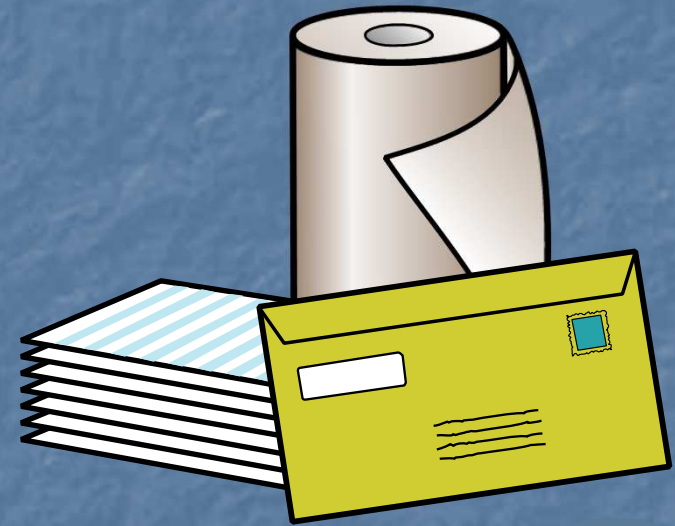
Green Products as defined by US Environmental Protection Agency (EPA)

NIGP Code	NIGP Description	Recycled-Content Product	ENERGY STAR Product	TxDOT Minute Order No. 107593	§ 2155.448. 1st Choice	§ 2155.442. Energy Efficient Products	§ 2155.446. Recycled-content Paper	§ 2155.447. Re-refined Oil	§ 2158.004. Alternative Fuel Vehicles	§ 2158.009. Low-Emissions Vehicles
005-21	Abrasives, Sandblasting, Metal	Blasting grit								
010-00	Acoustical Tile, Insulating Materials, & Supplies	Building insulation products	Home Sealing (Insulation)			X				
010-05	Acoustical Tile, All Types	Laminated paperboard								
010-53	Fiberglass: Batts, Blankets & Rolls	Building insulation products				X				
010-57	Foam-In-Place Insulation: Phenolic, Urethane, etc.	Building insulation products				X				
010-59	Foam Plastics: Blocks, Boards, Sheets, etc.	Building insulation products				X				
010-63	Insulation, Blown Type	Building insulation products				X				
010-64	Insulation, Loose Fill	Building insulation products				X				
010-72	Mineral Wool: Blankets, Blocks, Boards	Building insulation products				X				
010-76	Paper Type Insulation Material (Cellulose, etc.)	Building insulation products				X				
031-03	Air Conditioners: Commercial, And Parts And Accessories		Light Commercial HVAC			X				
031-05	Air Conditioners: Window & Wall Mounted		Room AC			X				
031-06	Air Conditioning & Heating: Central Units		Central AC			X				
031-10	Air Purifiers, Accessories & Supplies		Room Air Cleaners			X				
031-25	Controls: Limit Switches, Relays, Thermostats		Programmable Thermostats			X				
031-30	Dehumidifiers & Humidifiers		Dehumidifiers			X				
031-41-28	Fans, Ceiling		Ceiling Fans			X				
031-51	Furnaces, Central Heating Type		Furnaces			X				
031-56	Heat Pumps - air		Air-source Heat Pumps			X				
031-56	Heat Pumps - geo		Geothermal Heat Pumps			X				
031-95	Ventilation Equipment & Systems		Ventilating Fans			X				
045-24	Appliances & Equipment – Dishwashers		Dishwashers			X				
045-66	Refrigerators & Freezers		Refrigerators & Freezers			X				
045-66	Refrigerators and Freezers, Household Type		Refrigerators & Freezers			X				
045-94	Washers & Dryers, Residential Type		Clothes Washers			X				
060-03	Antifreeze	Engine coolants								
060-67	Antifreeze	Engine coolants								
071-00	Automobiles, School Buses, SUVs, & Vans									X

Green Purchasing *Offices*



- Recycled-content:
 - Printing & writing paper & envelopes
 - Paper towels & tissues
 - Corrugated cartons
 - Paper filing products
 - Plastic trash bags
 - Plastic-covered binders
 - Recycling containers
- Energy-saving photocopiers
- Rechargeable batteries
- Remanufactured toner cartridges



Green Purchasing *Fleet*

- Re-refined motor oil & lubricants
- Recycled antifreeze
- Recycled refrigerant
- Citrus-based asphalt cleaner
- No-lead wheel weights



Green Purchasing *Fleet*

Alternative fuels & vehicles

- 500,000 gallons/year of alternative fuels
- 1,264 flex-fuel (E85) vehicles
- 141 gas-electric hybrids (Prius, Escape)
- LPG & gasoline – 1103 cars & trucks
- LPG or electricity – 261 off-road equipment



Green Purchasing - Roads

Recycled Rubber Products



Guardrail Spacer Blocks



Green Purchasing - Roads

Recycled Rubber Products



Delineator Posts



Workplace Recycling



*aluminum cans
plastic bottles*

If it's rechargeable,
it's recyclable!



