

August Industrial Sands



This packet provides information about how and why to use industrial sands in various road construction applications.

Research Summary	Use of Foundry Sands in Transportation Applications
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If you have questions or comments regarding this packet, contact:

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Material Brief

The term "industrial sands" refers to any sand-like material that is a by-product of industrial processes. It includes manufactured sands or natural sands that have been used in some facet of industrial operations.

There are a number of different types of industrial sands, including filter sands, quarry settling pond sands, and foundry sands. Of these, foundry sands represent the largest volume and most geographically dispersed type of industrial sand in Texas.

Foundry sands are produced during the metal casting process. The annual U.S. generation rate of foundry sand is estimated at 15 million tons. The Texas foundry industry is reportedly the ninth largest in the nation, comprised of approximately 140 foundries producing between 180,000 and 500,000 tons of foundry sand annually. Foundry sands have been used in a number of different road construction applications, including the production of cement. However, highway embankments and flowable fill are the most common uses.



Overview

Foundry Sands

During the casting process, molten metal is poured into a mold made of sand combined with other materials. This process allows the sand to be reused up to 10 times before it breaks down and must be replaced. Estimates show that for every ton of metal produced, one ton of spent sand is generated. The spent foundry sand is frequently referred to as waste foundry sand (WFS).

Although the reuse of foundry sand in construction applications is relatively new, more than 90 projects have been constructed in 14 states and in Canada. Spent foundry sand has been used in base and subbase applications, asphaltic concrete, flowable fill, concrete and related products, cement, soil amendments, and landfill cover.

WFS varies in potential for and ease of reuse depending on the type of metal cast. Ferrous foundry sands include those used in the molding of steel, iron, and stainless steel. Ferrous foundry sands can be more

readily recycled because they are typically more environmentally benign.

The Environmental Protection Agency (EPA) advocates the use of ferrous foundry sands in flowable fill. Research indicates that ferrous foundry sand has the potential to be safely, beneficially, and cost-effectively used in road construction.

Sands used during aluminum, brass, and bronze casting are classified as nonferrous. Nonferrous foundry sands frequently contain elevated levels of lead and cadmium and, therefore, are classified as hazardous. Hazardous recycled materials can not be used in TxDOT projects. (See the “Specifications Section” at the end of this packet for TxDOT specifications outlining procedures for the use of non-

hazardous recycled materials.)

Within the ferrous and nonferrous sand classifications, there are further categorical breakdowns. The type of binding material combined with the sand to form the casting molds also affects the foundry sand properties. A number of different production variables determine which binding material is used. The combination of sand with clay is referred to as “green sand.” Green sand is the most common, and is used in 90 percent of casting operations. Both ferrous and nonferrous casting operations can use green sand. “Chemically bonded sand,” the combination of sand and polymer, is another type of binding material commonly used.

Type of Coating	Foundry Sand Classification	Potential for Use in Roadway Construction
Steel Iron Stainless Steel	Ferrous	Good
Aluminum Brass Bronze	Nonferrous	Limited, frequently classified as hazardous materials

References

“EPA Office of Compliance Sector Notebook Project: Profile of the Metal Casting Industry.” EPA/310-R-97-004, February 1998, Washington D.C.



Research Summary

Use of Foundry Sands in Transportation Applications

Problem Statement

To verify the potential for use of Texas-generated foundry sand in road construction applications, including investigation of economic, engineering, and environmental factors.

Objectives

Phase 1:

Conduct a literature review to document applications, regulations, and other DOT specifications for foundry sand.

Phase 2:

Identify Texas foundry locations and conduct limited laboratory tests; develop draft specifications.

Phase 3:

Design and monitor the performance of field tests.

Phase 4:

Develop final specifications for use of foundry sand and complete a final report.

Preliminary Findings

The literature review is almost complete and indicates that although the use of foundry sand in road construction applications has only occurred for 11 years, there have been more than 90 projects constructed on the North American continent. These projects span a wide range of construction applications.

In another phase of this research project, a survey was conducted of Texas Cast Metal Association (the foundry trade association) members. Twenty-two foundries responded to the survey. The survey data indicate that yearly these foundries generate approximately 76,000 tons of WFS that is available for recycling, with more than 3 million tons stockpiled.

The majority of these foundries (67 percent) generate ferrous sand. The

foundries which responded to the survey are located in 12 TxDOT districts, including Atlanta, Beaumont, Brownwood, Bryan, Dallas, Fort Worth, Houston, Lubbock, Paris, Tyler and Wichita Falls.

Implementation

Work has already begun to identify field test locations. One possibility is the use of foundry sand in cement stabilized backfill in the Houston District.

Sources:

Vipulanandan, C. "Use of Foundry Sands in Transportation Applications" Preliminary Report, Department of Environmental Engineering, University of Houston, July 1999.

This summary is based on preliminary research conducted by C. Vipulanandan (Vipu) at the University of Houston.

Contacts

Research Contact	Title	Phone
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C. Vipulanandan (Vipu) University of Houston	Principal Investigator	(713) 743-4278



Case Study

Foundry Sand and Other NRMs Used in the Production of Cement and Concrete

Overview

In recent years, TxDOT has actively explored the use of recycled materials in road construction and maintenance projects. Numerous research efforts conclude that alternative, recycled materials can compete against traditional, native feedstocks on an engineering, economic and environmental basis.

Sources for these alternative materials—referred to by TxDOT as NRMs—include foundries, shipyard sandblasting operations, refineries and petrochemical plants; and tank farm and pipeline operations.

TxDOT is not alone in recognizing the many benefits derived from using recycled materials. This case study looks specifically at one TxDOT material supplier and its ongoing recycling effort, which strives to reuse wastes produced in operations as well as assisting other

companies in reducing the amount of material sent to landfills.

