



Foundry Sand Reuse in Indiana

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 Indiana, 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

Indiana Code and IDEM Regulations

Indiana is nationally recognized as a leader in foundry sand beneficial reuse. The state's regulatory framework, established through Indiana Code 13-19-3-7, explicitly authorizes the beneficial reuse of foundry sand without individual permits under specific conditions.

Indiana Code 13-19-3-7 permits the beneficial use of Type III waste foundry sand for multiple applications, including:

- Daily cover at landfills - Alternative Daily Cover (ADC) material

- Protective cover for landfill leachate systems - Engineering applications
- Capped embankments - Ground and sight barrier construction
- Land application and soil amendment - Non-landfill operations
- Structural fill base - Roads, parking lots, floor slabs, utility trenches, and bridges
- Raw material in products - Concrete, asphalt, Portland cement, flowable fill, and brick manufacturing

Type III Waste Classification

The Indiana Department of Environmental Management (IDEM) manages foundry sand beneficial reuse through a Type III waste classification system under 329 IAC 10-9. Once foundry sand is classified as Type III waste, it qualifies for permit-free beneficial use under pre-established criteria.

Key Regulatory Points:

- Foundry sand must be classified as Type III waste through IDEM (not automatically approved; requires 329 IAC 10-9-4 determination)
- Type III classification allows permit-free beneficial reuse
- Pre-approval applies mainly to silica-based sands from ferrous foundries (iron, steel)
- Non-ferrous foundry sands (e.g., brass, bronze) may require case-by-case evaluation due to potential lead content
- Alternative Daily Cover (ADC) requirements under 329 IAC 10-20-14.1 explicitly list foundry sand as eligible material

Alternative Daily Cover (ADC) Specifics:

- Foundry sand qualifies for 7-day notification ADC process (329 IAC 10-20-14.1)
- Minimum placement thickness: 6 inches
- Must not remain exposed longer than 7 working days
- Performance standards and silt/clay content requirements apply per regulation

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 Indiana.

Local Ordinances

Most municipalities and counties in Indiana defer to IDEM's framework regarding foundry sand reuse. When a reuse project complies with Indiana's Type III classification system and IDEM approval, additional local permitting is generally minimal. However, local governments may require notifications or approvals for larger volume projects, especially for uses near sensitive areas like wetlands or residential zones.

5. Reuse Applications and Indiana Examples

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

Common Beneficial Reuses

Reuse Application	Description	Indiana Status or Examples
Road Base & Fill	Substitute for sand/aggregate in road subbase, embankments, and structural fill. Provides bulk and drainage.	Permitted under IC 13-19-3-7 for Type III foundry sand. Used in local infrastructure projects and road construction. Approved for parking lots and city roads.
Cement & Concrete Production	Raw feedstock in Portland cement kilns (replaces virgin silica) or as fine aggregate in concrete and masonry products.	Indiana permits foundry sand use as raw material in Portland cement and concrete manufacturing. Regional cement facilities have expressed interest in Indiana foundry sand sourcing.
Landfill Uses	Daily cover (usually sand-soil mix), interim cover, or drainage layer material in liners and leachate systems.	Explicitly approved under 329 IAC 10-20-14.1 for use as alternative daily cover (ADC). Indiana landfills actively utilize Type III 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.	Permitted under IC 13-19-3-7 for land application purposes. Safe at appropriate blending ratios per EPA/USDA guidance. Subject to Type III classification.
Sandblasting Abrasive	Dry, granular sand used for surface blasting/cleaning in lieu of mined sand.	Permitted under Indiana regulations. Clean spent core sand from foundries may be used for

Reuse Application	Description	Indiana Status or Examples
		industrial blasting applications. Must be free of lead and appropriately sized.
Other Innovative Uses	Additional experimental uses subject to case-by-case review.	Subject to IDEM Office of Land Quality beneficial use determination on case-by-case basis.

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 Indiana IDEM 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

Contaminant	Source	Notes
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 Indiana 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 Indiana Reuse:

All sands used in landfill cover, road base, concrete, etc., must pass TCLP and have supporting documentation for IDEM Type III classification.

