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## Can Locally Produced Steel Slag in Eastern North Carolina be Used as a Geomaterial?

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# The Need for Use of Slag

MOLTEN BLAST FURNACE SLAG

MOLTEN BOF STEEL SLAG

## BROAD FAMILY OF SLAGS

Ferrous Slags

Nonferrous Slags

Other Slags

Blast Furnace  
Steel

Copper  
Nickel  
Phosphorous  
Lead  
Zinc  
Lead-zinc  
Tin Slag  
Chromium  
Magnesium  
Lithium  
Tungsten

Boiler  
Phosphate-gypsum  
Water Quenched  
Bottom Ash  
Salt  
Incinerator  
Coal Gassification

MOLTEN COPPER SLAG

There is Significant Energy Invested in these Slags

MOLTEN NICKEL SLAG

## Potential Slag Applications (Each Use Must Be Technically Proven)

- Asphalt Concrete Aggregate
- Pavement Subbase And Base Aggregate
- Portland Cement Concrete Aggregate
- Railroad Ballast
- Blended Cement
- Fine Aggregate
- Port And Harbor Construction Stone
- Dam And Embankment Construction Stone
- Soft Soil Stabilization Stone
- Engineered And Foundation Fill
- Riprap, Armor And Gabion Stone
- Filter And Drainage Stone
- Erosion Control And Slope Protection Stone
- Surface Treatments Aggregate
- Grinding Aid
- Cemented Mine Backfill
- Sand Blasting Media
- Roofing Granules

