



Foundry Sand Reuse in Colorado

Best Practices & Regulatory Compliance

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3. Key Concepts and Definitions

What is Foundry Sand?

Foundry sand is high-purity silica sand used by Colorado's diverse manufacturing base—including mining, locomotive, and aerospace casting sectors—to create precise metal molds. Once the sand can no longer be used internally due to binder saturation or thermal fatigue, it is removed from the foundry loop as **spent foundry sand (SFS)**.

What is Beneficial Reuse?

In Colorado, beneficial reuse is the process of utilizing industrial byproducts as functional substitutes for virgin materials in applications like construction fill, road base, or manufactured soil. This process is governed by the state's solid waste regulations to ensure it does not negatively impact Colorado's vital groundwater or public health.

What is the TCLP Test?

The **Toxicity Characteristic Leaching Procedure (TCLP)** (EPA Method 1311) is the core test used to verify that spent sand is not a hazardous waste. In Colorado, passing TCLP is the first technical requirement to qualify for the streamlined "Recycling and Beneficial Use" pathways under **6 CCR 1007-2**.

4. Regulatory Guidelines

Colorado Dept. of Public Health and Environment (CDPHE)

The **CDPHE**, specifically the Hazardous Materials and Waste Management Division, regulates the beneficial reuse of materials through its solid waste program.

Specific Legal Citations:

- **6 CCR 1007-2 Part 1, Section 8:** "Recycling and Beneficial Use." This is the primary regulation for Colorado foundries, establishing a comprehensive framework for managing industrial materials without a solid waste permit.
- **Section 8.2:** Categorizes reused materials into Category 1, 2, or 3 based on their chemical profile and leaching mobility.
- **Section 8.3:** Outlines the specific performance standards for storage and application of beneficially used materials.

Categorization Framework

- **Category 1:** Materials with unrestricted use (meeting stringent soil-risk levels).

- **Category 2:** Materials suitable for un-bound civil engineering (e.g., road base, structural fill).
- **Category 3:** Materials suitable for encapsulated use (e.g., asphalt or concrete additive).

5. Reuse Applications and Colorado Examples

Application	Description	Colorado Context
Asphalt Additive	Fine aggregate in asphalt mixes.	Widely used by Front Range paving giants like Martin Marietta .
Flowable Fill	Controlled low-strength material (CLSM).	High demand in Denver-area municipal utility and pipe-bedding projects.
Landfill Intermediate Cover	Use as cover between active landfill cells.	Helps regional landfills meet CDPHE odor and vector control standards.
Road Sub-base	Foundation layer for road beds.	Subject to CDOT (Colorado DOT) engineering specifications.
Industrial Structural Fill	Filling building pads or embankments.	Subject to Section 8.2 (Category 2) leaching mobility limits.

6. Environmental and Technical Considerations

Front Range Regulatory Context

- **Front Range User Fee (FRUF):** Colorado imposes a specific state surcharge on waste disposal in Front Range counties (Denver, El Paso, Pueblo, etc.).
- **2026 Surcharge:** Effective January 2026, the Front Range surcharge is **\$3.63 per ton**. Diverting sand for reuse typically allows a generator to bypass this state-mandated cost.

Physical Stability

SFS from Colorado's iron foundries often contains bentonite clay. While excellent for mold-making, this clay must be evaluated for its swelling potential if used in un-bound structural fill beneath building slabs.

7. Funding, Grants, and Incentives

RREO Grant Program

The **Recycling Resources Economic Opportunity (RREO)** Grant Program, administered by CDPHE, provides funding for recycling equipment and market development. Foundries can apply for RREO funds to purchase on-site sand cleaning and reclamation systems.

Pollution Prevention (P2) Program

CDPHE provides free technical assistance to industrial facilities looking to reduce waste at the source. Implementing a sand reclamation system can help a foundry achieve "Sustainable Business" recognition through the Colorado Environmental Leadership Program (ELP).

