



## **Iron and Steel Making Slag – Environmentally Responsible Construction Aggregates**

The National Slag Association proves that Iron and Steel Making Slag materials present no threat to human health or to the environment.

### **Challenge:**

The National Slag Association wanted to prove that Iron and Steel making slags are suitable aggregate materials for use in a variety of residential, agricultural, industrial and construction applications.

The slag materials represented by the National Slag Association are generated in the Iron and Steel making process. Blast Furnace (BF) Slag is generated simultaneously with the production of iron on a blast furnace and Steel making Slag is a co-product of the steel produced either in a Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF). The slag is removed from the furnace at 1,600°C (3,000°F) and cooled to ambient temperatures prior to being crushed and screened into various sizes of construction aggregates.

Through work with governmental agencies, environmental scientists and toxicologists, Iron and Steel making slag has been approved for use by many environmental regulatory agencies and State Departments of Transportation.

### **Solution:**

Iron and steel slags have been extensively tested using certified laboratories, following USEPA and American Society for Testing Materials (ASTM) procedures. Tests conducted include: the Toxic Characteristic Leaching Procedure (TCLP) EPA Method 1311 test, ASTM Distilled Water Leachate ASTM Method D3987-85, Major Element Bulk Chemistry, Minor Element Bulk Chemistry and other tests. Since iron and steel slag is generated in a 1600° C (3000° F) furnace, organic, semi-volatile, or volatile compounds are not present in iron and steel slag. Chemically iron and steel slag consists primarily of oxides of calcium, iron, silicon, aluminum, magnesium and manganese in complexes of calcium silicates, aluminosilicates and aluminoferrite (primarily with BOF and EAF slag). These compounds are generally similar to those found in the natural  
(over)

environment. The metals in slags are fused together and tightly bound, therefore are not readily liberated from the slag particle or easily leached into the environment.

A Steel Slag Coalition was formed consisting of a group of 63 steel makers and slag processing companies which tested iron and steel slag from 73 different generating sources and subsequently prepared a risk assessment.

Environmental scientists and toxicologists completed an industry-wide "Human Health and Ecological Risk Assessment (HERA)". Based on worst case exposure assumptions the HERA demonstrated that iron and steel slag poses no meaningful threat to human health or the environment when used in a variety of residential, agricultural, industrial and construction applications. Consequently, the metals in the slag matrix are not readily available for uptake by humans, other animals or plants, do not bioaccumulate in the food web and are not expected to bioconcentrate in plant tissue.

Slag has been safely and successfully used as a construction aggregate in many applications such as asphaltic concrete, Portland cement concrete, roadway embankment and shoulders and on unpaved roads, parking lots, walkways, and driveways. Non-construction related applications include the Portland cement production, agricultural applications such as soil remineralization, pH supplement / liming agent, for treating acidic run-off from abandoned mines and for remediation of industrial waste water run-off. Contact your local **National Slag Association member** or the **National Slag Association** for appropriate uses of Iron and Steel Slag.

Iron and steel slag may be applied safely in aquatic environments, such as rivers, lakes or streams without impacting water quality or aquatic life. Prior to using slag in small aquatic bodies or stagnant water, contact the **National Slag Association** for a full **Risk Assessment Analysis** report. A full report is available for a nominal cost.

The U.S. Department of Interior, U.S. Geological Survey tracks mineral industry sales and they report that roughly 19,000,000 tons of iron and steel slag are sold annually for use in construction with a commercial value of \$150 million USD. Slag products are used extensively in the US with more than 50% of the iron and steel slag sold in the United States used for road construction.

Using iron and steel furnace slag will help preserve our natural resources. Based on the numerous environmental tests, studies and reviews by governmental agencies and the iron and steel industry we know iron and steel slag is a safe and valuable resource, and we encourage its use as an environmentally friendly product.

***Developed by the National Slag Association - Environmental Committee***