# Slag Utilization Philosophy

Bulk Applications  
Typically Aggregates



'Energy' Content

Cementitious Applications  
Value Added

Any Use Must Be

- Technically Sound
- Economically Viable
- Environment Friendly

Move From Bulk To Cementitious Applications For Slags

Nucor Steel Cofield Plant, Hertford County, NC

Slag is Processed by Harsco Metals and Minerals

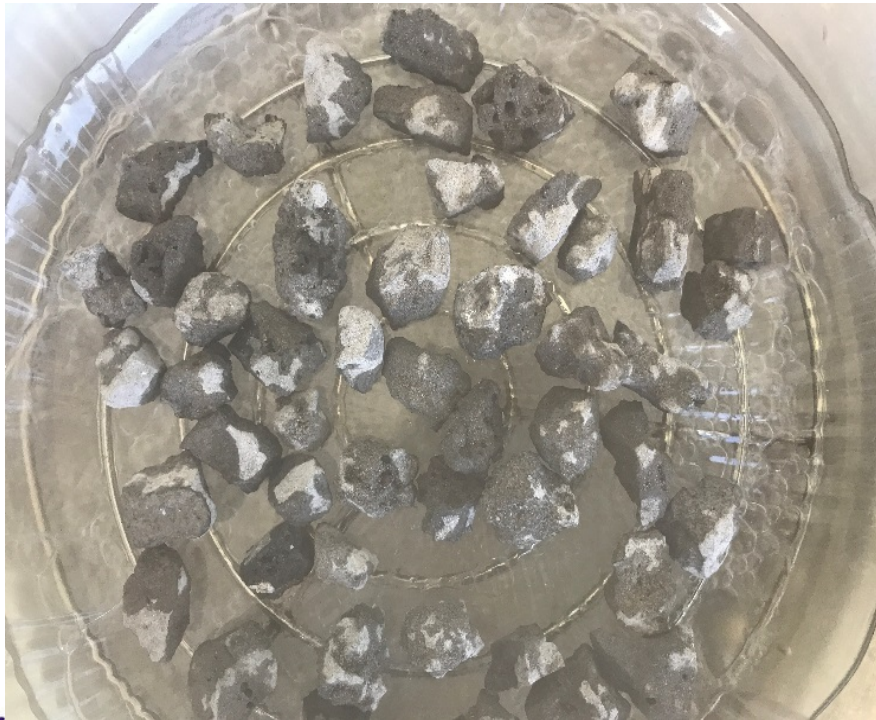




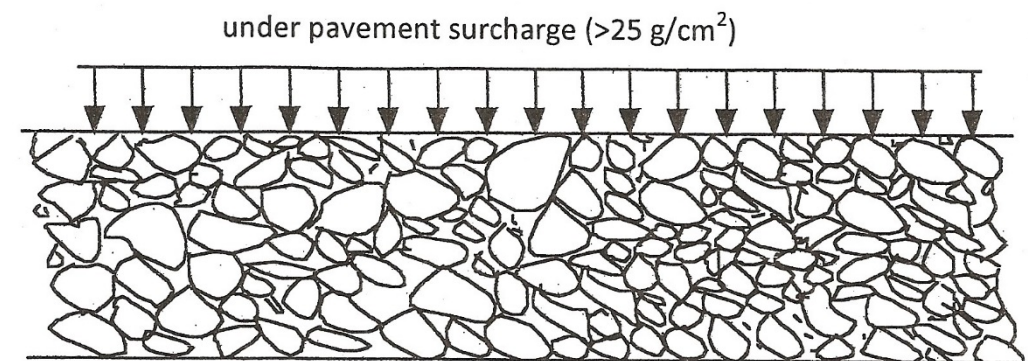
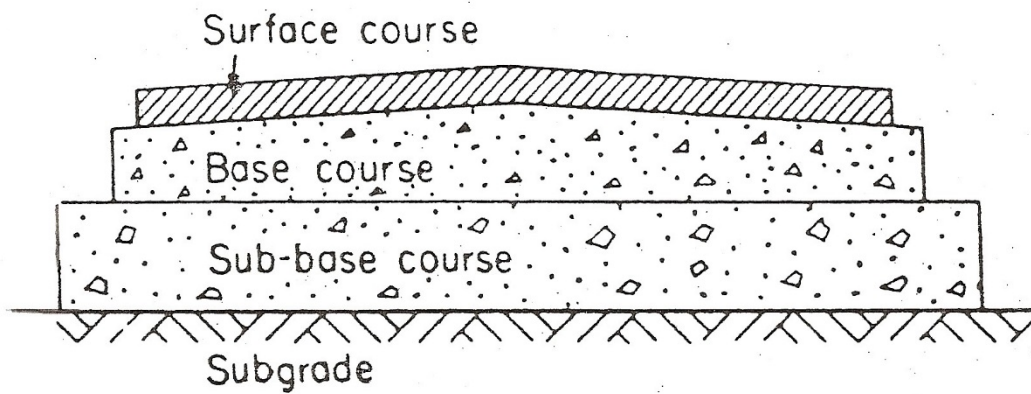
# Slag Sampling at Nucor Steel Plant in Cofield, Hertford County NC