Texas Industries (TXI), a supplier of cement, concrete, aggregates, steel and other related materials, is seeking ways to use recycled materials to enhance the environment while improving the quality and cost of its products. TXI uses a wide variety of recycled materials including foundry sands, coal combustion fly and bottom ash, steel slag, filter cakes (generated by Anheuser Busch in its brewing process), and Fluidized Catalytic Cracking Unit material (FCCU), a by-product of the oil refining process.

Although these materials come from diverse sources, they are all materials that supply chemical elements needed to produce cement and concrete.

TXI's use of foundry sands specifically illustrates how industrial sands can be beneficially recycled.

- TXI produces foundry sand, which is purchased and used by Texas metal casters.
- Waste foundry sand is reused in the

ready-mix concrete process as a native aggregate equivalent.

- Upon demolition of the road, the concrete may then be recycled again.

In this way, products are reused again and again in economically and environmentally useful applications. Value is derived from the original foundry sand product in three separate applications.



TxDOT Experience

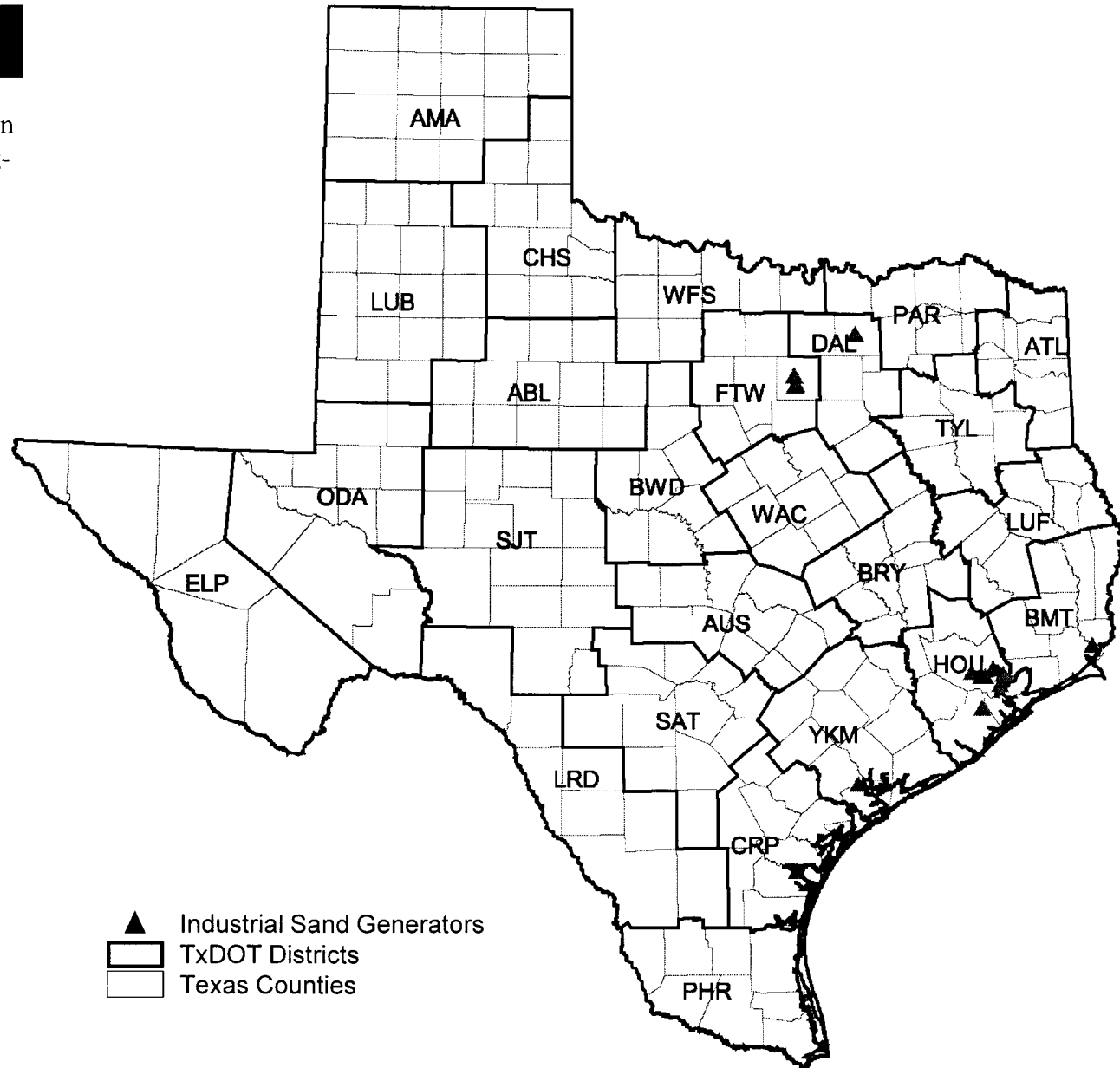
This table provides information about TxDOT's experience using industrial sands paving materials.

District	Construction Application	Material	Results	Years of Experience	Specification	Location	Additional Comments
Waco	Paving Materials-Base/Subbase	Foundry Sands	Good	1995	N/A	FM 3370 - Hill Co.	Installed by Maintenance Crew. Foundry Sand/Ceramic Material (1:1) mixture of flex base and broken ceramic molds. Added at approx. 20-25% mixed and laid. No significant advantage in enhancing flexbase, but no breakdown or damage to flex base.



Material Availability

The map and table provide information on companies with the ability and/or willingness to generate industrial sands.



