Slag Roofs

NSA 172-6

PREFERRED
BY
ARCHITECTS
CONTRACTORS. . .OWNERS

- SLAG PROVIDES MANY ADVANTAGES

Excellent Bonding
Durable Particles
Superior Reflectivity
Greater Insulation
Simplified Handling
Longer Roof Life
Lighter Weight
Higher Fire Resistance
Lower Costs
Pneumatic Lift Option

SPECIAL ROOFING REQUIREMENTS

Mineral aggregate coatings are applied to built-up roofing to reduce the fire hazard, and to protect and hold the bitumen. In addition to deterioration from the harmful actinic (radiant energy) and photochemical rays of sun, exposure of roofs is very severe because of the contrasts of summer and winter temperatures, high winds, rains, alternate freezing and thawing, and action of corrosive gases from chimneys.

Air cooled blast furnace slag is used on millions of squares (100 sq. ft.) of built-up roofing for such buildings as factories, warehouses, offices, stores, schools, private homes. General acceptance of slag as a superior roofing aggregate is indicated by the fact that in localities where available it is the chief mineral aggregate used for this purpose. Because of its opacity, vesicular surface, hydrophobic (affinity for bitumen) characteristics, and other favorable characteristics tabulated on the next page, blast furnace slag roofing chips are preferred by owners, architects and contractors over all other roofing materials.

WHAT IS BLAST FURNACE SLAG?

Blast furnace slag is the non-metallic by-product of the production of iron in the blast furnace. It consists primarily of silica and alumina from the original iron ore, combined with calcium and magnesium oxides from the flux stone. It comes from the furnace as a liquid resembling a molten lava at about 2700°F. It is free from deleterious materials such as: shale, chert, clay, and organic matter.

Air cooled slag is produced by permitting the molten slag to harden in a pit under prevailing atmospheric conditions. After the slag has cooled sufficiently to be handled it is excavated with power machinery, crushed, and screened to desired sizes. The weight range for air cooled slag aggregate is usually 70 - 85 lbs. per cu. ft.

Fig. 1

Vesicular texture of blast furnace slag chips.

Fig. 2

Typical appearance of slag roofing in place.

SPECIFICATIONS

Slag exceeds the requirements of ASTM Specification D 1863-64, Mineral Aggregate for Use on Built up Roofs, used by organizations such as AIA, CSI, AREA and U.S. Government. ASTM specifications include the following reference to blast furnace slag:

General Characteristics

Crushed Slag – the slag at the time of application shall be hard, air-cooled blast furnace slag that is surface dry (up to 5 per cent by weight moisture content), and free of sand, clay or other foreign substances.

Sieve Analysis Requirements

Sieve	Total Passing, per cent
3/4 in.	100
1/2 in.	90 to 100
3/8 in.	40 to 70
No. 4	0 to 15
No. 8	1 to 5

Physical Property Requirements

Moisture, max., per cent:	
Crushed stone and gravel	0.5
Crushed roofing slag	5.0
Unit weight (loose), min. lb. per cu. ft.	60
Dust, max., per cent	0.5
Hardness, max., percentage passing a No. 6 (3.36mm) sieve	20

WHY IS SLAG "THE BEST"?

FACTOR	SLAG CHARACTERISTIC/PERFORMANCE
Excellent Bonding	Vesicular surface and hydrophobic properties provide excellent adhesion to bituminous materials Large surface area of blast furnace slag resists movement of bitumen in hot weather
Durable Particles	Excellent resistance to freezing and thawing, and other deleterious weathering influences Sodium sulfate soundness loss less than 5% after 20 cycles
Superior Reflectivity	Light grey color provides a high degree of reflection of heat and actinic rays (which deteriorate bitumen)
Greater Insulation	Lower K Factor slag = 1.5 stone = 2.5 gravel = 2.6
Simplified Handling	Hardness minimizes dust Lightweight = easy handling
Longer Roof Life	High resistance to crushing and Mohs hardness (7) minimizes losses due to use of equipment and workmen traffic during construction and maintenance
Lower Design Stresses	Lighter weight = less dead load, permitting design economies.
Maximum Fire Resistance	Roofs will exceed UL Class A Fire Retardent Standards with 300 # per square
Economy	1/3 more coverage than natural aggregates Slag = 300 #/roofing square (100 sq. ft.) Stone and Gravel = 400 #/ square Low maintenance cost
Pneumatic Lift Option	Has been pneumatically lifted to height of 375 ft. with 9 psi pressure using 4" pipe and conventional pneumatic equipment