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

Type III Waste Classification Advantage:

- Indiana Code 13-19-3-7 establishes a regulatory framework that pre-approves certain beneficial uses without requiring individual permits
- This streamlines the approval process and reduces regulatory burden compared to other states
- Foundry operators and end-users can move forward with beneficial reuse projects more quickly

IDEM Technical Assistance:

- Free regulatory support and guidance available from IDEM Office of Land Quality for foundry sand reuse projects
- Contact: (317) 234-6923 or (800) 451-6027
- Assistance with Type III waste classification determination (329 IAC 10-9-4)

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
Type III Waste Classification	Regulatory Advantage	Permit-free beneficial use under IC 13-19-3-7 and 329 IAC Chapter 10	Streamlines approvals, reduces regulatory costs, enables faster project deployment
IDEM Technical Assistance	Technical Support	Free guidance from Office of Land Quality for Type III determination and beneficial use planning	Eliminates consulting costs for regulatory compliance review
EPA Sustainable Materials Management Grants	Federal Grants	Periodic funding for innovative reuse projects and pilot programs	Can fund equipment, infrastructure, or pilot projects
Infrastructure Investment and Jobs Act (IIJA)	Federal Funding	Recycling and waste reduction programs available to states and municipalities	Aligns with foundry sand reuse as waste diversion strategy
FHWA/DOT Recycled Materials Programs	Federal Support	Support for recycled materials in road construction and infrastructure	Promotes foundry sand use in highway and infrastructure projects

8. Active Participants in Indiana

Regulatory and Support Organizations

Indiana Department of Environmental Management (IDEM)

- Office of Land Quality

- Responsible for Type III waste classifications (329 IAC 10-9-4)
- Issues approvals for alternative daily cover at landfills (329 IAC 10-20-14.1)
- Provides technical guidance and regulatory support for beneficial reuse projects

Indiana Cast Metals Association (INCMA)

- Industry organization representing Indiana's foundry sector
- Provides technical resources, best practices, and advocacy for beneficial reuse initiatives
- Connects foundries with reuse opportunities and environmental compliance support

End Users (Consumers of Foundry Sand)

Indiana Landfills

- Accept Type III foundry sand for alternative daily cover and engineering applications
- Reduce operational costs through use of foundry sand instead of virgin materials
- Comply with 329 IAC 10-20-14.1 requirements for ADC placement and management

Construction and Infrastructure Contractors

- Use foundry sand as economical fill material for road subgrades, parking lots, and structural fill • Benefit from reduced material costs while supporting sustainable construction practices
- Work with local engineering and public works departments

Cement and Concrete Manufacturers

- May incorporate Indiana foundry sand as raw material feedstock
- Regional facilities interested in sourcing Indiana foundry sand for Portland cement manufacturing

Supporting Programs and Agencies

EPA Sustainable Materials Management Program

- Provides national guidance and support for industrial byproduct reuse
- Risk assessments and technical resources available to support state-level beneficial reuse programs

American Foundry Society (AFS)

- Provides technical manuals, best practice guides, and case studies
- Regional chapters and members actively promote foundry sand recycling

Federal Highway Administration (FHWA)

- Provides guidance and support for use of recycled materials in road construction

- Technical resources for engineers and contractors

Key Collaboration Insights

- Foundries generate consistent, tested sand streams suitable for beneficial reuse
- IDEM ensures regulatory compliance and streamlines Type III classification process
- Landfills and Contractors create end-use outlets for consistent, large-volume material flows
- Construction and Public Works generate project-specific demand for fill materials
- Federal Programs support innovative reuse projects and recycling infrastructure development

The synergy between foundries, regulatory agencies, and end-users creates opportunities for Indiana to continue leading in foundry sand beneficial reuse.

9. Success Story Highlights

Landfill Alternative Daily Cover Applications:

Indiana landfills have successfully implemented foundry sand as alternative daily cover under the 329 IAC 10-20-14.1 framework. These applications demonstrate:

- Consistent long-term performance with no environmental contamination issues
- Significant operational cost savings through elimination of virgin material purchases
- Compliance with stringent environmental protection standards
- Sustainable waste management practices aligned with Indiana's environmental goals

Road Construction and Structural Fill:

Foundry sand has been approved and used in Indiana infrastructure projects for:

- Highway and road subgrade construction
- Parking lot and site development
- Utility trench backfill
- Structural fill applications

These projects confirm the material's suitability and safety for transportation and construction applications under Indiana regulations.