Companies with Ability and/or Willingness to Generate Industrial Sands

COMPANY	ADDRESS	CITY	ST	ZIP
Amoco Chemicals	FM 2004, 2 miles south of 2917	Alvin	TX	77511-
BP Chemicals Inc.	Texas Hwy. 185 North	Port Lavaca	TX	77979-
Coastal Refining & Marketing Inc.	1300 Cantwell Ln.	Corpus Christi	TX	78407-
Cooper Industries	600 Travis, Ste. 5800	Houston	TX	77002-
Crown Central Petroleum Corp.	111 Red Bluff Rd.	Pasadena	TX	77506-1530
Exxon Chemical Americas-BTCP	5000 Bayway Drive	Baytown	TX	77522-
Firestone Synthetic Rubber	FM 1006 Chemical Rd.	Orange	TX	77530-
Fisher Controls International Inc.	310 East University	McKinney	TX	75069-
FMC Corp.	12000 Bay Area Boulevard	Pasadena	TX	77507-1310
Fort Worth Aluminum Foundry Inc.	2708 North Nichols St.	Forth Worth	TX	76106-
Huntsman Petrochemical Corp.	2101 Park St. / 2701 Spur 136	Port Neches	TX	77651-3500
Quality Cast Metals Inc.	3000 South Jones St.	Fort Worth	TX	76104-
Texas Steel Co.	3901 Hemphill St.	Fort Worth	TX	76110-
Valero Refining	9701 Manchester St.	Houston	TX	77012-2408

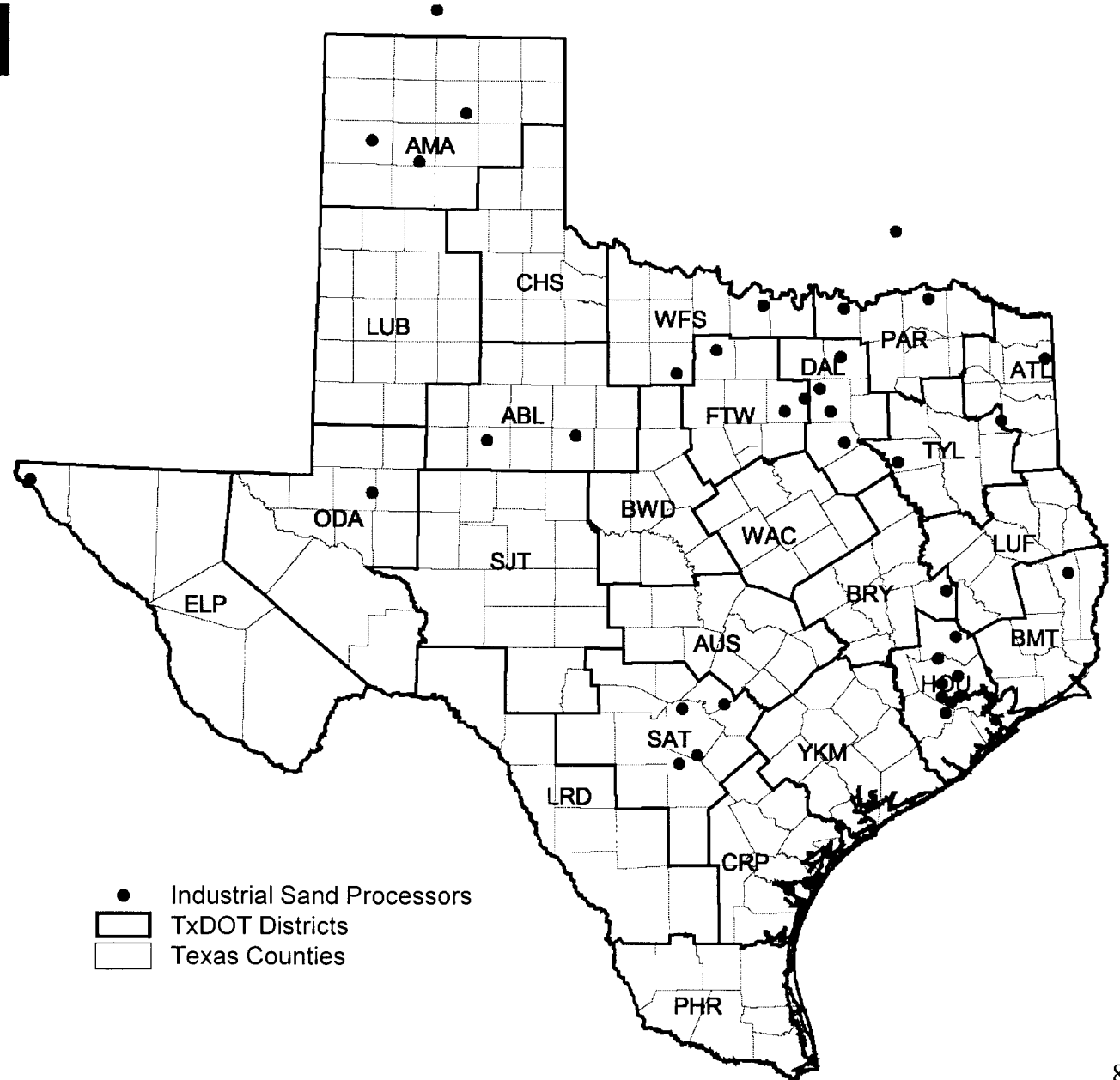
The information provided in this table is based on submission by the companies listed. TxDOT does not represent that any of this information is necessarily accurate or correct. Likewise, TxDOT does not intend, nor should anyone conclude, that companies listed are endorsed in any way or for any purpose by TxDOT.

Any person or firm not listed, who believes that the person or firm qualifies to be so listed, is invited to submit the required information. Please contact Rebecca Davio at (512) 416-2086 for more information.



Material Processors

This map and table provide information on companies that have expressed an ability and/or willingness to process industrial sands.



