



REFRACTORIES — FOR — INTEGRATED STEEL



Global **Refractory** Solutions



REFRACTORY SOLUTIONS AND TECHNICAL SUPPORT FOR EVERY STEP OF THE PROCESS

Contents



Learn more about our refractory solutions for integrated steel at alliedmineral.com/solutions/steel/

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ABOUT ALLIED

Allied Mineral Products is a world leader in the design and manufacture of monolithic refractories. We are present in over 100 countries, with 12 manufacturing facilities, 3 research & technology facilities, 5 precast shapes facilities and large sales and service teams in the foundry, aluminum, steel, heat treating / forging and industrial markets.

Allied's success is based on our dedication to *Being There Worldwide with Refractory Solutions*. Our product lines include innovative refractory technology and longstanding refractory alternatives.

Additionally, Allied provides quick response times to any urgent product request through flexible manufacturing systems located at all of its global manufacturing facilities.



ENGINEERING & RESEARCH

Allied starts the product selection process by first gaining a detailed understanding of your specific needs. Our team then evaluates operating criteria and physical design parameters to create a detailed Engineered Design encompassing:

- Optimized product zoning
- Thermal models to optimize and validate designs
- Proven safety lining system designs



We are focused on developing new products, improving existing ones and perfecting installation techniques. Product testing and development is conducted in Allied's state of the art research and technology centers. Allied is an innovative, technology-driven supplier, devoted to providing customized refractory solutions for various industry operations. Our wide variety of high performance refractories use superior raw materials, are vigorously tested in our modern labs, and are tailored to unique installation and application condition requirements.



PRODUCT INNOVATIONS

NEW TECHNOLOGY

GRAPHITE & CARBON ANCILLARY PRODUCTS

GC and HC Product Lines | WE CAN FILL THE VOID

Allied offers a comprehensive collection of carbon and graphite based cements, mortars, ramming materials and grouts. These dependable, industry-leading products are designed to fulfill ancillary needs in blast furnaces, cupolas and ferroalloy furnaces.



| Original Allied Line | |
|----------------------|---|
| HC3F | Single-component, clean carbon mortar |
| HC4F | Single-component, water-based grout for cold grout applications |
| HC5F | Single-component grout for hot installations |
| HC6F | Two-component collector bar and cathode block bonding mix with visible metal beads. |
| HC8F | High conductivity, multi-purpose ramming mix |

| Industry-trusted Products | |
|---------------------------|---|
| C34 | Two-component carbonaceous heat setting cement |
| C38 | Two-component carbonaceous heat setting cement |
| C46 | Single-component carbonaceous heat setting cement |
| CP9 | Carbonaceous hot ramming paste |
| EZRAM RP10 | Highly thermally conductive graphitic ram |
| SMART RAM® RP20 | Thermally conductive, self-correcting ram with specially treated graphite flake |
| GR37 | Two-component carbonaceous grout with expanding flake graphite |
| EZRAM RP3 | Single component carbonaceous ram |
| EZRAM RP4 | Single-component carbonaceous ram |

TAPHOLE MATERIALS

Allied is the leader in high-alumina & anhydrous taphole clay sales in North America. We offer a comprehensive line of taphole clays that span from siliceous plugging pastes for the alloy industry to high-alumina clays designed for high production, multiple-taphole blast furnaces.

Taphole Materials for Blast Furnaces

| | |
|--------------------|---|
| RSR 101 | For conventional drilling practice on medium-size furnaces producing 4000 - 6000 tons of hot metal per day |
| RSR 1170 R-AM | For blast furnaces producing 4000 - 6000 tons of hot metal per day with shorter gap times (25 - 30 minutes) |
| RSR 1170R Modified | Ideal for plants in urban environments |
| RSR 963-14 | For high-production blast furnaces |
| Restoration Clay | Formulated to fill cracks and fissures in the taphole clay column of blast furnaces |
| RSR Green Tap | Low volatile products that promote easy drilling and extended hole length |





PRODUCT INNOVATIONS

ALLIED PRODUCT FAMILIES

STACKCRETE®

The STACKCRETE® line features several products with **silicon carbide additions**, designed to match the unique properties and temperatures of each zone of blast furnace stacks. These products are suitable for **maintenance throughout the stack lining** and are designed to **withstand impact, abrasion, temperature fluctuation, slag attack, CO attack and alkali attack**. The STACKCRETE® line also features a **wide range of installation methods**.

