



Foundry Sand Reuse in Texas

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is a high-quality silica sand used by metal casting facilities to make molds for shaping molten metal into parts.

After repeated use, the sand becomes "spent" and needs to be replaced — creating a large volume of by-product material.

What is Beneficial Reuse?

Beneficial reuse means finding safe, productive ways to repurpose industrial by-products (like foundry sand) instead of throwing them away.

It protects the environment, saves natural resources, and cuts disposal costs.

In Texas, beneficial reuse helps businesses lower expenses and communities build infrastructure more sustainably.

Examples of beneficial reuse for foundry sand include:

- Replacing mined sand in concrete or road base
- Using sand as daily cover at landfills
- Mixing into manufactured soils for landscaping

What is a TCLP Test?

TCLP stands for Toxicity Characteristic Leaching Procedure — a laboratory test required by the U.S. EPA to find out if a waste material might release harmful contaminants into groundwater.

How a TCLP test works:

- A sample of the material is soaked in a mild acidic solution that simulates rainwater or landfill conditions.
- Scientists measure what chemicals "leach out" of the sample into the fluid.
- If dangerous levels of metals (like lead) or chemicals are found, the material is classified as hazardous waste and must be managed under strict regulations.

If the material passes the TCLP test (meaning contaminants are below federal limits), it can be reused safely under environmental rules.

Why Should Readers Care About Foundry Sand Reuse?

- **Environmental Protection:** Reuse reduces waste sent to landfills and conserves natural sand resources, which are expensive and limited.
- **Cost Savings:** Foundries, cities, and contractors save money by reusing sand instead of buying new materials or paying high disposal fees.
- **Public Safety:** Proper testing (like TCLP) ensures that reused sand does not threaten drinking water, soil, or the environment.
- **Economic Growth:** Reuse projects create jobs, strengthen recycling industries, and make local construction and public works projects more affordable.

4. Regulatory Guidelines

Texas TCEQ Regulations

The Texas Commission on Environmental Quality (TCEQ) manages beneficial reuse of industrial solid waste through its regulatory framework under 30 Texas Administrative Code (TAC) Chapter 335.

Under 30 TAC §335.1, foundry sand from the iron and steel casting industry may not be considered solid waste if the sand is an intended output or result of the use of an established industrial process. This exclusion provides a regulatory pathway for beneficial reuse without full waste permitting requirements.

Key regulatory points for foundry sand reuse in Texas:

- Case-by-case determination: Texas TCEQ evaluates beneficial use projects through case-specific determinations rather than universal approvals
- Non-hazardous requirement: All foundry sand must be classified as non-hazardous waste through proper testing (typically TCLP)
- Industrial waste management: Sand that does not qualify for the exclusion must comply with industrial waste management requirements under 30 TAC Chapter 335
- Landfill daily cover: Municipal solid waste landfills can accept approved foundry sand as alternative daily cover material with proper authorization

TCEQ Permitting Requirements:

- Foundries generating more than specified quantities must register as industrial waste generators
- End users may need to obtain case-specific beneficial use determinations for certain applications
- Landfills must include foundry sand acceptance in their special waste acceptance plans (SWAP)

Federal EPA Guidelines

At the national level, the U.S. EPA encourages the reuse of spent foundry sands from iron, steel, and aluminum foundries.

EPA's major documents include:

- Risk Assessment for Spent Foundry Sands in Soil-Related Applications (2014)
- Sustainable Materials Management Program resources.

EPA concluded that silica-based sands from iron, steel, and aluminum foundries can be safely reused in soil blends, construction materials, and road bases.

EPA does not federally regulate beneficial reuse of non-hazardous foundry sands but defers regulatory authority to states like Texas.

Local Ordinances

Most cities and counties in Texas defer to TCEQ's framework regarding foundry sand reuse. However, local governments may have additional requirements, particularly for:

- Projects near sensitive environmental areas
- Large-volume construction applications

- Transportation and handling permits

Some municipalities may require additional notifications or approvals for larger volume projects, especially near wetlands or water supplies. Generally, if a reuse project complies with TCEQ's beneficial use determination process, additional local permitting requirements are minimal.

