



**1. PRODUCT NAME**

**STEEL SLAG BASE AND SUBBASE AGGREGATES**

**2. MANUFACTURERS**

Producers of steel furnace slag aggregates for base course and subbase construction (applicable under either rigid or flexible pavements) can be contacted by visiting the NATIONAL SLAG ASSOCIATION at [www.nationalslag.org](http://www.nationalslag.org).



**3. PRODUCT DESCRIPTION**

**Composition:** Steel slag is the by-product of steel making. It is produced in one of three furnace types: Open-Hearth, Basic Oxygen or Electric Arc Furnace. Electric Arc Furnace (EAF) steel slag is most predominant in the marketplace. Steel slag consists principally of calcium silicates and calcium aluminoferrites and fused oxides of calcium, iron, magnesium and manganese. The compositions vary with the type of furnace, composition of furnace charges, grades of steel produced and with individual furnace operating practices.

(1) Molten steel slag is solidified by cooling at prevailing atmospheric conditions. After solidification, cooling may be accelerated by applications of water.

**Basic Use:** Aggregates are used for base and subbase road construction. In addition to applications requiring graded aggregates, pit run steel slag is extensively used for subbase construction in some areas, especially where weak subgrade conditions exist.

**Limitations:** Uses in bases and structural fills, where very high stabilities are obtained, may require proper selection, processing and aging (weathering) before use. Steel slag may contain free lime (CaO or MgO) that may cause the slag to be expansive or cause differential movement when used as a base. Steel slag is not recommended for use in rigid confined applications – such as concrete aggregate, base or fill under structures or floor slabs, or backfill against structures or bridge abutments.

**Shape and Texture:** Steel slag is a crushed product having hard, dense, angular and roughly cubical particles.

**Applicable Standards:** Steel slag meets the requirements of ASTM D 694 and D 1241, of national agencies, and of local highway departments for macadam and crushed aggregate bases. Local highway department standards or the producer’s recommendations are applicable for both base and subbase courses.

**4. TECHNICAL DATA**

**General:** Characteristics such as specific gravity vary by type of slag and by source. The producers in the particular project area should be consulted for data on their specific product. Steel slag should be tested for expansion (ASTM D 4792 or other approved method) prior to use as a base material for pavement.

Size and Grading Requirements Sub-base Applications	
Sieve Size	%Passing Sieve
2"	100
3/4"	52 - 100
3/8"	36 - 70
#4	24 - 50
#8	16 - 38
#16	10 - 30
#200	0 - 10

Standard Compaction of Dense Graded SF Slag Aggregate typically 140 lb/cft

Table: Strength Characteristics of Materials

Test Characteristics	Steel Slag
Maximum Size	1.0"
Moisture Content	8.1 - 9.4
CBR at 0.2", % of standard	120 - 132
Specific Gravity	3.2
Unit Weight	153 lb/cu.ft. (compacted)

**Durability:** The slags are highly resistant to weathering action such as freezing and thawing. Sulfate soundness losses (ASTM C 88) are low for the steel slags. LA Abrasion testing shows steel slag to be a hard aggregate.

**Base Course Strength Properties:** Tests of typical steel slag base course materials, using the California Bearing Ratio test (ASTM Method D 1883) on soaked specimens compacted to modified Proctor densities (ASTM Method D 1557), gave the results shown in the table above. Cementitious properties of the steel slag are shown by the test results as compacted and 28 days later.

Compacted densities will vary somewhat with gradation and specific gravity of the individual slag. The amount of compaction will have a marked effect on the CBR values, however, present field compaction equipment is capable of attaining the ASTM Method D 1557 values and a CBR value of 100 is the maximum ordinarily specified for the highest types of base courses—those directly under flexible pavements on heavy-duty airfields.

## 5. INSTALLATION

**Methods:** Use of standard construction practices is

recommended. In most cases, the equipment, procedures and compaction requirements specified by the state highway department represent the best practice for a given area and should be followed.

## 6. AVAILABILITY AND COST

**Availability:** Steel slag base and sub-base aggregates are available in areas around steel producing centers. Not all



types are available in all areas, however, and producers should be consulted to determine types being marketed in specific locations. Locations of steel mills can be found on the the National Slag Association website, [www.nationalslag.org](http://www.nationalslag.org).

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

## 7. 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.

## 8. MAINTENANCE

If unprotected base courses are subjected to traffic for any significant period of time, "dusting" or abrasion and wear of the surface will result.

Dependent upon the time and traffic involved before placement of the pavement, this can be minimized or eliminated by wetting the surface, CaCl treatment,

Dust Control Emulsion or by application of a bituminous surface treatment. Base failures are usually caused by soft, yielding underlying sub-grades. Such areas should be repaired by excavating and replacing them with properly compacted subbase materials or by use of a thicker base course.

## 9. 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 either the National Slag Association or the member companies.



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