STACKCRETE® G is Allied's innovative graphitic castable that can be used as both a repair and replacement material for carbonaceous refractory/brick. STACKCRETE® G offers:

Shortened installation time | Reduced labor cost | Reduced lead time compared with brick refractories | Can install using cast in place, gun or shotcrete technique



ALAKAST

ALAKAST is a line of castable refractories, ranging from no cement to conventional cement, that are ideal for various areas of steel reheat furnaces. Each ALAKAST mix is designed to meet a unique application requirement, such as volume stability, excellent flowability and high strength. These products also feature a variety of installation options.

BLAST KAST™

Our trademarked BLAST KAST™ products are designed for shotcrete installation, making them ideal for wall and roof applications in reheat furnaces. These low cement mixes are noted for their versatility and dependable delivery and performance.

V-CAST®

The V-CAST® line for iron-making is a collection of alumina-based castables with additions of silicon carbide and carbon. These products are recommended for use in a variety of applications, including blast furnace and cupola troughs, slag and iron runners, tilting runners, spouts, and tap holes. There is a V-CAST® product tailored to each application's unique operating temperature and conditions.



FLOORING: TUFFLOOR

TUFFLOOR is designed for areas exposed to extreme thermal cycling and intermittent exposure to liquid metal spills, dross and slag. It is a versatile product that can be installed as a complete floor, over existing (or new) concrete, or as precast tiles.

TUFFLOOR has years of success in repairs and rebuilds of casthouse floors, and has also proven successful in a wide variety of coke oven blast furnace and other integrated steel equipment areas.





ADDITIONAL PRODUCTS

FILLING THE GAPS

SKAMOL

INSULATION BOARD

Allied carries SKAMOL's line of vermiculite based insulation boards that help save energy and reduce costs.

- SKAMOL VIP-12 HS BOARD
- SKAMOL VIP-12 HS CLICKBOARD

SKAMOL insulation board products help steel ladles preserve heat and maintain internal temperature. These products reduce lining thickness, increasing ladle capacity.

SKAMOL VIP-12 HS CLICKBOARD features an innovative perforated design that allows simple and fast installation.



INSULATING FIREBRICK

SKAMOL's collection of insulating firebrick, supplied by Allied, is the ideal choice for back-up insulation systems for hot blast stoves. These systems can be customized for high insulation properties or high strength.

- HIPOR 450
- POROS
- SUPRA

Benefits of SKAMOL insulating firebricks include low thermal expansion, reduced heat loss, high cold-crushing strength and resistance to alkali and acid attack.

OTHER SUPPORTING PRODUCTS

Allied carries the ancillary products you need to complete your process.

- Carbon firebrick
- Installation equipment
- Thermocouples and wire



TECHNICAL SUPPORT



FAST • FLEXIBLE • FOCUSED

Allied Mineral Technical Service, Inc. (AMTS) offers value added technical assistance in the critical areas of the blast furnace, hot blast stove and cupola. The AMTS team has decades of experience in the industry and is backed by Allied Mineral Products, a global leader in refractory technology and production.

AMTS Supports:

- Blast Furnaces
- Hot Blast Stoves
- Hot Blast Systems
- Casthouse Design
- Cupolas