Companies with the Ability and/or Willingness to Process Industrial Sands

DISTRICT	COMPANY	ADDRESS	CITY	ST	ZIP	COUNTY
Abilene	Nobles Road Construction, Inc.	780 West I-20	Colorado City	TX	79512	Mitchell
Abilene	J.H. Strain & Sons Inc. #1 Crusher		Tye	TX	79563	Taylor
Amarillo	E.D. Baker Corporation	Fm 1551 & Huber Ave.	Borger	TX	79007	Hutchinson
Amarillo	Vega Sand and Gravel Inc.	10 mi N. of Vega on US 385	Vega	TX	79092	Oldham
Amarillo	Amarillo Road Co.-Rock Crusher	Panhandle & West Texas	Amarillo	TX		Potter
Amarillo	L.A. Fuller & Sons Construction, Inc.	9401 Amarillo Blvd. E	Amarillo	TX	79107	Potter
Atlanta	H.V. Caver, Inc.	1303 W. Main	Atlanta	TX	75551	Cass
Beaumont	Mathews Construction Co.	641 E. Milam	Jasper	TX	75951	Jasper
Bryan	Recycled Stone Co.-Huntsville Plant	US190 E	Huntsville	TX	77340	Walker
Corpus Christi	Garrett Construction	Garrett Rd.	Ingleside	TX	78362	Nueces
Corpus Christi	Mendez Construction Co.	8641 Agnes Street	Corpus Christi	TX	78469	Nueces
Dallas	Lattimore Materials	1600 Redbud	McKinney	TX	75069	Collin
Dallas	Big City Crushed Concrete	11131 Goodnight Lane	Dallas	TX	75229	Dallas
Dallas	Clemons Trucking	7934 South Lancaster Rd.	Dallas	TX	75241	Dallas
Dallas	M. Hanna Construction Co.		Ennis	TX		Ennis
El Paso	Jobe Concrete Products, Inc	#1 McKelligon Canyon Rd	El Paso	TX	79930	El Paso
Fort Worth	Zack Burkett Co.-Richards Pit	3 mi S of Jacksboro, FM 4	Jacksboro	TX	76458	Jack
Fort Worth	Archer-Western Contractor	1170 W. Corp. Drive	Arlington	TX	76006	Tarrant
Fort Worth	Thelin Recycling	5225 Thelin Street	Fort Worth	TX	76115	Tarrant
Houston	Southern Crushed Concrete-Chrisman	14329 Chrisman Rd	Houston	TX	77039	Harris
Houston	Southern Crushed Concrete-Gasmer	5001 Gasmer	Houston	TX	77035	Harris
Houston	Southern Crushed Concrete-Griggs	5625 Griggs Rd	Houston	TX	77021	Harris
Houston	Southern Crushed Concrete-Tanner Rd.	10360 Tanner Rd	Houston	TX	77041	Harris
Houston	Southern Crushed Concrete-Wilcrest	3901 Wilcrest	Houston	TX	77072	Harris
Houston	Texas Industries (TXI)	24403 FM 2978	Tomball	TX	77375	Harris
Houston	Pavers Supply Co.-Conroe Plant	9498 FM 1485	Conroe	TX	77303	Montgomery

Companies with the Ability and/or Willingness to Process Industrial Sands, continued

DISTRICT	COMPANY	ADDRESS	CITY	ST	ZIP	COUNTY
Odessa	Jones Brothers	1401 S. Grandview	Odessa	TX	79760	Ector
Paris	Rushing Hot Mix Asphalt	6102 Theresa Lane	Sherman	TX	75091	Grayson
Paris	Meridian Aggregates	Hwy. 271 North	Powderly	TX	75473	Lamar
San Antonio	Palo Alto Sand Inc.	16575 N. SH16	Poteet	TX	78065	Atascosa
San Antonio	Espey Silica Sand Co.	Hwy 281, 14 mi S. of Loop 410	San Antonio	TX	78264	Bexar
San Antonio	Redland Stone Products Co.	17910 IH-10 West	San Antonio	TX	78257	Bexar
San Antonio	John Stuart Sitework					Comal
Tyler	Russell & Sons Construction Co.	307 S. Eastman Rd.	Longview	TX	75602	Gregg
Tyler	King Sand & Gravel	7 mi. S. of Malakoff-CR 3441	Malakoff	TX	75148	Henderson
Wichita Falls	J.R. Thompson, Inc.-Running N Quarry	3 mi of Saint Jo on SH 59	Saint Jo	TX	76265	Montague
Wichita Falls	Zack Burkett Co.-Perry Pit	SH 16, 10 mi S of Graham	Graham	TX	76450	Young
	Highway Contractors, Inc.	2900 US Hwy 54 E	Guymon	OK	73942	
	Stringtown Materials, L.P.	100 E Mt. Blanc	Stringtown	OK	74569	



Specifications

Specification changes that specifically provide for the use of foundry sands are not complete yet. However, particle size and physical characteristics allow many industrial sands to be substituted for traditional sands in TxDOT specifications. The environmental characteristics of industrial sands should be verified before they are used in TxDOT projects. A Department Material Specification (DMS 11000) covering environmental testing procedures was recently completed. This specification prohibits suppliers from using hazardous materials in TxDOT projects. It requires that relevant TNRCC regulations be followed, and also that the nonhazardous recycled material be tested against the Texas Risk Reduction Standards, Level 2. A Texas registered professional engineer's seal is required, too.

DMS-11000, Guidelines for Evaluating and Using Nonhazardous Recyclable Materials (NRMs) in TxDOT Projects

Overview

Effective Date: July 1999.

This specification outlines current procedural and regulatory guidance for evaluating Nonhazardous Recyclable Materials (NRMs) for potential inclusion in TxDOT Specification Items. It has been prepared in collaboration with the Texas Natural Resource Conservation Commission (TNRCC). In this document, Nonhazardous Recyclable Material (NRM) refers to a material that has been recovered or diverted from the nonhazardous waste stream for purposes of reuse or recycling in the manufacture of products that may otherwise be produced using raw or virgin materials.

