

Physical and Chemical Characteristics of Blast Furnace, Basic Oxygen Furnace, and Electric Arc Furnace Steel Industry Slags

D. M. PROCTOR*

ChemRisk, McLaren/Hart, Inc., 16755 Von Karman Avenue, Irvine, California 92606

K. A. FEHLING

Exponent, 1970 Broadway, Suite 250, Oakland, California 94612

E. C. SHAY

ChemRisk, McLaren/Hart, Inc., Two North Shore Center, Suite 100, Pittsburgh, Pennsylvania 15212

J. L. WITTENBORN AND J. J. GREEN

Collier, Shannon, Rill & Scott, PLLC, 3050 K Street NW, Washington, DC 20007

C. AVENT

North Star Steel, Centennial Lake Office Park, 7650 Edinborough Way, Suite 600, Edina, New York 55435

R. D. BIGHAM

Edw. C. Levy Co., 8800 Dix Ave., Detroit, Michigan 48209

M. CONNOLLY

International Mill Service, 1155 Business Center Drive, Suite 200, Horsham, Pennsylvania 19044-3454

B. LEE

Structural Metals, Steel Mill Road, P.O. Box 911, Seguin, Texas 78156-0911

T. O. SHEPKER

WCI Steel, 1040 Pine Ave. SE, Warren, Ohio 44483

M. A. ZAK

U.S. Steel, 600 Grant Street, Pittsburgh, Pennsylvania 15219-2749

Approximately 21 million tons of steel industry slag are produced each year in the United States, and many productive commercial uses of slag have been developed (e.g., road bed, fill material). However, because slag contains heavy metals at concentrations that are higher than in most soil, questions have been raised regarding the need to evaluate the potential human health and environmental hazards associated with current applications. To enhance general understanding of the physical and chemical characteristics of this material, slag samples from 58 active mills with blast furnaces, basic oxygen furnaces, and/or electric arc furnaces were examined. This study profiles the major and minor constituents of slag from each furnace type and reports the leachability of metals from slag under neutral and acidic conditions. Particle size distributions and partitioning coefficients (K_d) are also reported. Although concentrations of metals in slag are elevated relative to concentrations in soil, the metals in slag are tightly bound to the slag matrix and not readily leached. This study represents the most complete characterization of steel industry slag currently produced in North America, encompassing mills that collectively produce over 47% of steel industry slag. These data provide insights that may be useful for evaluating the marketability of steel industry slag and for human and ecological health risk assessment of environmental applications.