Engineering and Design Services

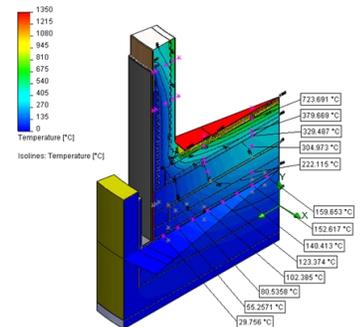
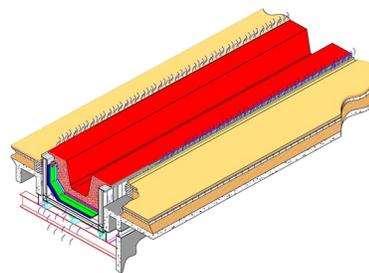
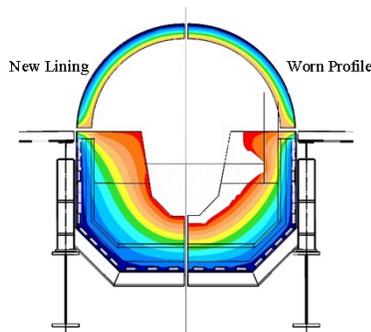
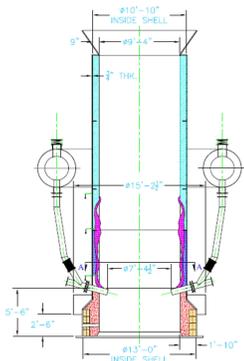
Our value added technical assistance includes a range of data collection and analysis and engineering design capabilities to help optimize furnace operation.

- Hearth monitoring and modeling
- Failure diagnostics of hearth and taphole
- Innovative refractory selection
- New and spent refractory testing
- Advanced cooling systems
- STACKCRETE® high conductivity grout

Field Services

Our team is on site providing supervision and assistance to ensure your operations run safely and efficiently. Our support includes:

- Assistance for:
 - Core drilling
 - Grouting
 - Installation
 - Maintenance
- Emergency responsiveness
- Data collection equipment placement
- Refractory properties and behavior monitoring
- Analysis of melt practices
- Training on refractory best practices



