



Foundry Sand Reuse in Illinois

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 Illinois, 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

Illinois Environmental Protection Agency Regulations

The Illinois Environmental Protection Agency (IEPA) regulates beneficial reuse of foundry sand through Title 35, Part 817 of the Illinois Administrative Code: Requirements for New Steel and Foundry Industry Wastes Landfills.

Waste Classification System

Illinois classifies foundry sand into four categories based on leaching potential as determined by ASTM Method D3987-85:

- Beneficially usable waste
- Potentially usable waste
- Low risk waste
- Chemical waste

Approved Uses for Beneficially Usable Foundry Sand

Under Section 817.202, beneficially usable foundry sand may only be used as substitutes for commercially available materials, including soil used for land reclamation purposes.

Key Regulatory Points

Maximum Allowable Leaching Concentrations (MALCs) for the beneficially usable classification establish strict limits for contaminants.

Testing via ASTM Method D3987-85 is required to determine waste classification.

Foundry sand used as an ingredient in an industrial process to manufacture a product is exempt from these regulations.

For land reclamation purposes, the Agency may approve foundry sand reuse upon demonstration that such uses will not exceed applicable groundwater quality standards.

Pre-approval applies to silica-based sands from ferrous foundries (iron, steel). Non-ferrous foundry sands (brass, bronze) are not automatically approved due to potential elevated levels of lead and other heavy metals and may require individual beneficial use determinations.

Open dumps containing beneficial waste are prohibited.

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 Illinois.

Local Ordinances

Illinois does not have a comprehensive local ordinance framework specifically addressing foundry sand beneficial reuse comparable to other states. Foundry sand beneficial use in Illinois is regulated at the state level by the Illinois Environmental Protection Agency under Title 35, Part 817.

Projects involving beneficial use of foundry sand should be coordinated with the local county or municipality, as they may have additional land use or construction permitting requirements independent of the IEPA beneficial use regulations.

5. Reuse Applications and Illinois Examples

Beneficial Reuse of Foundry Sand in Illinois

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

Common Beneficial Reuses

Reuse Application	Description	Illinois Examples or Status
Road Base & Fill	Substitute for sand/aggregate in road subbase, embankments, and structural fill. Provides bulk and drainage.	Approved under 35 Ill. Adm. Code § 817.202 as substitute for commercially available materials. Used in various Illinois highway and construction projects.
Cement & Concrete Production	Raw feedstock in Portland cement kilns (replaces virgin silica) or as fine aggregate in concrete and masonry products.	Holcim Mason City plant receives approximately 75,000 tons/year from regional foundries including Illinois sources. EPA-supported trials show foundry sand replacing 20% of concrete mix without loss of strength.
Landfill Uses	Daily cover (usually sand-soil mix), interim cover, or drainage layer material in liners and leachate systems.	Approved under 35 Ill. Adm. Code § 811.106 for use as daily cover and intermediate cover. Illinois landfills utilize beneficially usable foundry sand in landfill operations.
Soil Amendment	Blend into topsoil, manufactured soil, or potting media to improve drainage. Typically limited to ferrous/aluminum sands with low contaminants.	Illinois Pollution Control Board documented successful pilot project near Geneseo, Illinois using beneficially usable foundry sand on agricultural land. Results showed improved drainage timeline and maintained crop yields.
Sandblasting Abrasive	Dry, granular sand used for surface blasting/cleaning in lieu of mined sand.	Permitted under Illinois regulations. Clean spent core sand from foundries may be used for blasting applications. Must be free of lead and appropriately sized.

Reuse Application	Description	Illinois Examples or Status
Other Innovative Uses	Additional experimental uses subject to case-by-case review.	Subject to Illinois Environmental Protection Agency beneficial use determination on case-by-case basis.