TxDOT Recycling Initiative

The Texas Department of Transportation (TxDOT) is interested in using Nonhazardous Recyclable Materials (NRMs) in all phases of construction and maintenance. In so doing, TxDOT demonstrates environmental stewardship and supports the recycling initiatives of industries, municipalities, and the Texas Natural Resource Conservation Commission (TNRCC).

Goal

TxDOT's goal is to increase the use of Nonhazardous Recyclable Materials (NRMs) in road construction where they yield economic or engineering advantages and environmental benefits. TxDOT is attempting to ensure that only responsible recycling activities are considered by limiting such material to NRMs that can be used in an environmentally acceptable and occupationally safe manner.

Incorporating Nonhazardous Recyclable Materials into TxDOT Projects

The current procedural and regulatory guidance for evaluating Nonhazardous Recyclable Materials (NRMs) are as follows:

Approval Criteria

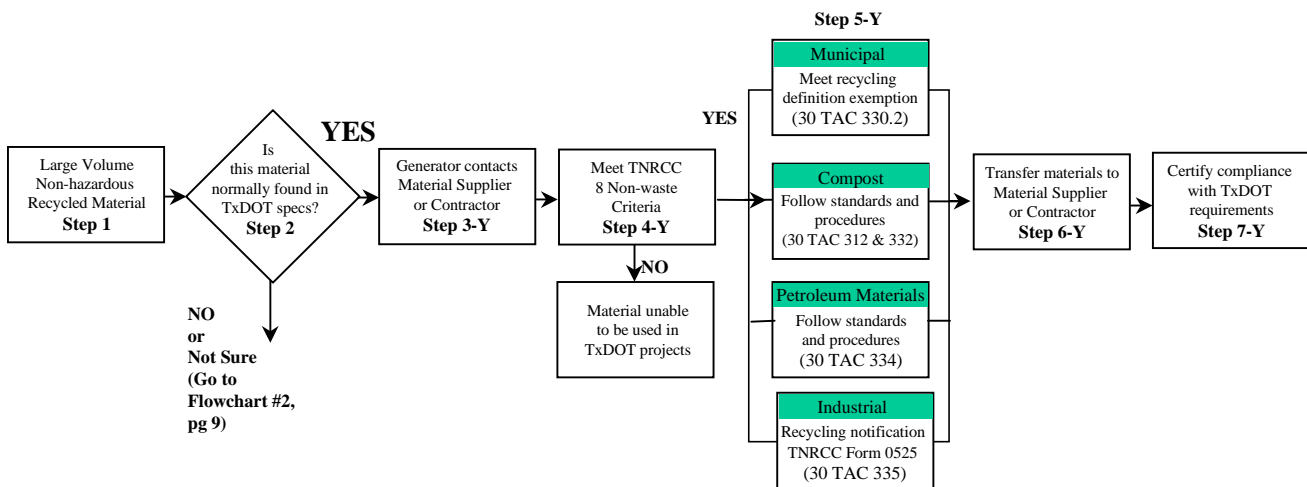
TxDOT's decision regarding the use of NRMs is dependent on two evaluations:

1. Engineering Properties
 - The properties of NRMs must meet the engineering specifications required of the materials that NRMs are proposed for replacing. The same testing requirements and test methods that are used for conventional materials are employed for NRMs, therefore, the engineering evaluation requirements are not included in this guidance.
2. Environmental Quality
 - The environmental characteristics of NRMs must be such that TxDOT considers any risk posed by using NRMs as acceptable. The evaluation of a material to assess its environmental quality is highlighted in this guidance. The environmental quality of NRMs will attest to the materials environmental suitability for use in TxDOT projects and will in no way warranty a material's engineering suitability for meeting TxDOT specifications.

TxDOT requires that contractors who want to use NRMs in TxDOT projects submit to the Department a certification, signed and sealed by a Texas Licensed Professional Engineer, certifying that the material has undergone an evaluation consistent with the requirements of this guidance and that the requisite documentation is true and complete. For details regarding the certification requirements, reference Step 7-Y.

NOTE: Generators shall *not* submit samples directly to TxDOT, but rather work with local contractors, material suppliers, Texas Engineering universities or commercial laboratories, to determine material suitability for recycling in TxDOT projects.

Flowchart #1 illustrates the process of incorporating NRMs into TxDOT construction and maintenance projects if they are *similar* to materials normally used in TxDOT specifications.



Flowchart #1
(For NRMs of the type found within TxDOT Specifications)

Steps for Furnishing NRMs

The steps that are required for furnishing NRMs are as follows:

STEP 1: Identifying Large Volume Source of Nonhazardous Recyclable Materials

As a rule of thumb, a minimum quantity of 250 tons of any one material is necessary to be considered for inclusion. Individual determinations about what constitutes an acceptable volume can be negotiated between the generator and the contractor or material supplier. (See: Step 3-Y.) The costs associated with conducting tests and documenting a material's suitability in accordance with these guidelines will be a factor in determining a feasible minimum volume.

Recycled materials that TxDOT will use shall not endanger human health, the environment, or the waters of the state. (Refer to 30 TAC [Texas Administrative Code] Subchapter A, Section 335.4 and Section 26.121 of the Texas Water Code. For reference, the primary, relevant Texas environmental statutes can be found on the Internet at: www.sos.state.tx.us/tac/30/index.html).

Hazardous wastes are prohibited from inclusion in TxDOT projects and will be rejected as outlined in "Item 8, Prosecution and Progress," Section 8.10. Hazardous Materials. (The hazardous waste definition can be found in 30 TAC 335 Subchapter A, Section 335.1 and how to make a hazardous waste determination can be found in 30 TAC 335, Subchapter R, Section 335.504.)