Allied Mineral Technical Services

AMTS@alliedmin.com | alliedmineraltechnicalservices.com



BLAST FURNACE



UPPER STACK

STACKCRETE® 62M

MIDDLE STACK

STACKCRETE® 21V

STACKCRETE® 608

STACKCRETE® 62M

LOWER STACK

STACKCRETE® G

STACKCRETE® AZS 5R

STACKCRETE® 62M

BOSH

STACKCRETE® G

STACKCRETE® 62M

TAPHOLE CLAY

RSR 101

RSR 1170R-AM

RSR 1170R-Modified

RSR 963-14

RSR GREEN TAP 5

RESTORATION CLAY

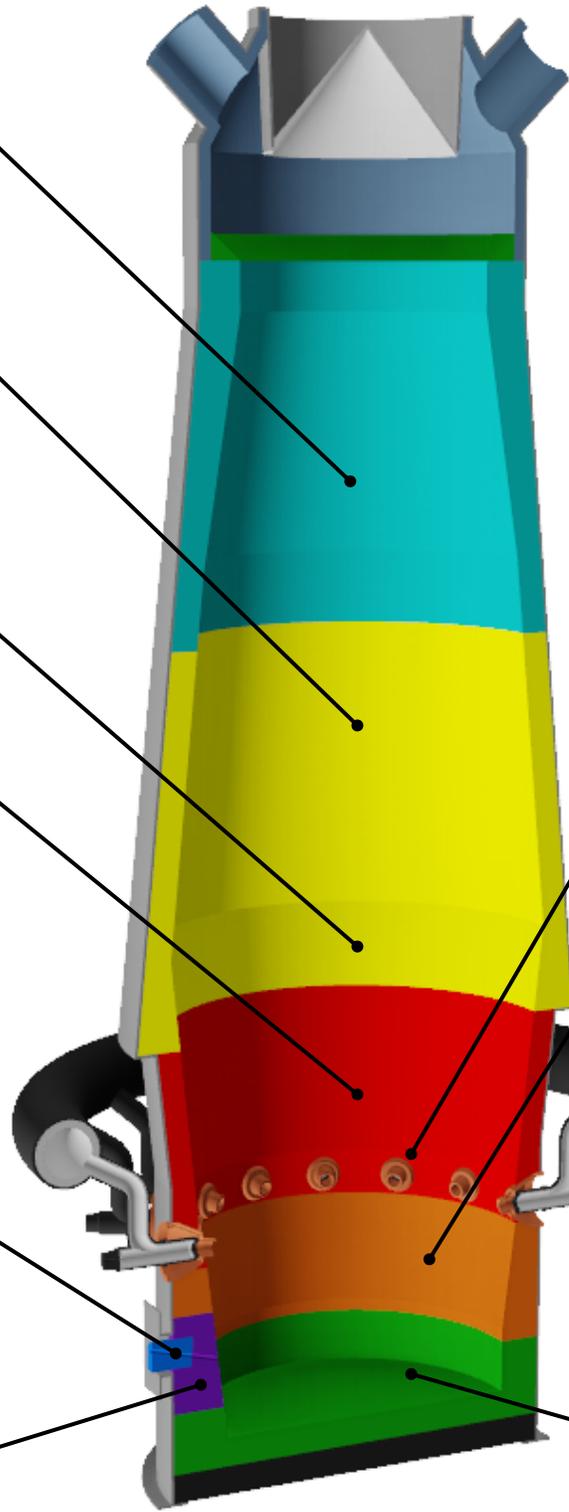
TAPHOLE STRUCTURE

V-CAST® 133A

V-CAST® 720A

V-CAST® 739A

Carbon Blocks



TUYERE SLEEVE

LCF 798A (Precast)

HEARTH

STACKCRETE® 20V

STACKCRETE® 18V

HC3F Mortar

C34 Cement

HC4F Grout

HC5F Grout

STACKCRETE® 62M

GUNCAST 12

BUSTLE PIPE

INSULMIX® 80LI P

LCF 798A Pump

BOTTOM & HEARTH CORNER

Ceramic Pad Shapes





CASTHOUSE

TROUGH / RUNNER

WORKING LINING

- V-CAST® 218A
- V-CAST® FA2L
- V-CAST® 418A
- V-CAST® 712A
- V-CAST® 719A
- V-CAST® 739A
- RAPID PUMP 2750 SC

SAFETY LINING

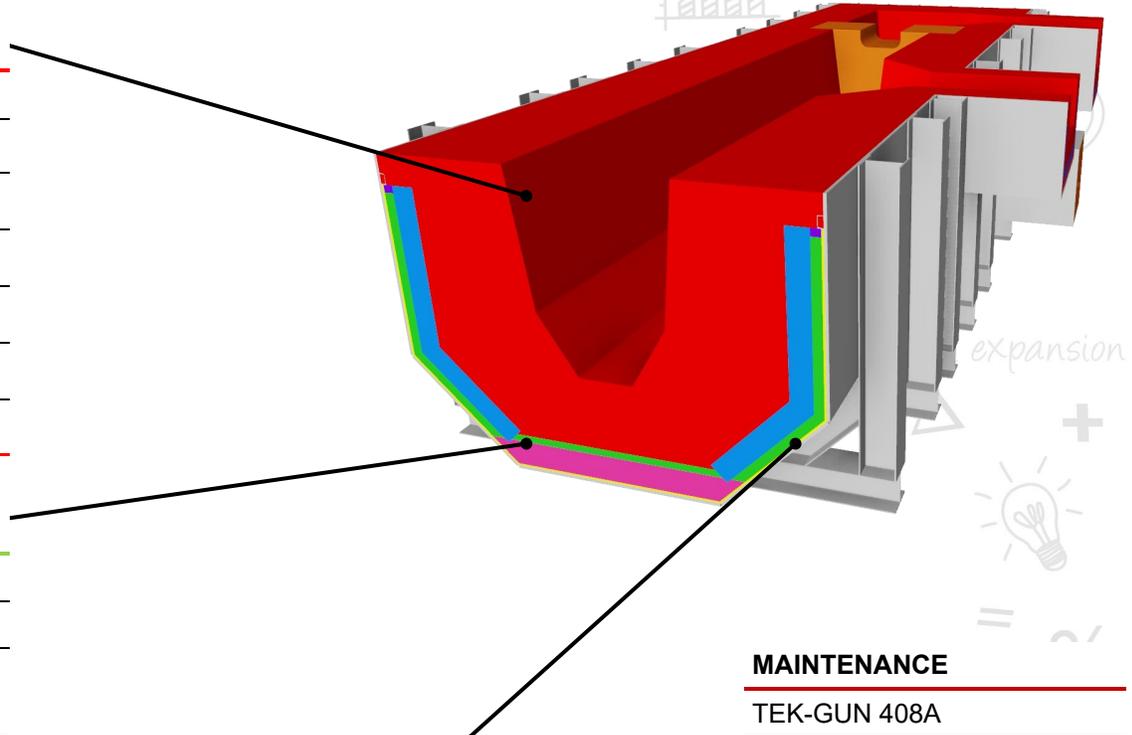
- DRI-VIBE® 660A
- RAM 491A
- CW 7929 Castable
(Precast retainer shape)
- MATRIPUMP 80
- TEK-PAK 664A

