

Industry Assessment

Technical Brief

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Office of the
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Review of Construction Material Specifications and Standards for Acceptance and Testing of Slag

Overview

This technical brief examines how slag materials of all types are addressed within construction material specifications and standards, with emphasis on material definitions, acceptance criteria, and referenced testing methods. The review considers national standards (ASTM, AASHTO), technical guidance documents (FHWA), and State DOT standard specifications. The assessment indicates that testing procedures and evaluation methods for slag cement (GGBFS) are largely standardized at the national level for assessing chemical, physical, mechanical, and durability-related properties. However, dedicated material classifications and standalone specifications are not equally developed for all slag-derived materials, such as EAF or BOF slag. Specifications often reference established ASTM and AASHTO test methods to evaluate key performance characteristics relevant to the intended application. Despite the common technical foundation, differences arise in how agencies distinguish qualification testing from acceptance testing and apply durability- or expansion-related limits. This indicates that while national standards provide consistent technical evaluation methods, acceptance language, verification protocols, and application-specific requirements remain distributed across multiple State DOT specifications.

Key Takeaways

- Documentation and data availability are uneven across slag types.
- Steel/EAF slag use in construction relies largely on alternate-material approvals rather than structured national specifications.
- Qualification, acceptance, and aging requirements differ among State DOTs.
- Centralized datasets for steel/EAF slags and non-ferrous slags remain limited.
- No cementitious material specifications exist for steel/EAF slag comparable to ASTM C989/AASHTO M 302 for slag cement.
- Expansion limits and test methods vary across jurisdictions without harmonized national criteria.
- Research-supported processing and stabilization pathways for steel slag are not codified in national specifications.
- Unused slag-derived materials lack standardized evaluation and classification frameworks.

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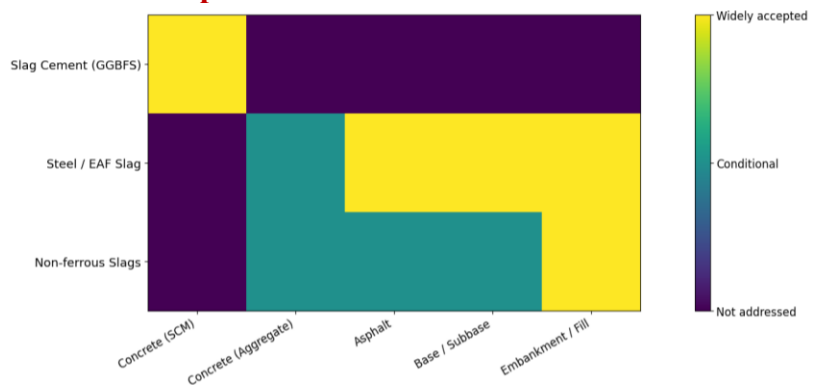
Specification-Based Classification



Sources: ASTM C989/C989M; ASTM D2940/D2940M; ASTM D4792/D4792M; AASHTO M 302; FHWA Steel Slag User Guidelines.

While slag cement is permitted as an SCM under specifications ASTM C989/C989M and AASHTO M 302, comparable standalone specifications for steel/EAF slag remain limited. Steel/EAF slag is primarily addressed within aggregate or base material standards. Processed EAF slag and other slag-derived materials proposed for cementitious applications are not currently addressed in dedicated ASTM/AASHTO standards, and associated processing considerations and acceptance-related material requirements are not yet standardized within national specifications. Similarly, the absence of material specifications for non-ferrous slags and other emerging slag-derived materials creates a gap in standardized classification and verification protocols. As a result, agencies commonly rely on project-specific qualification procedures and compliance testing provisions, which may vary across jurisdictions.

Treatment of Slag Across Application and Specification and Documentation Gap



Source: National guidance and State DOT policy documents

Widely accepted: explicitly addressed in guidance and/or permitted by State DOTs; Conditional: permitted under certain circumstances, rather than being universally allowed; Not addressed: No consistent policy language identified in guidance or State DOTs.

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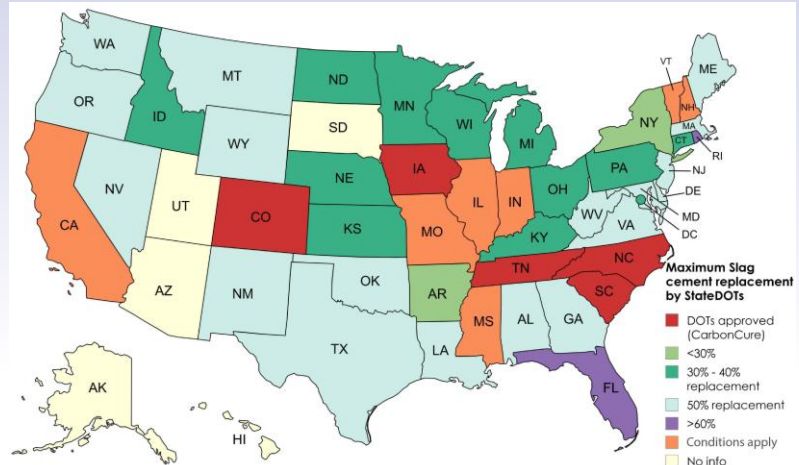
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United States Department of Transportation Research Initiative on the Use of Steel Slag in Concrete and Cement



Maximum slag cement replacement by State DOTs (Source - Slag Cement Association, 2018)

Conditions apply: CA - 50% (95% for IS), MO - 30% (25% for IS), IL - 35% (65% for mass concrete), IN - 30% (04/01-10/15), MS - 50% (75% for mass concrete), NH - No max (50% min. for ASR), VT - No max (25% min), IA - 35% (up to 50% w/ash).

Source	EAF Slag Coverage	Key Limitation
ASTM Standards	Addressed primarily within aggregate-related standards	No dedicated specification for processed EAF slag intended for cementitious applications
AASHTO Standards	Covered under aggregate/base material provisions	Absence of specification defining EAF slag or other emerging slag for cementitious use
State DOT Specifications	Across select aggregate, asphalt, and base applications	Acceptance limits, terminology, and qualification pathways vary by jurisdiction
FHWA Guidance	Broad discussion of steel slag behavior and performance considerations	Guidance not structured as enforceable material acceptance criteria
Academic Literature	Numerous laboratory-scale investigations, including durability and reactivity studies	Findings do not directly translate into standardized specification provisions

The figures and table collectively illustrate variability in documentation, specification coverage, and acceptance frameworks across slag types and application categories. While slag cement replacement limits have been compiled (e.g., Slag Cement Association, 2018), allowable ranges differ by state and are not consistently supported by explicit technical justification or periodic review. In contrast, consolidated national provisions governing the acceptance and qualification of steel/EAF slag, non-ferrous slags, and emerging processed slag-derived materials remain limited or absent. Accordingly, consideration may be given to permitting processed steel slag for applicable construction uses, provided project specifications clearly define required treatment, conditioning, and performance-based testing criteria to ensure material stability and durability.

This brief summarizes findings on material specifications and standards for acceptance and testing of slag as part of the industry assessment for USDOT-SLAG, “Research Initiative on the Use of Steel Slag in Concrete and Cement” under cooperative agreement 693JK42550005. Information supporting these findings can be found at: <https://cait.rutgers.edu/usdotsteelslag/publications/>. Inquiries about this work can be sent to: usdotsteelslaginitiative@rutgers.edu