
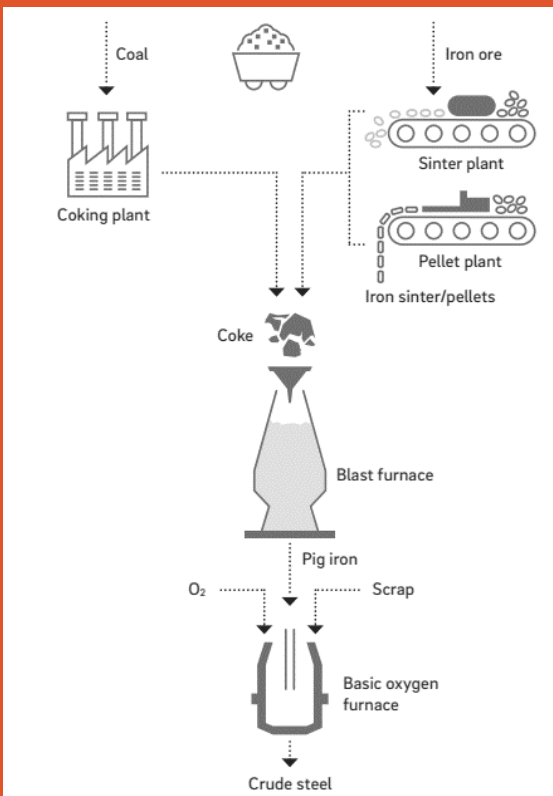
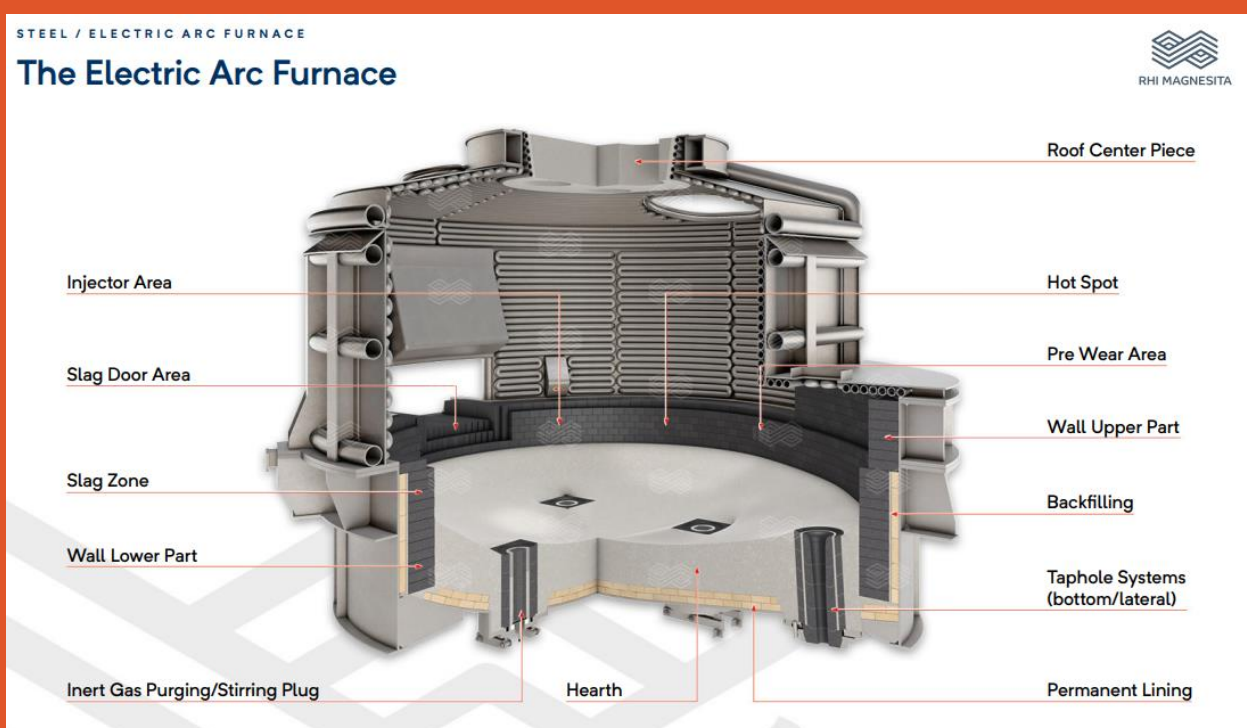