INSULATION

- Super Firetemp X

MAINTENANCE

- TEK-GUN 408A
- DRI-VIBE® 348A
- DRI-VIBE® 512A



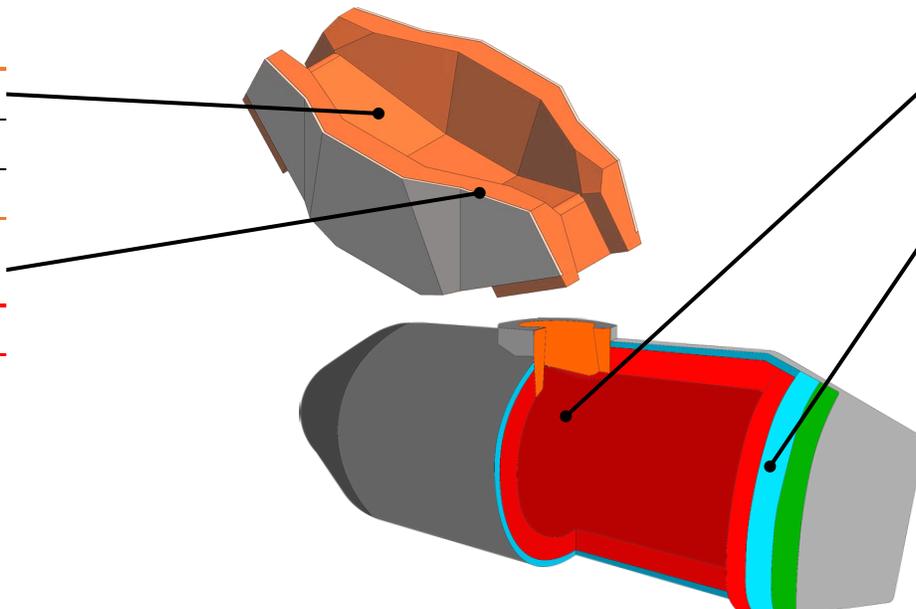
IRON TILTER

WORKING LINING

- V-CAST® 133A
- V-CAST® 712A
- V-CAST® 720A

SAFETY LINING

- MATRIPUMP 60



LADLE

WORKING LINING

- TUFFCRETE® 62M-FR

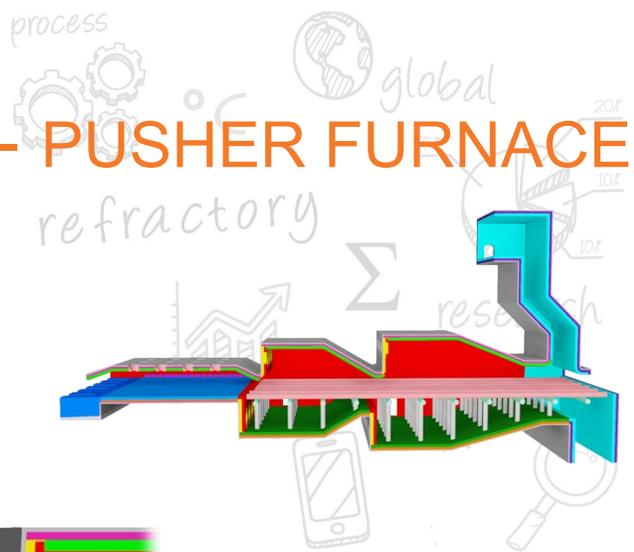
SAFETY LINING

- MATRIPUMP 60



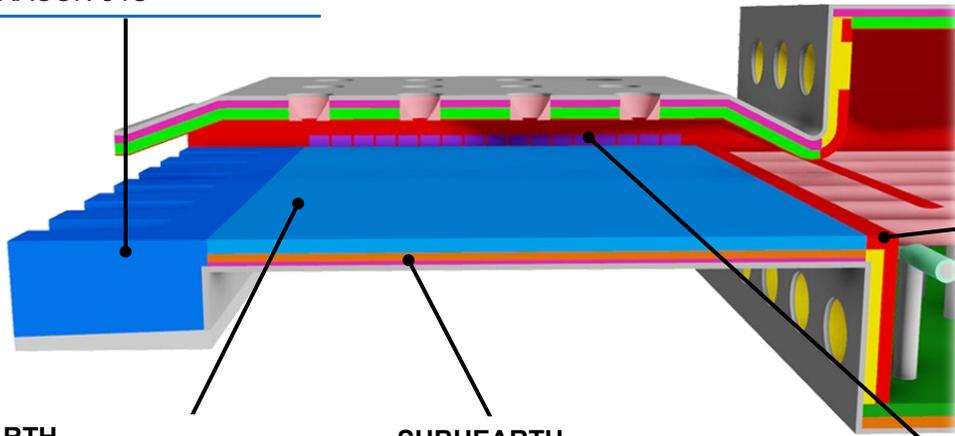


REHEAT - PUSHER FURNACE



EXTRACTOR SHAPES

- ALAKAST 98 EZC
- ALAKAST 90 LC-P
- ULTRACON 34C



LEADING EDGE

- ALAKAST 98 EZC
- ALAKAST 90 LC-P