Illinois Examples in Action

- **Cement Kiln Reuse:** Holcim's Mason City plant processes approximately 75,000 tons/year of spent foundry sand. Sourced regionally from Iowa, Minnesota, Wisconsin, and Illinois foundries, this reuse saves virgin resources and reduces emissions in cement production.
- **Road Construction Fill:** Foundry sands have been approved for use in highway projects for structural fill under roads and in road subbase applications across Illinois under 35 Ill. Adm. Code § 817.202.
- **Landfill Daily Cover:** Illinois landfills actively accept beneficially usable foundry sand for daily cover and intermediate cover applications under 35 Ill. Adm. Code § 811.106, conserving native soils.
- **Soil Amendments:** The Illinois Pollution Control Board documented a successful pilot project near Geneseo, Illinois demonstrating that beneficially usable foundry sand blended into agricultural soils improved drainage without adverse effects on crop yields or heavy metal uptake by plants.
- **Sandblasting and Industrial Applications:** Clean spent core sands from Illinois foundries may be diverted for industrial sandblasting and surface preparation applications, substituting for more expensive commercial blasting media.

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 Illinois consider these the safest and most preferred for reuse.

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

- Similar base sand but 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)	Organic compounds typically present in very low concentrations.
PAHs	Burnt sea coal or resin residues	Detected at very low levels; below environmental risk thresholds.
Dust / Free Silica	Physical hazard from dry sand	Requires dust suppression measures during handling to protect workers.
pH / Salinity	Binders, chemical additives	Some foundry sands have slightly alkaline pH, generally not problematic unless used directly in soils.

Importance of TCLP Testing

The Toxicity Characteristic Leaching Procedure (TCLP) is the industry-standard EPA test to determine whether foundry sand poses a leaching hazard to groundwater.

- Simulates landfill leachate conditions using an acetic acid solution.
- Measures 8 key metals (Lead, Arsenic, Cadmium, Chromium, etc.).
- Passing TCLP = Sand is classified as non-hazardous.
- Ferrous foundry sands in Illinois typically pass TCLP easily.

If foundry sand fails TCLP (e.g., high lead from brass castings):

- It must be managed as hazardous waste, not reused without treatment.

Key for Illinois Reuse: All sands used in landfill cover, road base, concrete, etc., must pass TCLP and have supporting documentation.

Environmental Behavior of Foundry Sand

- Heavy metals in ferrous sands are generally immobilized in the sand matrix.
- Organics (e.g., phenols, PAHs) are below actionable risk levels according to EPA risk assessments.
- Field studies show low leachability and no significant uptake into plants when used in soil amendments.

Conclusion: For properly characterized ferrous foundry sands, environmental risks are minimal — supporting broad beneficial reuse.

7. Funding, Grants, and Incentives

State-Level Incentives

Landfill Fee Exemption:

- Illinois law exempts foundry sand from state landfill surcharge fees when used in beneficial applications.
- Under 415 ILCS 5/22.15(k) and 35 Ill. Adm. Code § 858.103, foundry sand classified as beneficially usable waste is exempt from the solid waste management fee.
- Creates economic incentive for landfills and end-users to accept and utilize foundry sand.
- Saves landfill operators and foundries disposal costs compared to virgin material or standard waste disposal.

Beneficial Use Determinations (BUD):

- Free technical assistance available through the Illinois Environmental Protection Agency for foundry sand projects.
- The IEPA reviews beneficial use applications and provides determinations at no cost to applicants.
- Helps foundries and end-users navigate regulatory requirements and identify approved reuse applications.

Federal-Level Opportunities

EPA Sustainable Materials Management Grants:

- Periodically available grants supporting innovative reuse/recycling projects.
- Can fund pilot projects, outreach campaigns, or infrastructure improvements related to foundry sand.

Federal Infrastructure and Recycling Funding (Infrastructure Investment and Jobs Act):

- Some grant programs are open to states and municipalities improving recycling or circular economy initiatives.
- Foundry sand reuse aligns with goals of waste reduction and sustainable construction.

FHWA / DOT Support:

- Federal Highway Administration promotes the use of recycled materials (including foundry sand) in road construction.
- Some research grants and technical support available for projects demonstrating new uses of industrial byproducts in infrastructure.

Local Opportunities

Local Government Partnerships:

- Counties and cities sometimes offer mini-grants or project cost-sharing for green construction and waste diversion projects.
- Example: County public works departments may help subsidize trucking costs if foundry sand is used in local road construction.