STEP 2: Determining Whether Material is Normally Found in TxDOT Specifications

The types of materials most commonly used in construction and maintenance projects include: coarse and fine aggregates, cementitious materials (i.e., cement and fly ash), and asphaltic compounds.

TxDOT specifications that offer the most potential for incorporating NRMs include:

- "Item 132, Embankment"
- "Item 247, Flexible Base"
- "Item 276, Cement Stabilized Base"
- "Item 300, Asphalts, Oils, and Emulsions"
- "Item 302, Aggregates for Surface Treatments"
- "Item 340, Hot Mix Asphaltic Concrete"
- "Item 345, Asphalt Stabilized Base-Plant Mix"
- "Item 400, Excavation and Backfill for Structures"
- "Item 421, Portland Cement Concrete"
- "Item 423, Retaining Wall"
- "Item 432, RipRap."

Nonhazardous Recyclable Materials (NRMs) may not necessarily be called out by name in the TxDOT specifications. Therefore, the engineering properties and function of the particular NRMs must be comparable to the materials they are replacing. For example, coal-fired boiler slag can be ground to the consistency of sand and used as a sandblasting material or depending on the chemical characteristics of this material, it may also be substituted for traditional sand in roadway construction applications.

NOTE: NRMs routinely used in TxDOT construction and maintenance projects including crushed concrete, reclaimed asphalt pavement (RAP), fly and bottom ashes from electrical utility plants, ground granulated blast furnace slag, tire rubber, plastics, ceramics, and glass, are *exempt* from TxDOT's certification requirements (reference Step 7-Y), as long as the NRMs have not come in contact with hazardous materials. Materials that are TxDOT property are also exempt from certification requirements.

If the NRMs *are* of the type found within TxDOT specification items, follow Steps 3-Y through 7-Y.

If the NRMs *are not* of the type found within TxDOT specification items, follow Steps 3-N through 9-N.

* * * *

For NRMs of the type found within TxDOT specification items:

STEP 3-Y: Generator Contacts a Local Material Supplier or Contractor

To aide in locating contractors and material suppliers who have expressed an ability or willingness to process NRMs in the geographic area, contact TxDOT's Recycling and Recycled Products Program staff (512) 416-2086.

Since the generator and contractor/material supplier will be entering into a contractual agreement, it is important that they verify the regulatory compliance, product history, quality control, and financial stability of each other.

STEP 4-Y: Meeting TNRCC's Eight Non-Waste Criteria

TxDOT's goal is to use those NRMs with an environmental quality which do not necessitate long term management (i.e., deed certification, tracking, monitoring) or special handling after the project life. TNRCC has developed eight criteria to help distinguish between regulated industrial wastes and materials that are legitimately being reused or recycled. In order to document that responsible recycling practices are followed, TxDOT requires that the NRMs used in our projects satisfy all the criteria specified in the TNRCC's Eight Non-Waste Criteria.

TNRCC's Eight Non-Waste Criteria

1. Each constituent found in the NRM must also be a constituent normally found in the raw material it is replacing. If not, it does not present an increased risk to human health and/or the environment and/or waters of the state. *(For TxDOT purposes, recycled materials need to be compared to the Texas Risk Reduction Standard Number 2 (RRS2), found in 30 TAC 335, Subchapter S. Persons conducting the evaluation/certification should also refer to the TNRCC's July 23, 1998 interoffice memo – Implementation of the Existing Risk Reduction Rule (available on TNRCC's Office of Waste Management Web Page). This memo updated and expanded the Texas Risk Reduction Standards Number 2 tables. In addition, the TNRCC is proposing a new Texas Risk Reduction Program which may further refine/revise these standards. If the NRMs exceed RRS2, then the results are compared to materials they are replacing as used in the district where the subject project is located. Details regarding certification requirements are provided in STEP 7-Y. These RRS2 tests must be conducted by an independent commercial lab. TxDOT reserves the right to verify test results and reject data from labs that do not follow industry standards).*
2. A legitimate market exists for the NRMs and its products.
3. The NRM is managed and protected from loss as would be raw materials and/or ingredients and/or products.
4. The quality of the final product is not degraded by substitution of raw material/product with the NRM.
5. The use of the NRM is an ordinary use and met and/or exceed the specifications of the product it is replacing without treatment or reclamation, or, the NRM is a reasonable ingredient in a production process and meet and/or exceed raw material specifications without treatment or reclamation.
6. The NRM is not burned for energy recovery, used to produce a fuel or contained in a fuel.
7. The NRM can be used as a product itself or to produce products as it is generated without treatment or reclamation.

8. During the calendar year (beginning January 1), 75% or more of the NRM (by weight or volume) accumulated at the start of the year is recycled.

The above “Eight Non-waste Criteria” are reprinted from TNRCC Publication RG-240 *Helpful Recycling Facts for Materials That Could Be Considered Industrial and/or Hazardous Wastes*. For questions regarding these criteria, contact TNRCC’s Waste Evaluation Section at (512) 239-6832.

STEP 5-Y: Compliance with Recycling Regulations

Compliance with waste management and recycling regulations is determined by the status of the material generator. The options for materials currently suitable for recycling into TxDOT projects are either: Municipal, Compost, Petroleum-Substance Contaminated, or Industrial. Examples of industrial generators are power generation facilities, manufacturing facilities such as metal casters, laboratories serving an industry, and parts manufacturers. Non-industrial or municipal generators include schools, hospitals, churches, dry-cleaners, most service stations, and laboratories serving the general public. (Ref: TNRCC Publication Fact 0417.96 for more information regarding generator status.)

