



## SLAG RAILROAD BALLAST

### MANUFACTURER

Locations of steel slag aggregate for Railroad Ballast can be contacted by visiting [www.phxslag.com](http://www.phxslag.com).

### PRODUCT DESCRIPTION

**Composition:** Slags used as ballast and subballast aggregates are the non-metallic by-products of iron or steelmaking furnaces, as follows:

- (1) Air-cooled blast furnace slag consists principally of silicates and aluminosilicates of lime and other bases. It is formed simultaneously with iron in a blast furnace, and solidifies under atmospheric conditions.
- (2) Granulated blast furnace slag has the same composition as the air-cooled slag but is a glassy, granular material formed by quenching the molten slag in water.
- (3) Steel slag is a by-product of open hearth, electric, or oxygen steel furnaces and consists principally of a fused mixture of oxides and silicates. (Note: Some specifications refer to steel slag as "open hearth" slag since the open hearth has been the most commonly used type of steel furnace.)

**Basic Use:** Coarse aggregate sizes of air-cooled blast furnace slag and of steel slags are used railroad tracks, from industrial spurs and yards to high-speed main lines. The screenings (fine aggregate sizes) of air-cooled and steel slags and the granulated blast furnace slags are used as subballast to prevent intrusion of subgrade soils into the ballast sections.

**Limitations:** None.

**Sizes:** Standard ballast aggregate sizes specified by rail-



roads. Applicable Standards: American Railway Engineering Association (AREA) Specification for Prepared Slag, Stone and Gravel Ballast and Federal Specification SS-S- 449: Slag and Stone, Crushed; Gravel, Crushed and Uncrushed (for Railroad Ballast).

### TECHNICAL DATA

**General:** Characteristics such as unit weight and specific gravity vary with type of slag, gradation, and, to a lesser extent, between sources of the same type. The producers in the Particular project area should be consulted for information on the specific types available and their characteristics. Shape and Surface Texture: Air-cooled blast furnace slag and steel slag are crushed products, and have angular, roughly cubical particle shape with pitted vesicular surfaces.

**Durability:** All types of slag are highly resistant to weathering action such as freezing and thawing. Sulfate soundness losses (ASTM C 83) are exceptionally low for both the air-cooled blast furnace slags and steel slags.

**Stability:** Rough surfaced, angular particles that develop high internal friction are desirable to grip railroad ties, maintain

Size No.	Screen Size Nominal, In.	Percents by Weight Passing Screens							
		2"	1-1/2"	1"	3/4"	1/2"	3/8"	#4	#8
4	1-1/2"-3'4"	100	90-100	20-55	0-15	..	0-5	..	..
5	1"-3/8"	..	100	90-100	40-75	15-35	0-15	0-5	..
57	1"-#4	..	100	95-100	..	25-60	..	0-10	0-5

proper anchorage and alignment and provide uniform load distribution. Crushed slag typically has a high angle of internal friction, usually in the range of 45 to 50°. The hardness of slag on Mohs mineralogic scale is usually 6 to 7, compared to values of 3 to 4 for limestones and 7 for quartz. Change in gradation under traffic is negligible due to the hardness and high stability which minimizes inter-particle movement.

**Weight:** Compact unit weights (ASTM Method C 29) of air-cooled blast furnace slag coarse aggregates are in the range of 70-90 lb./cu. ft. as compared to weights of 100 lb./cu. ft. or more for the heavier natural aggregates and steel slags. A cubic yard of ballast, in place, uses a correspondingly low weight of the air-cooled slag. The finer sizes of other aggregates used for this purpose have compacted weights generally in excess of 100 lb./cu. ft.

#### **Electrical Resistance:**

A minimum resistance to passage of an electric current of 2 ohms per thousand feet of track is specified by the AAR Communication and Signal Section. Laboratory tests at the AAR Research Center on small sections of saturated slag ballast indicated the following resistances per 1000 feet of track length: steel slag-15.0 ohms, blast furnace slag-20.0 ohms ("Ballast Tests," Report of Committee 1 Roadway and Ballast, Bulletin No. 573, American Railway Engineering Association, Sept.- Oct., 1962). These resistance values are far in excess of the minimum specified to avoid short-circuits of signal systems.

## **INSTALLATION**

**Methods:** Standard construction equipment and practices are used as for any ballast material.

Placement and compaction of sub ballast and the lower part of the ballast can be done with regular ballast placing and tamping procedure or with roadway and embankment construction equipment. Placement and tamping of the top ballast around and between ties in the final track alignment may be done either with hand tools on small jobs or with the special



ballast placing and tamping machines used by the railroads on larger projects.

## **AVAILABILITY AND COST**

**Availability:** Locations of Phoenix Services sites can be found on the company website in the "Slag Sales" section. The contact information for the slag sales representatives is included on the individual site section.

**Cost:** Information can be obtained from producers in the individual project area.

## **GUARANTEES**

Aggregates of all types are usually purchased on the basis of standard specification requirements which should be met at

the production plant. Aggregate producers cannot assume responsibility for contamination, segregation or the effects of mistreatment or misuse of the aggregate after it leaves their control.

## **MAINTENANCE**

No special maintenance is required for slag ballast due to its resistance to degradation. Under some exposure conditions, fines may accumulate from other sources spillage from cars, dust, etc.-to interfere with proper drainage of the ballast.

If this occurs, the ballast should be cleaned (fines removed) and replaced.

## **TECHNICAL SERVICES**

Technical assistance in the proper application of slag in base courses and additional information on properties and characteristics are available on request through the National Slag Association web-

site ([www.nationalslag.org](http://www.nationalslag.org)).



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