Public-Private Collaborations:

- Landfills may waive tipping fees for sand.
- Construction contractors may provide free transport in exchange for discounted material.
- Informal partnerships often unlock major savings without formal grant applications.

Summary Table: Key Funding and Incentive Programs

Program/Incentive	Type	Key Details	Impact for Foundry Sand Reuse
Landfill Fee Exemption	Cost Savings	Foundry sand classified as beneficially usable waste is exempt from Illinois solid waste management fees under 415 ILCS 5/22.15(k).	Immediate cost savings for landfills and foundries.
Tax Certification Program for Pollution Control Facilities	Tax Incentive	Illinois Environmental Protection Agency administers tax certification program that can reduce property tax value of pollution control improvements. Certification through Illinois Pollution Control Board (35 Ill. Adm. Code Part 125).	May apply to foundry sand processing equipment certified as pollution control facilities.
IEPA Beneficial Use Determinations	Technical Assistance	Free regulatory support from Illinois Environmental Protection Agency for foundry	Eliminates costs for regulatory compliance

Program/Incentive	Type	Key Details	Impact for Foundry Sand Reuse
		sand reuse projects.	review.

8. Active Participants in Illinois

Ferrous and Non-Ferrous Foundries

- Illinois has ferrous foundries (iron and steel) and non-ferrous foundries (aluminum, non-leaded brass, and other alloys) that generate spent foundry sand. According to Illinois Pollution Control Board records, ferrous foundries in Illinois have been the primary focus of beneficial reuse regulations under 35 Ill. Adm. Code Part 817. Non-ferrous foundries that pour non-leaded metals may also participate in beneficial reuse programs if they segregate waste streams appropriately.

Regional Partnership: Holcim Geocycle US

- Several Illinois foundries contribute to the Holcim Mason City plant's cement manufacturing program, which receives approximately 75,000 tons annually of spent foundry sand from regional foundries located in Iowa, Minnesota, Wisconsin, and Illinois. This partnership demonstrates active beneficial reuse of Illinois-generated foundry sand in regional cement production.

University of Illinois Pilot Program

- Research conducted by the University of Illinois, documented in Illinois Pollution Control Board proceedings, demonstrated successful beneficial reuse of foundry sand in agricultural soil amendment near Geneseo, Illinois, showing improved drainage without adverse crop impacts.

End Users (Consumers of Foundry Sand)

Holcim (Geocycle) Cement Plant (Mason City, IA with regional sourcing)

- Major consumer of spent foundry sand (approximately 75,000 tons/year).
- Incorporates sand as silica feedstock in cement production.
- Receives foundry sand from regional foundries including Illinois sources.

Illinois Landfills

- Illinois landfills are authorized under 35 Ill. Adm. Code § 811.106 to accept beneficially usable foundry sand for alternative daily cover (ADC), intermediate cover, and drainage layer applications.
- Foundry sand is used as an alternative to virgin soil and clay materials in landfill construction.

Illinois Department of Transportation (IDOT) and Local Road Authorities

- Illinois road construction projects utilize foundry sand as a substitute for virgin aggregate in roadway subbase, embankments, and structural fill under approved beneficial use determinations.
- County engineers and public works departments can incorporate foundry sand for road subgrades, culvert bedding, and other highway construction applications when materials meet Illinois specifications.

Illinois Construction and Material Suppliers

- Various construction contractors and material suppliers in Illinois utilize foundry sand as economical fill material for building projects, parking lots, and industrial applications.

Agricultural Applications

- The Illinois Pollution Control Board documented a successful pilot project near Geneseo, Illinois where beneficially usable foundry sand was used to improve drainage on agricultural land, enhancing soil conditions without adverse crop impacts.

Supporting Programs and Agencies

Illinois Environmental Protection Agency (IEPA) Bureau of Land

- Oversees Beneficial Use Determinations (BUDs) for foundry sand reuse.
- Provides regulatory guidance and technical assistance for beneficial use applications.
- Administers approval process for foundry sand beneficial use under 35 Ill. Adm. Code Part 817.