TxDOT does not make environmental regulatory determinations for contractors or material suppliers. It is the sole responsibility of generators, contractors, and material suppliers to ensure they are in compliance with applicable TxDOT specifications, and relevant local, state, and federal regulations, regulatory guidance, laws, and statutes. TxDOT reserves the right to verify compliance with engineering and environmental specifications and may perform additional verification testing.

Municipal Generators: Regulations for municipal generators are located in 30 TAC 330. The recycling definition for municipal generators is expressed in 30 TAC 330.2, “Recycling—A process by which materials that have served their intended use or are scrapped, discarded, used, surplus, or obsolete are collected, separated, or processed and returned to use in the form of raw materials in the production of new products. Except for mixed municipal solid waste composting, that is, composting of the typical mixed solid waste stream generated by residential, commercial, and/or institutional sources, recycling includes the composting process if the compost material is put to beneficial use.”

Compost Generators: Regulations relevant to compost are located in 30 TAC 312 and 332. Class A Biosolid compost is allowed on TxDOT projects.

Petroleum-Substance Contaminated Generators: Regulations relevant to petroleum-substance contaminated waste generators regulated by the TNRCC are located in 30 TAC 334. Environmental guidelines for reuse of certain petroleum-substance wastes in cold and hot mix paving applications are provided in this chapter. (Petroleum-substance contaminated wastes regulated by the Railroad Commission are not currently allowed on TxDOT projects.)

Industrial Generators: Regulations relevant to industrial generators are located in 30 TAC 335. All industrial generators who want to provide NRMs for TxDOT projects shall notify TNRCC of their intent to recycle, using TNRCC Form 0525 “Generator Notification Form For Recycling Hazardous or Industrial Waste” available on the TNRCC web site, <http://www.tnrcc.state.tx.us/waste/ihw/weval/pub.html>. New recycling activities require such notification a minimum of 90 days prior to engaging in such activities. Recycling operations may commence 90 days after the initial notification of the intent to recycle, or upon receipt of confirmation that the TNRCC executive director has reviewed the information found in this section. (For facilities receiving and recycling wastes, TNRCC Form 0524 “Notification Form for Receiving and Recycling Hazardous or Industrial Waste” is required.)

STEP 6 -Y: Transferring Material to Supplier or Contractor

Once the eight non-waste criteria and other applicable regulatory requirements have been satisfied, final arrangements for transferring materials can be made. Specific economic and logistic details are negotiated directly between the generator and material supplier or contractor. Potential cost savings include landfill tipping fees, processing and transportation costs, and other expenses normally associated with material disposal.

STEP 7-Y: Certifying Compliance with Guidelines and Required Laws Before Start of Construction

Contractors desiring to use NRMs on TxDOT projects shall furnish a written certification signed and sealed by a Texas Licensed Professional Engineer, certifying that the material has undergone an evaluation consistent with and met the TxDOT requirements, and that the requisite documentation is true and complete.

The type and amount of documentation required to accompany the certification form depends upon whether the NRMs are below or above Risk Reduction Standard 2 (RRS2).

NRMs Below RRS2

Option 1: Project certification

Form CSTM-NRM-1, “Nonhazardous Recycled Materials (NRMs) Certification For An Individual Project,” (NRM-1) shall be submitted to the Area Engineer. This form shall include information about the specific NRMs used, the volume used, the product it’s used in, and the location of the project where it will be used. The project certification form must be signed and sealed by a Texas Licensed Professional Engineer and turned in prior to the start of construction.

Adequate and detailed documentation for the NRMs used in TxDOT projects shall be kept in the contractor’s files and be available for TxDOT review. This documentation shall include:

- Written answers to TNRCC’s 8 Non-Waste Criteria, and
- A lab report documenting that the NRMs’ values are below RRS2.

Option 2: Annual certification

Form CSTM-NRM-2, “Nonhazardous Recycled Materials (NRMs) Certification For NRMs Below Risk Reduction Standard 2 (RRS2)-ANNUAL,” (NRM-2) is intended for contractors that routinely supply TxDOT products incorporating NRMs. In submitting this form, the contractor certifies—through the signature and seal of a Texas Licensed Professional Engineer—that all NRMs used in their operations are evaluated according to the requirements stipulated by TxDOT.

Adequate and detailed documentation for each NRM used during the year shall be kept in the contractor’s files and be available for TxDOT review. This documentation shall include:

- Written answers to TNRCC’s 8 Non-Waste Criteria, and
- A lab report documenting that the NRMs’ values are below RRS2.

NRMs Above RRS2

“Above RRS2” includes any constituents (chemicals of concern) that exceeded the tabulated values for Risk Reduction Standard No. 2. Process knowledge and analytical sampling should be used. Material Safety Data Sheets (MSDS), when available, can provide information on chemicals used in a process. This information

may also be of value in determining reaction and daughter products, which might be contained in the waste. In cases where there are one or more unknowns with regard to the generating process and/or raw or reaction products, then these unknowns pass to the waste product. Other relevant issues associated with NRMs that the generator should address include whether the NRMs are generated from different processes and whether or not other wastes have been mixed with the NRMs. Information about such other wastes should be addressed as well.

Form CSTM-NRM-1, “Nonhazardous Recycled Materials (NRMs) Certification For An Individual Project,” (NRM-1) shall be submitted to the Area Engineer. The type and amount of documentation required increases for NRMs above RRS2. This certification form must be signed and sealed by a Texas Licensed Professional Engineer. (When NRMs exceed RRS2 they should be compared to the environmental parameters of the materials they are replacing as used in the district where the subject project is located.)

The required documentation includes:

- Written answers to TNRCC’s 8 Non-waste Criteria
- Lab report highlighting values above RRS2
- Stockpile sampling plan (including total stockpile volume, number of samples taken, and sampling method)
- Required precautions to protect worker health/safety
- Explanation of why NRMs are safe in the proposed application.