5. Reuse Applications and Texas Examples

Beneficial reuse of foundry sand in Texas takes multiple forms depending on material properties, project goals, and TCEQ approvals. Real-world applications have been proven across industries, especially construction and landfill operations.

Common Beneficial Reuses

Reuse Application	Description	Texas examples/status
Road base & fill	Substitute for sand/aggregate in subbase, embankments, and structural fill. Provides bulk and drainage.	TxDOT approved for flowable fill and cemented sand applications. Over 60,000 tons available annually.
Cement & concrete	Raw feedstock in Portland cement kilns or as fine aggregate in concrete and masonry products.	TXI facilities use foundry sand as cement kiln feedstock. Ready-mix concrete operations incorporate foundry sand.
Landfill uses	Daily cover (usually sand-soil mix), interim cover, or drainage layer material in liners and leachate systems.	Multiple Texas landfills accept foundry sand for alternative daily cover with proper authorization.
Soil amendment	Blend into topsoil, manufactured soil, or potting media to improve drainage. Typically limited to ferrous/aluminum sands.	Research conducted by University of Texas on soil blending applications.
Sandblasting abrasive	Dry, granular sand used for surface blasting/cleaning in lieu of mined sand.	Limited commercial applications identified in Texas as of 2025.
Other Innovative Uses	Construction fill, structural applications, experimental uses in controlled environments.	Texas foundry survey identified over 93,000 tons produced annually with proven construction applications.

Texas Examples in Action

- TxDOT Transportation Applications: Texas Department of Transportation developed specifications for foundry sand use in flowable fill and cemented sand mixes. Research by Texas A&M Transportation

Institute showed successful highway construction applications. Over 60,000 tons available annually for transportation use.

- **Cement Kiln Reuse:** TXI facilities process foundry sand as raw material feedstock for Portland cement production. Ready-mix concrete operations blend waste foundry sand to replace virgin aggregate.
- **Hensley Industries Fort Worth Success:** Large steel foundry reduced disposal costs by over 75% through beneficial reuse partnerships. Sand blended with crushed concrete and sold as stabilized roadbase for local construction projects.
- **Landfill Alternative Daily Cover:** Multiple municipal landfills across Texas accept foundry sand for daily cover, saving costs.

6. Environmental and Technical Considerations

Beneficial reuse of foundry sand requires careful understanding of material composition, contaminant risks, and environmental testing protocols to ensure safe and responsible outcomes.

Types of Foundry Sands

Ferrous Foundry Sands (Iron and Steel Castings)

- Typically high-purity silica sand bonded with clay (green sand) or chemical resins.
- Low in contaminants.
- EPA and Texas TCEQ consider these the safest and most preferred for reuse.

Non-Ferrous Foundry Sands (Aluminum, Brass, Bronze Castings)

- Use a similar base sand but with potential contamination from metal alloys.
- Brass/Bronze sands often contain elevated lead, requiring more stringent testing or stabilization before reuse.

Specialty Sands

- Some foundries use olivine sands or other media.
- Not covered under EPA's standard risk assessment for reuse.
- May alter soil pH or chemistry.

Contaminants of Concern

Contaminant	Source	Notes
Lead (Pb)	Brass/bronze alloys	Key concern; must not exceed TCLP leaching limit (5.0 mg/L).
Chromium (Cr)	Stainless steel alloys, pigments	Usually low and stable in ferrous foundries; not a major issue.
Phenols/Cresols	Phenolic resins (binder breakdown)	Typically very low concentrations.
PAHs	Burnt sea coal or resin residues	Detected at low levels; below risk thresholds.
Dust/Free Silica	Physical hazard from dry sand	Dust control measures needed to protect workers.
pH/Salinity	Binders, chemical additives	Texas foundry sands range pH 7-10.2; generally safe.

Importance of TCLP Testing

The Toxicity Characteristic Leaching Procedure (TCLP) is the EPA test to determine if foundry sand poses groundwater leaching hazards.

- Simulates acidic landfill leachate conditions.
- Measures 8 key metals (Lead, Arsenic, Cadmium, Chromium, etc.).
- Passing TCLP means sand is non-hazardous.
- Ferrous foundry sands in Texas typically pass TCLP easily.