INTRODUCTION

- 
- Traditional steel production accounts for approximately 9 percent of global carbon dioxide emissions
- Steelmaking industry is still difficult to decarbonize and scale up
- 
- Hertha Metals, INC. is pioneering a technology that produces steel with 95% less CO2 emissions compared to today's primary steelmaking processes
- This is done by reducing and smelting iron ore with green hydrogen and green electricity, through a process based on the fundamentals of hydrogen plasma smelting reduction

BACKGROUND

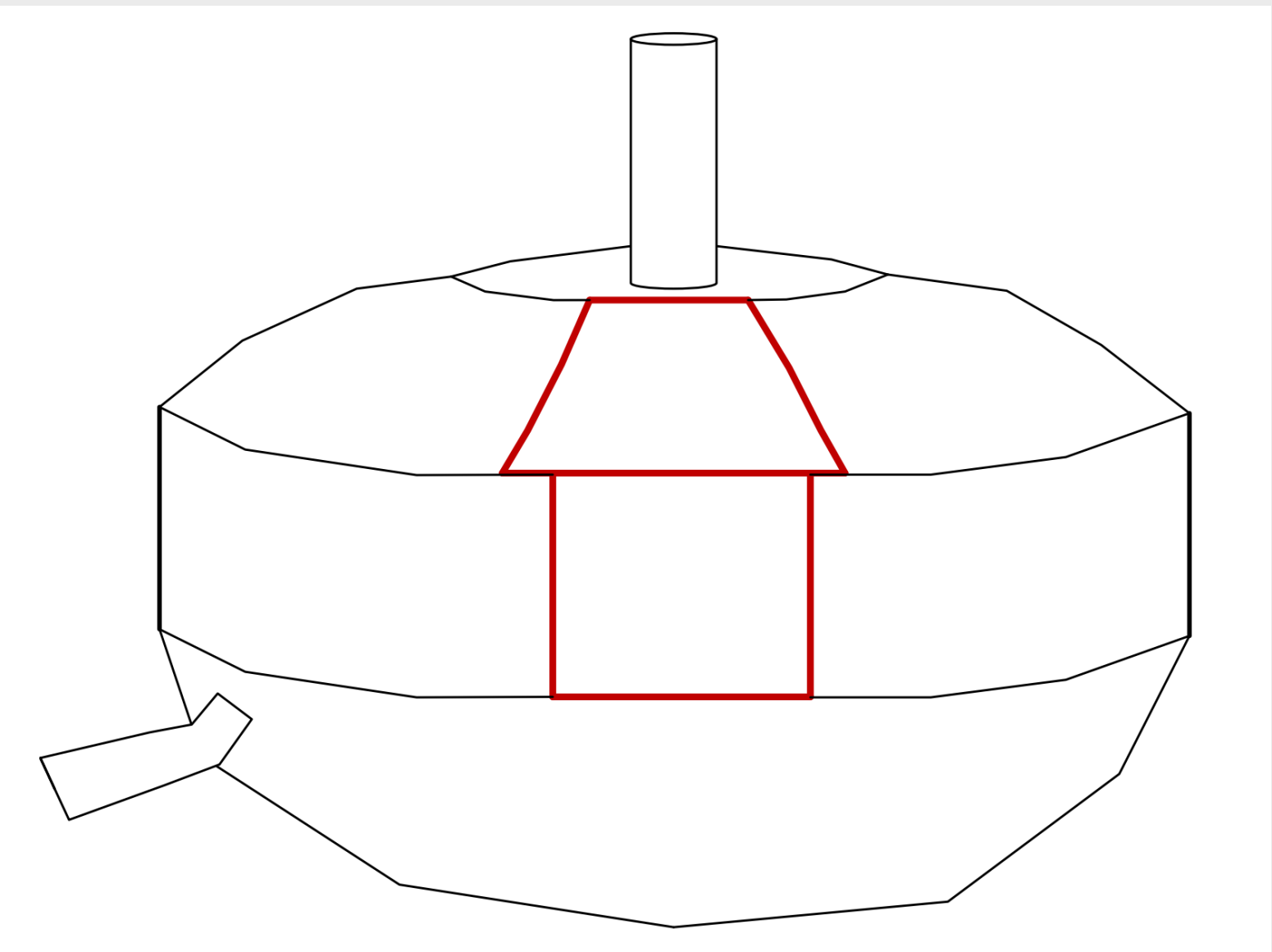
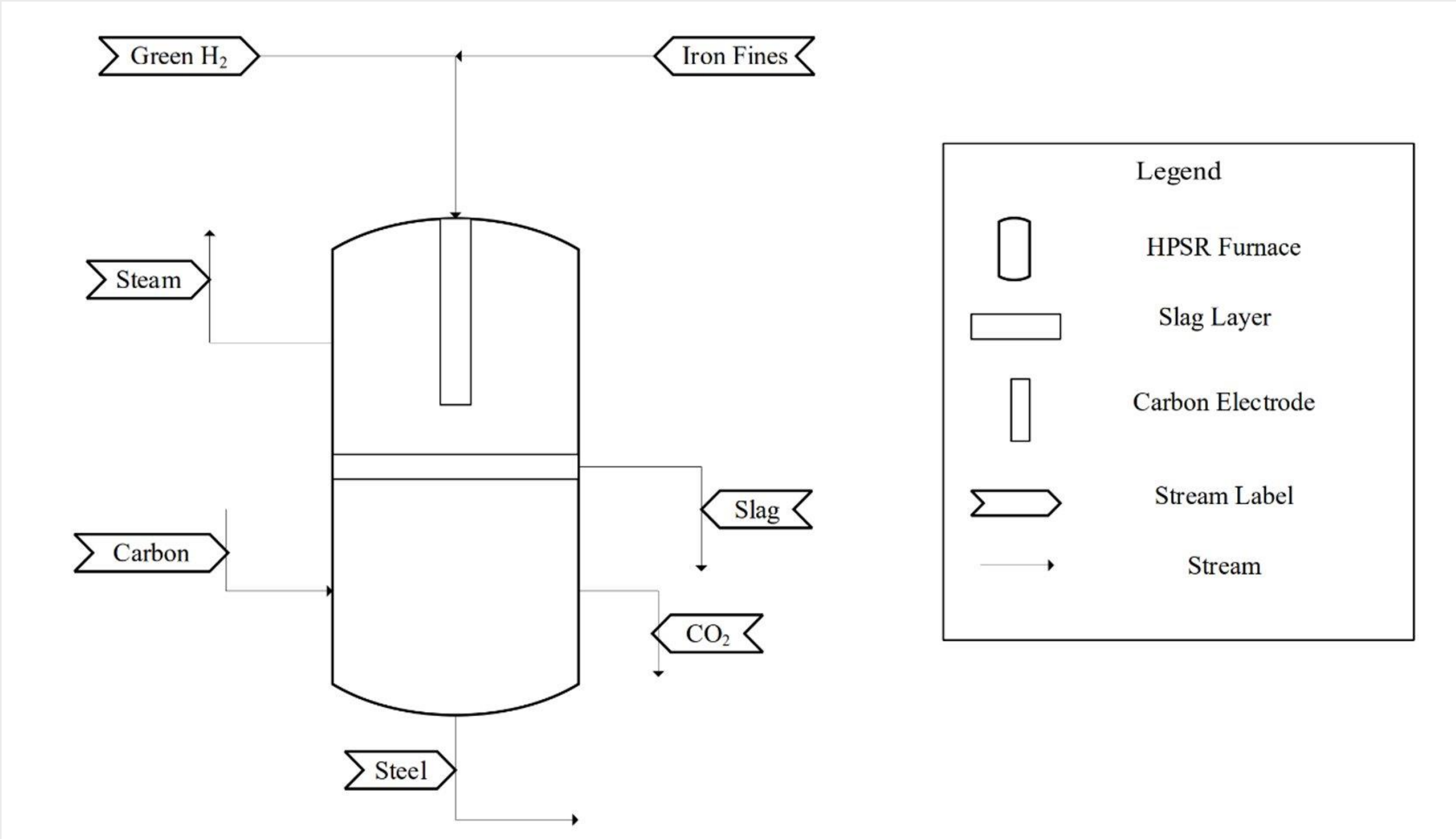
- The goal of this project is to determine refractory materials to be used in Hertha's hydrogen-electric steel making furnace
- Basing our findings on refractory materials used in electric arc furnaces