The “stockpile sampling plan” should be prepared to account for potential variability and inconsistency in the material. The number of samples and frequencies of testing are dependent on the variability of the generating processes and consistency of the NRMs. The sampling and analysis plan must be defensible and in accordance with Chapter 9 of EPA’s SW-846 or other approved methodologies.

The “explanation of why NRMs are safe in the proposed application” shall consider the proposed application of the material, as well as, site-specific factors (i.e. specifying a maximum usage rate within a mix design).

The TxDOT Area Engineer receiving Form CSTM-NRM-1 (NRM-1) or Form CSTM-NRM-2 (NRM-2) should forward a copy to the Construction Division, Materials Section (CSTM). CSTM will forward copies to the Environmental Division and the Recycling and Recycled Products Program.

* * * * *

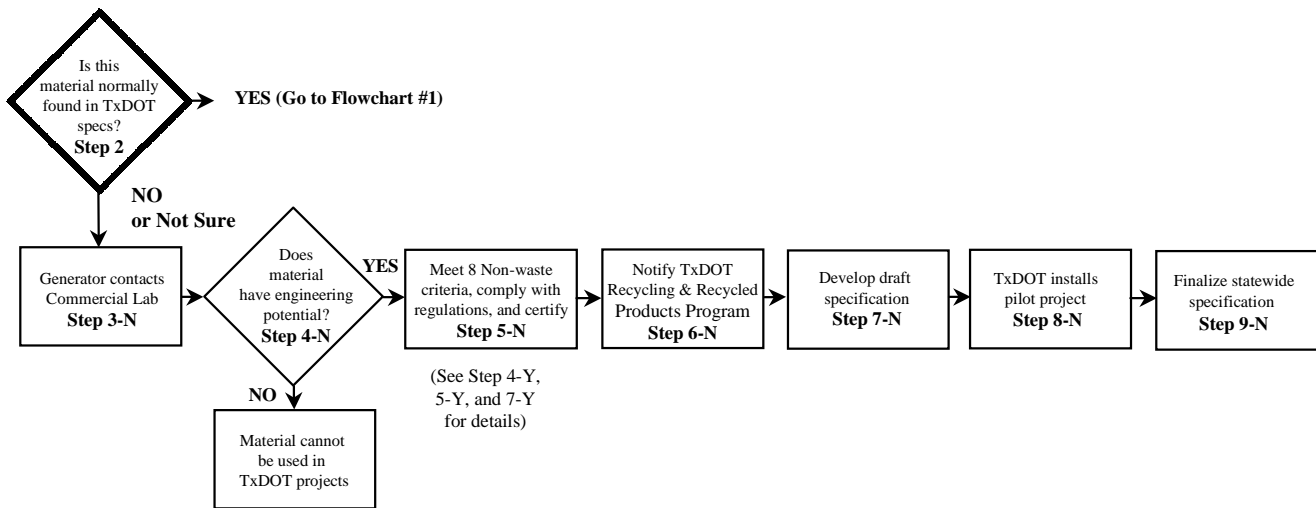
For NRMs *not* of the type found within TxDOT specification items:

If the NRM is of the type *not* normally found within TxDOT specification items, or that determination cannot be made with certainty, a commercial lab or Texas engineering university can help determine the NRMs’ potential for use in TxDOT projects. This evaluation process, including a pilot project stage, will generally take three years or more to complete.

STEP 3-N: Generators Contact a Commercial Laboratory or Texas Engineering University Laboratory
 Generators of NRMs of the type *not* normally found within TxDOT specification items, or that determination cannot be made with certainty shall contact Commercial laboratories or Texas Engineering Universities with a Civil Engineering Program and laboratory facility, who are familiar with TxDOT specifications. These laboratories can run preliminary tests to begin accessing the potential of the NRMs for use in TxDOT projects. TxDOT reserves the right to reject data from laboratories that do not follow industry standards.

STEP 4-N: Determining if the NRMs have Engineering Potential

The commercial or university laboratory will conduct tests to determine if the NRMs have the necessary engineering properties for use in TxDOT projects. A time and cost estimate should be obtained prior to initiating any service. The laboratory shall determine which TxDOT specification item offers the most potential for the NRMs and which tests will be required.



Flowchart #2
 (For NRMs Not of the Type Found Within TxDOT Specifications)

STEP 5-N: Meeting the TNRCC 8 Non-Waste Criteria, Complying with Regulations, and Certifying

If the laboratory determines that the NRMs have engineering potential, the next step is for the generator to verify that the NRMs meet the necessary environmental standards. It is important to note that TxDOT does not make environmental regulatory determinations for contractors or material suppliers. *It is the sole responsibility of generators, contractors, and material suppliers to ensure they are in compliance with applicable TxDOT specifications, and relevant local, state, and federal regulations, regulatory guidance, laws, and statutes* (Ref.: Steps 4-Y, 5-Y, and 7-Y above).

STEP 6-N: Notifying the TxDOT Recycling and Recycled Products Program

After demonstrating that the NRMs can meet basic engineering and environmental criteria, notify TxDOT’s Recycling and Recycled Products Program at (512) 416-2086 for help in identifying department contacts regarding a potential pilot project location.

STEP 7-N: Developing a Draft Specification

After a potential pilot project location has been identified, the commercial or university laboratory that conducted the initial material evaluations shall draft a specification (in the TxDOT format) for using the NRMs.

STEP 8-N: TxDOT Installing a Pilot Project

If approved by TxDOT, this specification shall be used on a “one-time” pilot project and a test section may be installed. TxDOT will be responsible for overseeing the installation of the test section and collecting performance data for one year, or a time as determined by TxDOT. The Materials Section of the Construction Division (CSTM) will assume primary responsibility for determining the type and frequency of data collection and the Research Section (CSTR) will assume primary responsibility for data collection and performance monitoring.