Manufacture of Slag Cement
Opening a Tap-Hole on ‘L’ Furnace
Portland Cement Reaction

Portland Cement + Water → Calcium-Silicate Hydrate + Calcium Hydroxide
Slag Cement Reaction

Slag Cement + Water → Calcium-Silicate Hydrate

Slag Cement + Water + Calcium Hydroxide → More Calcium-Silicate Hydrate

From Portland Cement
Plastic Properties

- Reduced water demand
- Better slump retention
- Enhanced workability
- Easier consolidation
- Improved pumpability
- Superior finishability
- Consistent air content
Reduced Water Demand
Air Content
Time of Set Characteristics

![Bar chart showing the time of set characteristics for different slag cement replacement percentages at different temperatures.](chart.png)
Hardened Properties

- Improved Compressive and Flexural Strengths
- Reduced Permeability
- Improved Corrosion Resistance
- Increased Resistance to Sulfate Attack and Alkali-Silica Reaction
- Reduced Heat Generation
Compressive Strength

![Compressive Strength Graph](image)

- **7 Day Compressive Strength (psi):**
  - 100% Portland
  - 25% Slag Cement
  - 50% Slag Cement

- **28 Day Compressive Strength (psi):**
  - 100% Portland
  - 25% Slag Cement
  - 50% Slag Cement
Permeability
Chloride Permeability
ASTM C1202

Charge Passed (Coulombs)

Slag Cement Replacement (%)

W/C = 0.45
W/C = 0.55
W/C = 0.70

Very Low
Low
Moderate
High

0%
25%
50%
Alkali-Silica Reaction
All tests performed with Kalkberg aggregates and portland cement with an equivalent alkali content of 0.98.
Sulfate Resistance
Sulfate Resistance

Portland Cements with Various C3A Contents

Moderate Sulfate Resistance

High Sulfate Resistance

Portland cements with Slag cement addition
Sulfate Resistance

• The proper addition of slag cement can:
  • Give a Type I (normal, non-sulfate resistant) Cement the properties of a Type II (moderate sulfate resistant) cement or a Type V (high sulfate resistant) cement
  • Give a Type II cement the properties of a Type V cement
Mass Concrete
Effect of Slag Cement on Heat Rise in Concrete

![Graph showing the effect of slag cement on heat rise in concrete. The graph compares the temperature (in °F) over time (in hours) for Type II Portland cement and 65% and 80% slag cement mixtures.](image-url)
Drying Shrinkage

ASTM C157

Source: Louisiana DOTD