HYDROGEN PLASMA STEEL PRODUCTION




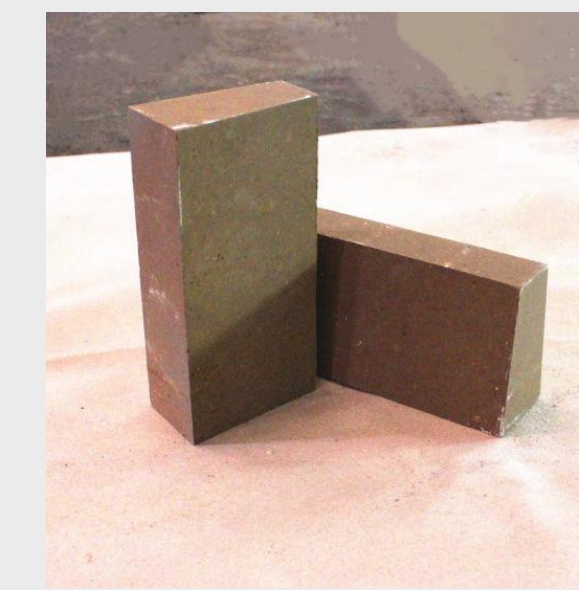
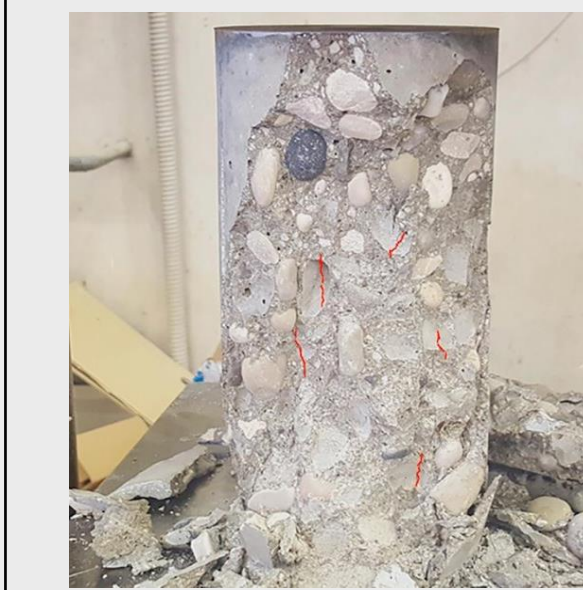