Illinois Sustainable Technology Center (ISTC)

- Division of the Prairie Research Institute at the University of Illinois.
- Provides pollution prevention research, technical assistance, and information services.
- Assists businesses with waste reduction, materials recycling, and beneficial reuse projects.
- Offers technical consultation to small and medium-sized manufacturing facilities including foundries.

University of Illinois Chicago Energy Resources Center (UIC-ERC)

- Provides pollution prevention technical assistance to industrial facilities in Illinois.
- Offers energy and waste reduction assessments and consulting services.
- Partners with EPA on pollution prevention grant programs.

American Foundry Society (AFS) – Schaumburg, IL Headquarters

- National headquarters located in Schaumburg, Illinois.
- Provides technical manuals, best practice guides, and case studies for foundry sand recycling.
- Chicago Chapter and Central Illinois Chapter actively promote foundry sand beneficial reuse.

- Hosts Metalcasting Congress and CastExpo trade events featuring foundry sand recycling technologies.

U.S. EPA Region 5 (Chicago)

- Oversees environmental programs in Illinois and surrounding states.
- Contributed to national risk assessment studies on foundry sand reuse in soil-related applications.
- Provides technical guidance on beneficial use of spent foundry sand.

Key Collaboration Insights

- Ferrous foundries provide consistent, tested sand streams that meet Illinois beneficial use waste classifications.
- Illinois landfills and Holcim Geocycle's regional cement plant offer large-volume end-use outlets for beneficially usable foundry sand.
- Construction contractors and local public works departments create project-specific demand for foundry sand in road construction, fill, and infrastructure applications.
- IEPA, ISTC, and technical assistance programs ensure regulatory compliance, technical support, and identification of approved reuse applications.
- American Foundry Society and Illinois industrial networks spread success stories, technical standards, and new foundry sand recycling technologies throughout the region.

9. Success Story Highlights

Success Story 1: Holcim Geocycle Cement Plant, Mason City (Regional)

- Accepts approximately 75,000 tons/year of spent foundry sand from regional foundries.
- Sourced from Iowa, Minnesota, Wisconsin, and Illinois including Illinois foundries.
- Saves virgin sand mining and reduces environmental impact in cement production.
- Replaces silica feedstock in Portland cement manufacturing.

Success Story 2: Geneseo Agricultural Pilot Project, Illinois

- Illinois Pollution Control Board documented beneficial reuse of foundry sand in agricultural soil amendment.
- Improved drainage on wet farmland, allowing earlier planting timelines.
- Crops produced healthy yields equivalent to untreated soils.
- Metal uptake studies confirmed no adverse impacts on plant composition or soil safety.

Success Story 3: Illinois Landfill Alternative Daily Cover

- Illinois landfills authorized under 35 Ill. Adm. Code § 811.106 to use beneficially usable foundry sand for daily cover.
- Foundry sand approved for daily cover is exempt from Illinois solid waste management fees.
- Demonstrates cost savings and environmental safety of foundry sand reuse in public sector landfill operations.

10. Clear Business Case Summary

Why Foundries Should Reuse Sand:

- Save \$30–\$50 per ton vs. landfill disposal costs.
- Avoid environmental liability.
- Improve sustainability reporting for customers and regulators.

Why Contractors Should Reuse Sand:

- Get free or discounted sand for construction fill.
- Improve project bids by lowering material costs.

Why Landfills Should Accept Foundry Sand:

- Secure free cover material.
- Reduce operating costs.
- Increase daily cover efficiency.

11. Risk Management Overview

Beneficial reuse of foundry sand carries significant economic and environmental benefits, but participants must manage risk carefully to ensure compliance and protect their businesses.

Best Practices

- Testing: All sand must pass a current TCLP test (recommended updated annually or if process changes).
- Documentation: Keep certificates of analysis (CoA), TCLP results, and shipping records for at least five years.

- **Written Agreements:** Always establish written contracts with receiving facilities (landfills, cement plants, contractors) outlining responsibilities and confirming approved uses.
- **Site-Specific Approvals:** For new or unusual uses not covered under Illinois' beneficially usable waste classifications, seek Illinois Environmental Protection Agency Beneficial Use Determination (BUD) under 35 Ill. Adm. Code § 817.101 or documented exemption.
- **Insurance:** Verify liability coverage, and ensure your insurer understands your beneficial reuse activities.