8. Active Participants in Colorado

Major Foundries:

- **Western Foundries, Inc.** (Longmont) - Gray and ductile iron sand castings.
- **Precise Cast Prototypes** (Denver) - Advanced aluminum sand casting.
- **Protocast Inc.** (Commerce City) - Aluminum, magnesium, and zinc castings.
- **T&T Foundry, Inc.** (Pueblo) - Custom machined metal components and assemblies.
- **Uhrich Locomotive Works** (Pueblo) - Specialized metal castings for rail infrastructure.

Potential End-Users:

- **Martin Marietta** (Regional) - Major aggregate, asphalt, and concrete producer.
- **Brannan Sand & Gravel** (Denver) - Large-scale paving and civil contractor.
- **Kilgore Companies** (Front Range) - High-demand user of recycled aggregates.
- **Waste Management (Front Range Landfill)** - User of alternative daily cover.

9. Success Story Highlights

Longmont Industrial Synergy: Ferrous foundries in the Front Range corridor, such as **Western Foundries, Inc.**, have successfully transitioned spent "Green Sand" from landfill disposal to asphalt batch plants in the Denver metro area. By satisfying the CDPHE Category 2 mobility limits, the sand acts as a functional substitute for virgin fines, avoiding local gate fees (which can reach **\$98.00 per ton**) and bypassing the **\$3.63 per ton** Front Range state surcharge. These partnerships provide local paving contractors with high-quality recycled content while significantly reducing the environmental footprint and operational costs of industrial manufacturing in Colorado.

10. Clear Business Case Summary

1. **Avoidance of Gate Fees:** Saving up to **\$98.00 per ton** in the Denver metro region.
2. **Exemption from State Surcharges:** Bypassing the **\$3.63/ton** Front Range User Fee.
3. **Reduced Procurement Costs:** Using recycled sand in internal site development or structural fill for facility expansions.

11. Risk Management Overview

- **Groundwater Protection:** Materials used in un-bound applications must pass Category 2 Mobility limits (Table 1B of 6 CCR 1007-2) to ensure zero risk to Colorado's water table.
- **Dust Mitigation:** Foundries must ensure that SFS is stored in a manner that prevents wind-blown dispersal, as required by CDPHE storage performance standards.

12. Step-by-Step Workflow for Foundries

1. **Analytical Testing:** Conduct a full suite analysis (Totals and Mobility) per **6 CCR 1007-2 Tables 1A and 1B**.
2. **Category Determination:** Identify if the sand is Category 1, 2, or 3 based on results.
3. **Pre-Approval Verification:** Determine if the intended reuse (e.g., asphalt) is a pre-approved use in Colorado.
4. **Logistics Documentation:** Maintain records of the "Beneficial Use Determination" and tonnage logs for annual state audits.
5. **Execution:** Deliver sand to the approved end-user per engineering specifications.

13. Real Cost Savings Example

Scenario: A Denver County foundry generating 2,500 tons of sand annually.

- **Disposal Cost (at \$101.63/ton incl. surcharge):** \$254,075
- **Reuse Program (Testing + Logistics + Compliance):** \$60,000
- **Annual Savings:** \$194,075

15. General FAQ & Landfill-Specific FAQ

Q: Do I need a solid waste permit to reuse sand as asphalt aggregate?

A: No, if it meets Category 3 standards and is used according to Section 8, it is considered "Recycling" rather than "Waste Disposal."

Q: Are Larimer County fees lower than Denver?

A: Yes, gate rates at Larimer landfills are significantly lower (~\$35/ton), but the state surcharge of \$3.63 still applies.

16. References

1. **6 CCR 1007-2 Part 1, Section 8:** [Recycling and Beneficial Use Regulations](#).
2. **CDPHE Solid Waste User Fee:** [State Surcharge and Fee Schedule](#).
3. **Colorado RREO Program:** [Recycling Resources Economic Opportunity Grants](#).
4. **CDOT Standard Specifications:** [Division 700 - Materials Details](#).

5. **Larimer County Landfill:** 2026 Master Fee Schedule.
6. **EPA SMM Technical Guidance:** Foundry Sand in Transportation Applications.