EXAMPLES OF SLAG ROOFS

Slag has demonstrated its superior qualities as a durable roofing aggregate on many types of construction coast-to-coast, from individual homes to huge industrial complexes.

Fig. 3
Ford Parts Redistribution Center

Long life and low maintenance costs are hallmarks of slag roofs. An example is the large automotive manufacturing plant built in Cleveland, Ohio in 1948-49. This structure used 2,850 tons of blast furnace slag on its built up roof, over 30 acres in area. Now more than 22 years old, it has not had any significant roof problems and maintenance costs have been minimal.

One of the most recent examples of the latter is the 4,548 tons of air cooled blast furnace slag used to cover 3,032,000 sq. ft. of built-up roofing on the Ford Motor Company's new Autolite Plant at the Ford Parts Redistribution Center in Brownstown Township, Michigan. The use of slag on this roof reduced the deadload for which the roof structure had to be designed by 3,000,000 lbs.

Slag has been used extensively on Government Buildings in Washington, D.C. One of these is the State Department building shown below.

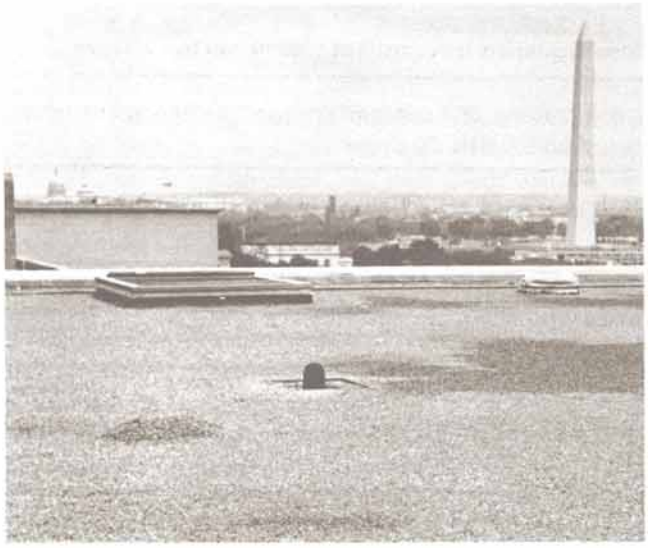

Fig. 4

Slag roof, State Department Building, Washington, D.C.

In many areas of the country, especially California, slag is the preferred material for housing roofs. It continues to be used exclusively at the Rossmore Leisure World developments at Laguna Hills and El Toro, California. To date over 320,000 roof squares have been covered with slag on more than 15,000 units. Slag continues to be used because it has demonstrated by in-place performance that its claim of excellence is factual.

Fig. 5

Rossmore Leisure World Housing

Slag's ability to adhere permanently to the roof bitumen is demonstrated by the performance of the slag chips on the Convention Hall roof in Houston, Texas. 16 acres of 5/8" - 1/4" blast furnace slag on a 1 on 5 slope has not had any maintenance problems in the 6 years it has been in place to date and inspection indicates no sign of future problems.

Fig. 6

Convention Hall, Houston, Texas

Slag is preferred for large industrial building roofs. An example is the large automotive assembly plant constructed in Talbotville, Ontario, Canada in 1965-66, which used 3,000 tons of 1/2" - #4 blast furnace slag on its 1,500,000 sq. ft. roof.

Fig. 7

Assembly Plant, Talbotville, Ontario

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