If foundry sand fails TCLP (e.g. high lead from brass castings), it must be managed as hazardous waste and not reused without treatment.

Key for Texas reuse:

All reused sands must have current passing TCLP results with documentation.

Environmental Behavior of Foundry Sand

- Heavy metals in ferrous sands are generally immobilized in the sand matrix.
- Organics (phenols, PAHs) are below actionable risk levels.
- Field studies show low leachability and no significant plant uptake when used in soils.

Conclusion

Properly characterized ferrous foundry sands present minimal environmental risk and support broad reuse.

7. Funding, Grants, and Incentives

State-Level Incentives

Regional Solid Waste Grants Program

- Administered by TCEQ via regional councils of governments (COGs).
- Provides grants for solid waste management projects including sand reuse.
- Funded by landfill tipping fees revenue.

Texas Emissions Reduction Plan (TERP)

- Grants for equipment upgrades reducing NOx emissions.
- Funds modernization improving sand reclamation.

Industrial Waste Management Incentives

- Technical assistance and case-specific beneficial use determinations by TCEQ.

No Dedicated State Foundry Sand Program as of 2025.

Federal-Level Opportunities

EPA Sustainable Materials Management Grants

- Support for innovative reuse pilots and infrastructure upgrades.

Infrastructure Investment and Jobs Act Funding

- Grants open to state and local agencies promoting circular economy.

FHWA/DOT Support

- Funding and technical aid for recycled materials in road construction.

Local Opportunities

Regional Council of Governments Grants

- COGs like North Central Texas provide implementation grants for waste diversion projects.

Public-Private Collaborations

- Landfills may waive tipping fees for foundry sand.

- Contractors may provide discounted transport.

Summary Table: Key Funding and Incentive Programs

Program/Incentive	Type	Key Details	Impact
Regional Solid Waste Grants	State Grants	Competitive funding through regional COGs	Fund equipment, logistics, pilot projects
TERP Equipment Grants	State Grants	Funding for NOx equipment upgrades	Reduces sand reclamation costs
TCEQ Technical Assistance	Technical Support	Regulatory approvals and guidance	Provides certainty for reuse projects
EPA/Federal Grants	Research Grants	Sustainable Materials Management grants	Supplements state funding
COG Implementation Grants	Regional Grants	Local waste diversion project funding	Supports foundry sand diversion

8. Active Participants in Texas

Foundries (Generators of Spent Sand)

- Taylor Foundry Company (Wichita Falls, TX)
- Texas Metal Casting Co. (Lufkin, TX)
- IPC Foundry Group - Texas (Marble Falls, TX)
- Quality Electric Steel Castings
- Hensley Industries (Fort Worth area)

End Users (Consumers of Foundry Sand)

- TXI/Martin Marietta Cement Plants
- TxDOT and Regional Transportation Authorities
- Big City Concrete and Regional Aggregate Processors
- Municipal Solid Waste Landfills
- Construction Contractors

Supporting Programs and Agencies

- Texas Commission on Environmental Quality (TCEQ)
- Texas Department of Transportation (TxDOT)
- American Foundry Society (AFS)
- Texas A&M Transportation Institute (TTI)

Key Collaboration Insights

Texas foundries provide consistent, tested sand streams; infrastructure projects offer large-volume end use; TCEQ and research groups provide regulatory and validation support. This collaboration drives beneficial reuse success statewide.

9. Success Story Highlights

Hensley Industries, Fort Worth Area

Reduced disposal costs from \$60,000 to \$13,500 per month through beneficial reuse partnerships; sand blended with crushed concrete for roadbase.

TxDOT Foundry Sand Research Program

Validated over 93,000 tons annually for flowable fill and cemented sand in highway construction via Texas A&M research.

TXI Cement Operations

Consumes foundry sand as raw material for Portland cement production and incorporates it into ready-mix concrete.

10. Clear Business Case Summary

Why Foundries Should Reuse Sand

- Save \$30–\$75 per ton vs. landfill disposal costs.
- Avoid environmental liabilities.
- Improve sustainability reporting.