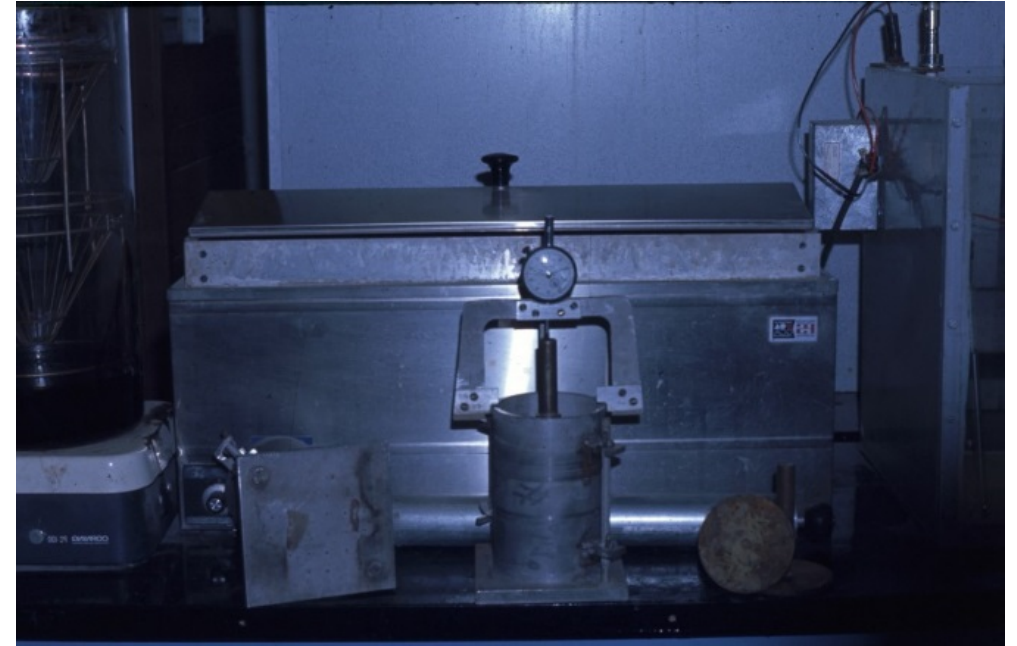
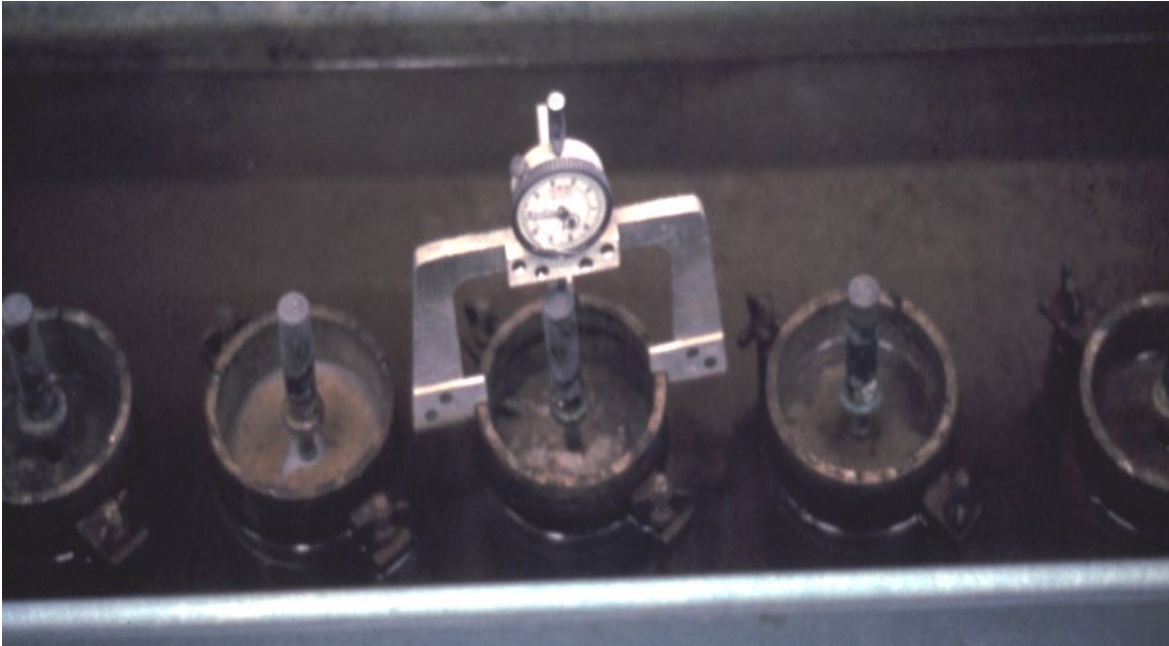
# Pressure Cooker Treatment For Granular Slag