Refractory Materials Evaluation

Kendra Hunt, Hayden Skelton, Cindy Wong
Laureen Meroueh, Nick AuYeung



FINDINGS

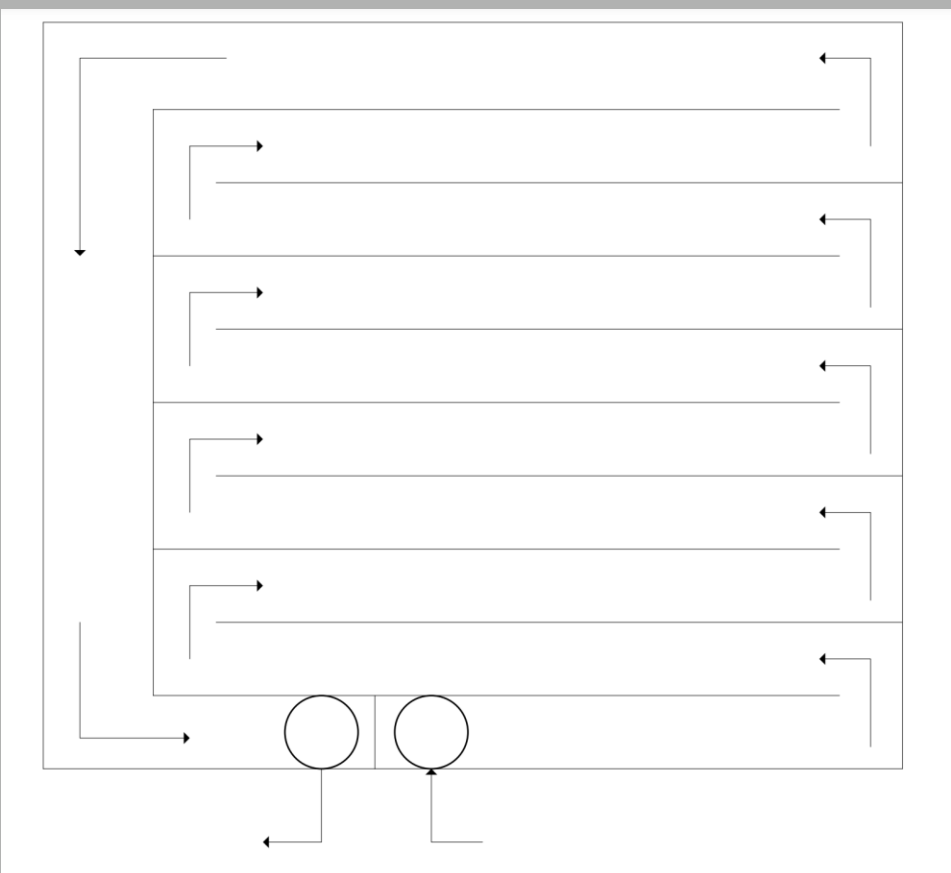
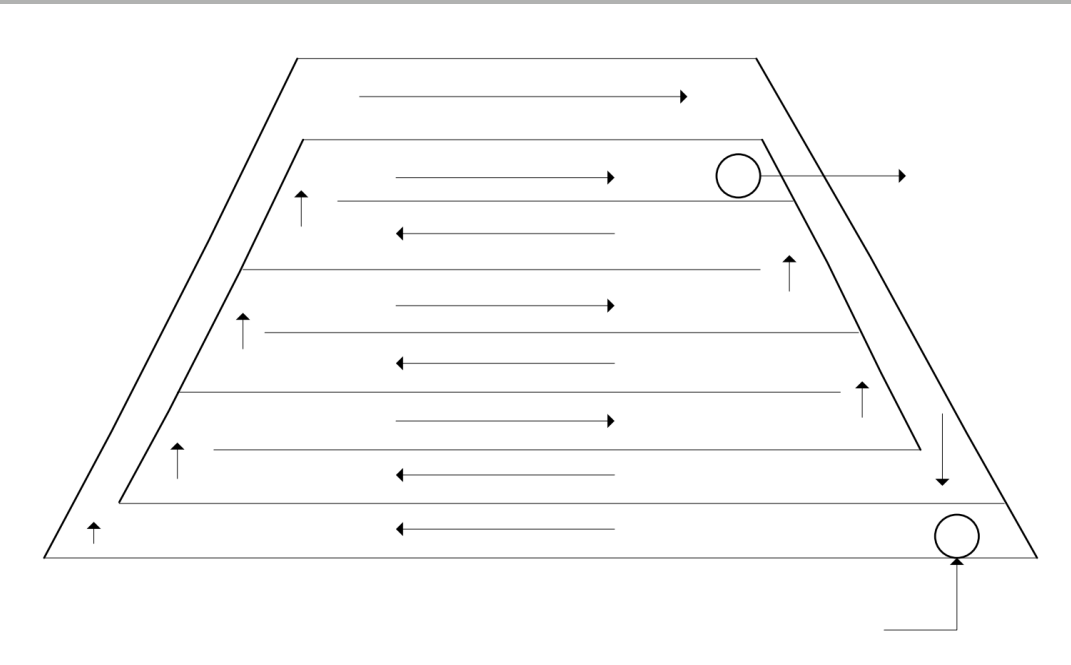
Refractory Materials – strong and heat resistant

Bricks				Concretes	
High alumina	Magnesia	Magnesia Carbon	Magnesia Chrome	Concrete	Concrete + Slag aggregate
<ul style="list-style-type: none">Thermal shock resistantAbundant resourceNo issue with carbon oxidation	<ul style="list-style-type: none">Slag resistantGood conductivityNo issue with carbon oxidation	<ul style="list-style-type: none">Better slag resistanceCorrosion toleranceHigher conductivity	<ul style="list-style-type: none">Better slag resistanceCorrosion toleranceNo issue with carbon oxidation	<ul style="list-style-type: none">AbundantInsulationStability	<ul style="list-style-type: none">Cost effectiveInsulationStability
					

FINDINGS

Water Cooling Panels

- Tubular cooling water panels are commonly used in EAFs. The panels are used on both the sides and roof of the furnace
- The flow rate of each individual panel can be controlled. This helps to conserve energy
- The use of cooling water panels allows for the furnace to have fewer refractory material layers



Effects of Slag

- Slag is formed in the furnace with byproducts. A layer of slag will build up in the furnace on top of the molten iron, as well as on the side walls. This layer of slag acts as insulation for the furnace and allows for higher temperatures
- The slag formed is very acidic and can cause degradation of the refractory material layers

FUTURE WORK?

- Look into hydrogen gas effects on refractory materials
- Cross-sectional diagram to incorporate cooling panels

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