Click to learn more about
what this seal means



Paper Recycling Recipe

RECYCLE:

- All colors of office paper
- Printing, writing, computer paper
- Copier, typing, fax, or pad paper
- Newspapers & magazines
- Post-it notes
- Cardboard – please flatten boxes
- File folders – manila or colored
- Mail – envelopes with windows or labels
- Brown paper bags & soda cartons

OK to include:

- Paper clips
- Staples
- Spiral bindings
- Tape
- Rubber bands
- Plastic tabs

NOT OK to include:

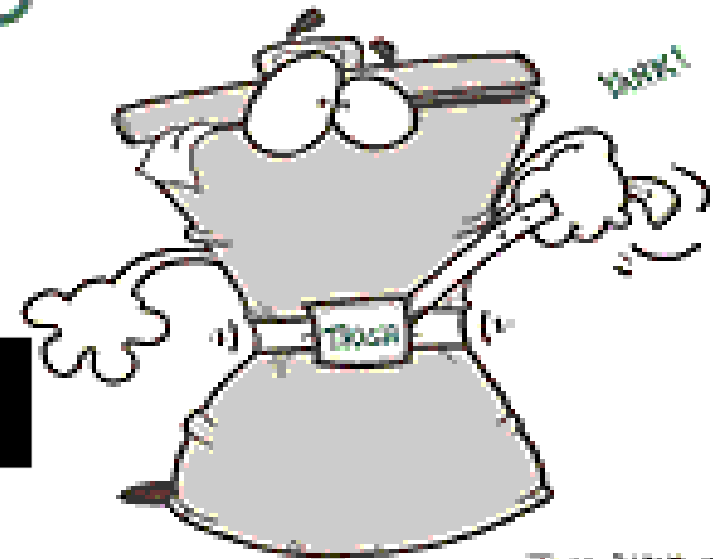
- Label backings
- Food-contaminated paper
- Paper towels, tissues, napkins
- Blueprints & Mylar
- Wax paper

www.dot.state.tx.us/recycling



paper

Reduce
Your Waste please!



TxDOT Recycles

Workplace Recycling *Offices*

- Office paper
- Printer cartridges
- Corrugated boxes
- Rechargeable batteries
- Computers & peripherals
- Aluminum cans, plastic bottles



Workplace Recycling

Print Shop, Warehouses

- Printer Shop trimmings
- Expired publications
- Corrugated boxes
- Pallets



Workplace Recycling

Roadway & Fleet Maintenance

- Used oil & other lubricants
- Oil filters
- Antifreeze
- Refrigerant
- Parts washer solvent
- Lead-acid batteries
- Scrap metal
- Tires



Imagine 300 reams of paper
(150,000 sheets, eight 5-ft stacks)

Now, imagine 30,000 reams of office
paper, or 15 million sheets.

How often do we use that much
office paper in the US?



- 5 years
- 5 days
- 5 hours
- 5 minutes

Office Paper, 2007 (60" x 80")
Chris Jordan Photography

From Chris Jordan's Running The Numbers



Depicts 106,000 aluminum cans –
as many as the US consumes every 30 seconds

Public Education

Colorado County Safety Rest Area

RECYCLING ROADS TO MAKE NEW ROADS

Each year 500,000,000,000 tons of asphalt are used in U.S. roadwork. If not recycled, this ends up in landfills. TxDOT has been recycling asphalt since 1967.

Here's how:



Old worn roads are broken up and loaded into a "crusher" at the recycling plant.



Asphalt chunks are ground-up and mixed with recycling agent, new asphalt, and/or aggregate.



This new mix creates a stronger road that is more impervious to water and needs less maintenance.

Old asphalt from the I-10 access road was recycled in this manner to rebuild the roads here. This reduces use of natural resources, reduces landfill, reduces transportation costs, and preserves the environment.