Why Contractors Should Reuse Sand

- Get free or discounted sand for fill and roadbase.

- Lower project material costs.
- Meet sustainable construction requirements.

Why Landfills Should Accept Foundry Sand

- Obtain low-cost or free cover material.
- Reduce daily operating costs.
- Generate revenue via tipping fees.

11. Risk Management Overview

Best Practices

- Testing: Current TCLP test required.
- Documentation: Keep CoAs, test results, shipping records ≥ 5 years.
- Written Agreements: Contracts detailing responsibilities with users.
- Case-Specific Approvals: Obtain TCEQ beneficial use determinations if needed.
- Insurance: Verify liability coverage including reuse activities.
- ARS Support: Assistance available for compliance and documentation.

12. Step-by-Step Workflow for Foundries

- Test: Perform TCLP testing via accredited lab; confirm non-hazardous status per Texas TCEQ.
- Document: Retain lab reports and summaries.
- Partner: Coordinate with ARS for matching reuse projects.
- Agreement: Sign beneficial reuse contracts.
- Ship: Label loads and ship sand.
- Monitor: Re-test if production changes; maintain communications.

Result: Compliance, savings, and sustainability without headaches.

13. Real Cost Savings Example

Landfill Disposal Costs in Texas

- Disposal fee: \$50–\$100/ton
- Transport: \$15–\$35/ton
- Total: \$65–\$135/ton

Beneficial Reuse Costs

- Transport only: \$10–\$30/ton

Savings Example

For 1,000 tons/year:

- Landfill cost: \$100,000
- Reuse transport: \$20,000
- Annual Savings: \$80,000

Multiply by 5–10 years for large impact.

15. General FAQ & Landfill-Specific FAQ

Q: Is reused foundry sand safe for public projects?

A: Yes, if it passes TCLP and complies with Texas TCEQ and EPA guidelines.

Q: How often should sand be tested?

A: Initially and annually or when production changes.

Q: Can sand be used near homes or drinking water?

A: Usually safe for roads and landfills; soil amendments require case-by-case approval.

Q: What if sand fails post-use tests?

A: Remedial action required; testing and documentation are critical.

Q: Who is responsible for safety proof?

A: Foundries test and certify; users must apply approved uses.

Landfill-Specific FAQ

Q: Does foundry sand affect landfill leachate?

A: No, research confirms minimal hazard.

Q: Is sand accepted as daily cover?

A: Yes, with TCEQ authorization.

Q: Special equipment needed?

A: No, standard landfill equipment suffices.

Q: How to document for compliance?

A: Keep simple logs; templates available from ARS.

Q: What if sand chemistry changes?

A: Re-test as needed.

16. References

- Texas Commission on Environmental Quality: 30 TAC Chapter 335 — <https://www.tceq.texas.gov/rules/indxpathdf.html>
- EPA: Beneficial Uses of Spent Foundry Sands — <https://www.epa.gov/smm/beneficial-uses-spent-foundry-sands>
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- TCEQ Regional Solid Waste Grants Program — https://www.tceq.texas.gov/permitting/waste_permits/waste_planning/wp_grants.html
- American Foundry Society: Landfill Construction with Foundry Sand — <https://www.afsinc.org/landfill-construction>
- Texas Department of Transportation: Industrial Sands — https://ftp.txdot.gov/pub/txdot-info/gsd/pdf/yr_aug.pdf

- TCEQ: Industrial and Hazardous Waste Compliance Resources — <https://www.tceq.texas.gov/assistance/waste/ihw-compliance-resources>
- EPA Archives: Beneficial Reuse of Foundry Sand State Practices — <https://archive.epa.gov/sectors/web/pdf/reuse.pdf>
- Texas Metal Casting Company — <https://texasmetalcasting.com>
- IPC Foundry Group Texas — <https://www.ipcfoundry.com/texas-foundry>
- Taylor Foundry Company — <https://taylorfoundry.com>
- TCEQ: Landfill Cover Requirements 30 TAC 330.165 — <https://www.law.cornell.edu/regulations/texas/30-Tex-Admin-Code-SS-330-165>