Industrial and Commercial Development:

Type III foundry sand has been successfully incorporated into various Indiana development projects, including:

- Commercial site preparation
- Industrial park development
- Facility construction and expansion

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
- Meet corporate waste reduction goals

Why Contractors Should Reuse Sand:

- Get free or discounted sand for construction fill
- Improve project bids by lowering material costs
- Support sustainable construction practices
- Reduce project waste streams

Why Landfills Should Accept Foundry Sand:

- Secure free or low-cost cover material
- Reduce operating costs
- Increase daily cover efficiency
- Support circular economy initiatives

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, contractors) outlining responsibilities and confirming approved uses
- Site-Specific Approvals: For new or unusual uses not covered under Indiana's pre-approved applications, seek IDEM Type III determination or documented exemption
- Insurance: Verify liability coverage, and ensure your insurer understands your beneficial reuse activities
- IDEM Coordination: Maintain communication with IDEM Office of Land Quality regarding ongoing compliance and any process changes

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:

- Characterize:
 - Conduct TCLP testing on representative sand samples through an accredited laboratory
 - Confirm results meet non-hazardous thresholds
- Document:
 - Save all lab results, including full reports and summary sheets
 - Prepare material characterization summary
- Classify:
 - Submit documentation to IDEM for Type III waste classification (329 IAC 10-9-4)
 - Coordinate with IDEM Office of Land Quality
- Partner:
 - Contact ARS to match your material to a reuse project (landfill, construction, industrial)
 - Identify end-users and potential applications
- Agreement:
 - Sign a beneficial reuse agreement or memo of understanding with receiving facilities
 - Confirm compliance with 329 IAC Chapter 10 requirements

- Ship:
- Begin shipping sand as needed
- Label loads clearly and maintain load-out logs
- Ensure proper documentation accompanies each shipment
- Monitor:
- If your production process changes (e.g., alloy change, new binder), re-test your sand
- Maintain communication with IDEM and receiving partners
- Update Type III classification if necessary

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 (varies by facility): varies
- Total = approximately \$70-\$150+/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 \$100 (average) = \$100,000

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

Total annual savings = ~\$85,000

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. Indiana Code 13-19-3-7 and IDEM regulations endorse reuse for approved applications like roads, landfill cover, and construction fill.

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

A: Sand must be tested initially to prove non-hazardous status and support Type III 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). Consult IDEM 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 Indiana law. The end user must ensure they use the sand only in approved ways per IDEM determinations.

Q: What are Indiana's specific Type III waste requirements?

A: Type III waste classification under 329 IAC 10-9 requires material characterization (typically TCLP), documentation of intended use, and IDEM approval. Contact IDEM Office of Land Quality at (317) 234-6923 for specific requirements.

Landfill-Specific FAQ

Q: Does foundry sand affect landfill leachate or groundwater?

A: No. Studies by EPA, USDA, and IDEM confirm that properly tested ferrous foundry sand does not contribute hazardous leachate or groundwater issues. Indiana landfills using Type III foundry sand have reported no adverse environmental impacts.

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

A: Yes. Under 329 IAC 10-20-14.1, Type III foundry sand is explicitly approved as alternative daily cover (ADC) material.

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

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

Q: How do we document use to maintain IDEM compliance?

A: Maintain load logs detailing source, date, and volume of foundry sand received. Keep Type III classification documentation, certificates of analysis (CoA), and TCLP results on file. These records must be available during IDEM inspections.

Q: What are the placement thickness requirements for ADC?

A: Under 329 IAC 10-20-14.1, foundry sand ADC must be placed in a minimum 6-inch layer and must not remain exposed longer than 7 working days.

Q: What if sand chemistry changes?

A: Periodic re-testing is recommended, especially if the foundry changes alloy or binder systems. If material changes significantly, contact IDEM to determine if Type III classification remains valid or if re-determination is needed.

16. References

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