IH-10 near Columbus

TxDOT Recycles

52



Public Education

Colorado County Safety Rest Area





Welcome to the Recycled Educational Stop of Texas. (R.E.S.T.)

Choose from the options below to enter the R.E.S.T. TEST site.



HELP

Make the Smart Choice: Buy Recycled

Enjoy TxDOT Green, our environmental video, at

On YouTube at: www.youtube.com/user/TxDOTpio - Parts 1 & 2



TxDOT
Green



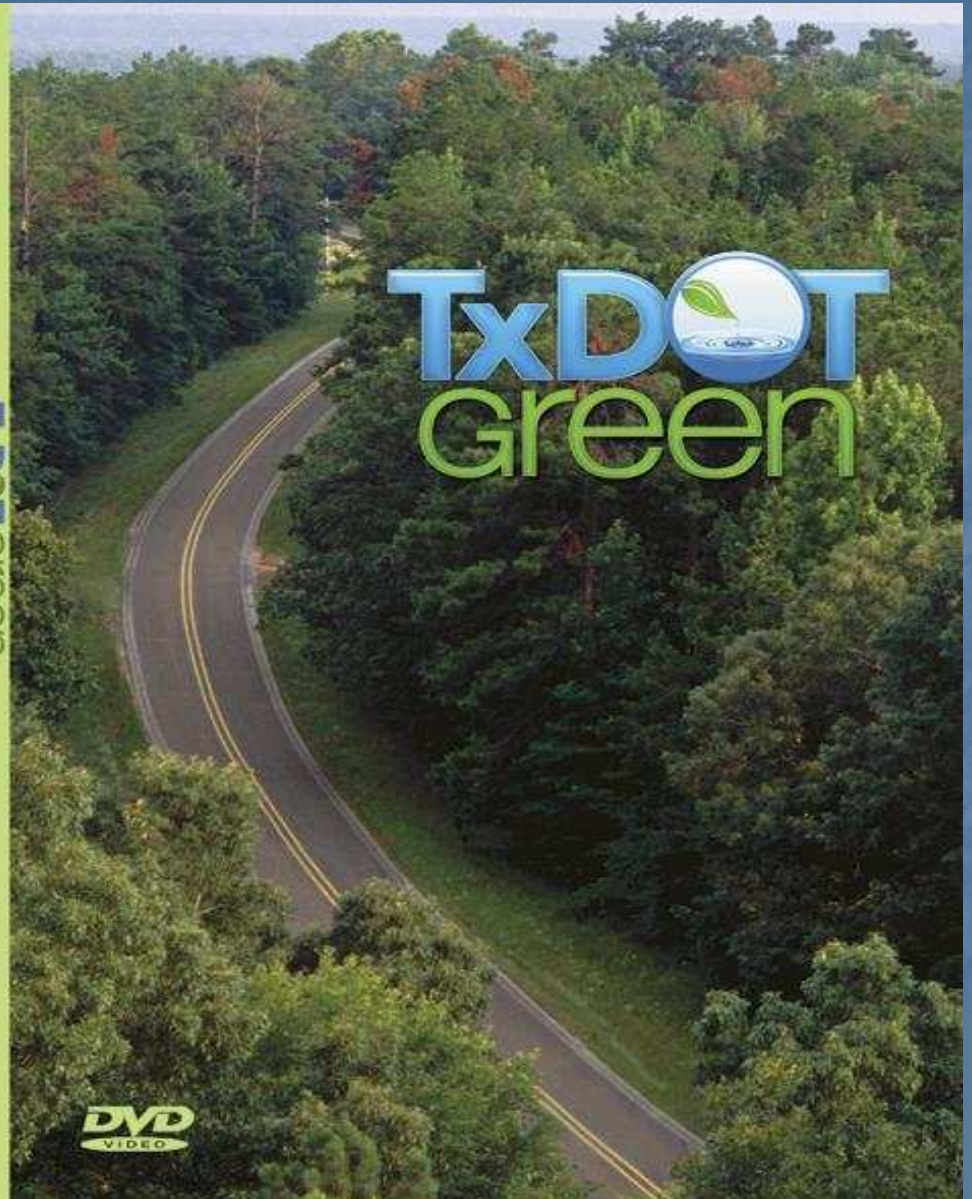
2009 WINNER
Texas Department of Transportation

For more information

<http://crossroads.org/gsd/Recycling/>



TxDOT Green





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