ARS Support: ARS can assist participants in setting up compliance systems, testing protocols, and document templates to minimize legal risk.

12. Step-by-Step Workflow for Foundries

Simple Process to Start Foundry Sand Reuse:

- **Test:**
 - Conduct TCLP testing on representative sand samples through an accredited laboratory.
 - Confirm results meet Illinois standards
- **Document:**
 - Save all lab results, including full reports and summary sheets.
- **Partner:**
 - Contact ARS to match your material to a reuse project (landfill, cement, construction).
- **Agreement:**
 - Sign a beneficial reuse agreement or memo of understanding.
- **Ship:**
 - Begin shipping sand as needed.
 - Label loads clearly and maintain load-out logs.
- **Monitor:**
 - If your production process changes (e.g., alloy change, new binder), re-test your sand.
 - Maintain communication with ARS and receiving partners.

Result: Compliance, savings, and sustainability without added operational headaches.

13. Real Cost Savings Example

Why Reuse Makes Financial Sense:

- Landfill Disposal Costs:
 - Disposal fee: ~\$70-\$150/ton
 - Landfill surcharge: +\$4.25/ton
 - Total = ~\$74.25-\$154.25/ton to landfill
- Beneficial Reuse Costs:
 - Transportation only: ~\$10-\$75/ton (varies by distance)

Savings Calculation:

If your foundry produces 1,000 tons/year:

Landfill cost: 1,000 tons x \$49.25 = \$49,250

Reuse transport cost (avg \$15/ton): 1,000 tons x \$15 = \$15,000

Total annual savings = ~\$34,250

Multiply this by 5–10 years and the impact becomes massive.

15. General FAQ & Landfill-Specific FAQ

Q: Is reused foundry sand safe for public use projects like roads or parks?

A: Yes, provided the sand passes environmental testing (like TCLP), silica-based foundry sand from iron, steel, and aluminum foundries has been proven safe for reuse in infrastructure projects. Illinois Environmental Protection Agency and U.S. EPA endorse reuse for approved applications like roads, landfill cover, and construction fill under 35 Ill. Adm. Code Part 817.

Q: How often does foundry sand need to be tested?

A: Sand must be tested initially to determine waste classification. After that, testing frequency depends on process consistency. Most foundries re-test yearly or if they change raw materials or binder systems.

Q: Can reused foundry sand be used near homes, gardens, or drinking water supplies?

A: Applications like road base and landfill cover are common and safe. For use in soils near gardens or homes, additional case-by-case approvals and environmental assurances may be needed (especially for soil amendments). Contact IEPA for site-specific guidance.

Q: What happens if a reused sand load fails testing after reuse starts?

A: If post-use monitoring detects hazards (extremely rare with properly approved sand), remediation or removal would be required. This is why initial proper testing and documentation are critical.

Q: Who is responsible for proving the sand is safe — the foundry or the user?

A: The foundry (generator) is responsible for testing and certifying that the sand meets regulatory requirements under 35 Ill. Adm. Code § 817.105 and 817.106. The end user must ensure they use the sand only in approved ways.

Landfill-Specific FAQ

Q: Does foundry sand affect landfill leachate or groundwater?

A: No. Studies by EPA, USDA, and Illinois Pollution Control Board confirm that properly tested ferrous foundry sand does not contribute hazardous leachate or groundwater issues.

Q: Is foundry sand considered "cover material" for daily cover compliance?

A: Yes. Illinois regulations under 35 Ill. Adm. Code § 811.106 approve beneficially usable foundry sand as alternative daily cover (ADC) material.

Q: Do we need special equipment to handle foundry sand?

A: No. Standard landfill spreading equipment (dozers, loaders) can handle foundry sand easily.

Q: How do we document use to maintain fee exemption?

A: Maintain simple load logs and daily cover documentation. IEPA can provide guidance on recordkeeping requirements for fee exemptions.

Q: What if sand chemistry changes?

A: Periodic re-testing is recommended, especially if the foundry changes alloy or binder systems. Contact IEPA if chemistry changes significantly.

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