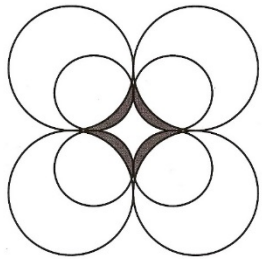




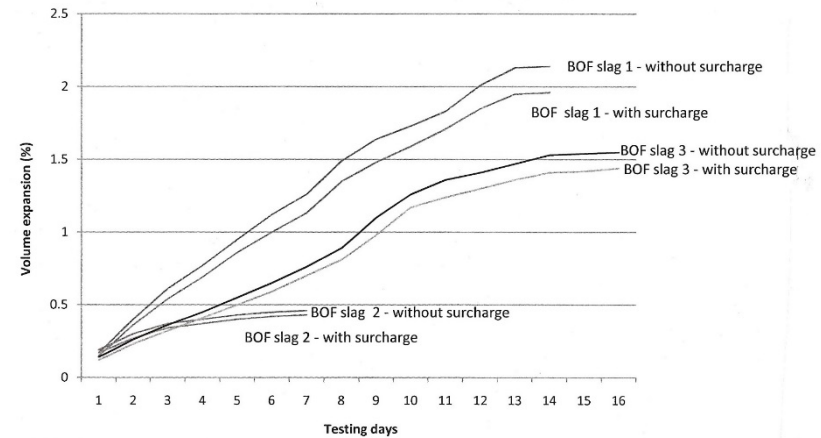
## Recommended Tests for Steel Slag Aggregate (SSA) Quality Volume Expansion



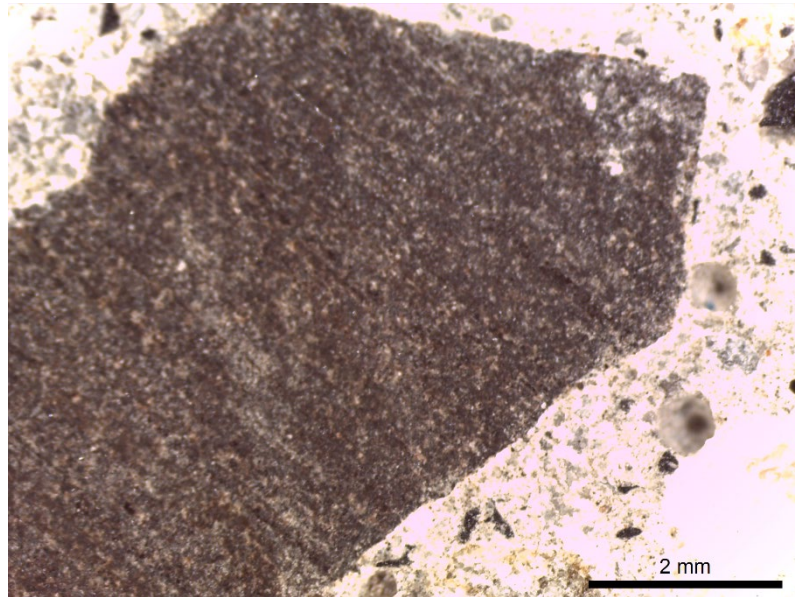
7, 14 Day Water Immersion at 70°C To Measure Expansion



Small spheres: initial volume of solid phase  
 Large spheres: final volume of solid phase  
 Space between small spheres: initial volume of void  
 Hatched areas: increment of void  
 Space between large spheres including hatched areas: final volume of void



$$F_{all} < 2.8\% + \frac{K_{25}(\gamma_s - \gamma_o)}{0.38\gamma_s^2} \times 100\%$$




~ 300 million scrap tires per year are were generated in the US. In Europe and some US states whole tires were banned from landfills.

In Eastern NC, ~ 40 waste tires dump sites. The utilization of ground tire rubber (GTR) for instance is very low.



EAF slag – Nucor Cofield, NC



Waste tire – Liberty Tire Plant in Cameron, NC



What can we do?



**Patentable portable tester is developed  
which (instrument and test method) could be new test method for  
steel slag**