- TUFFCRETE® 90

HEARTH

- ALAKAST 98 EZC
- ALAKAST 90 LC-P
- TUFFCRETE® 90
- ALAKAST 85 LC-P-ES

SUBHEARTH

- ALAKAST 45-P
- ALAKAST 50 LC-P
- TUFF-FLO 50
- Super Firetemp X

BUMPER & SKID BLOCKS

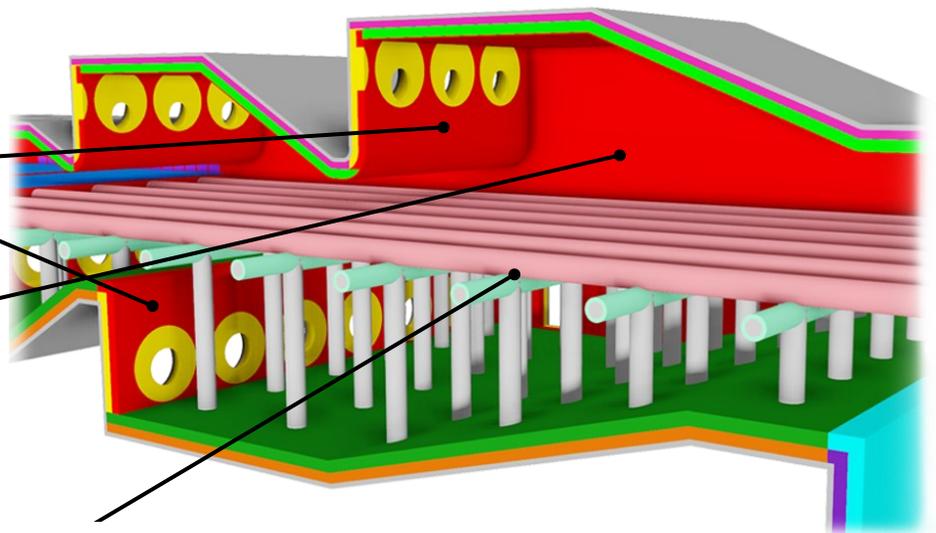
- ALAKAST 98 EZC (Precast shape)
- ULTRACON 34C
- ALPHAMAX T

BURNER WALLS & ROOF

- BLAST KAST 70 LC

SIDE WALLS

- BLAST KAST 70 LC
- TUFF-FLO 50
- BLAST KAST 45 LC



WET SKID SYSTEM

- ALAKAST 68 LC-P
- ALAFLOW 60 LC-P
- TUFF-FLO 65M

$$\Delta L = \alpha_L \Delta T$$





REHEAT - WALKING BEAM FURNACE



SIDE WALLS

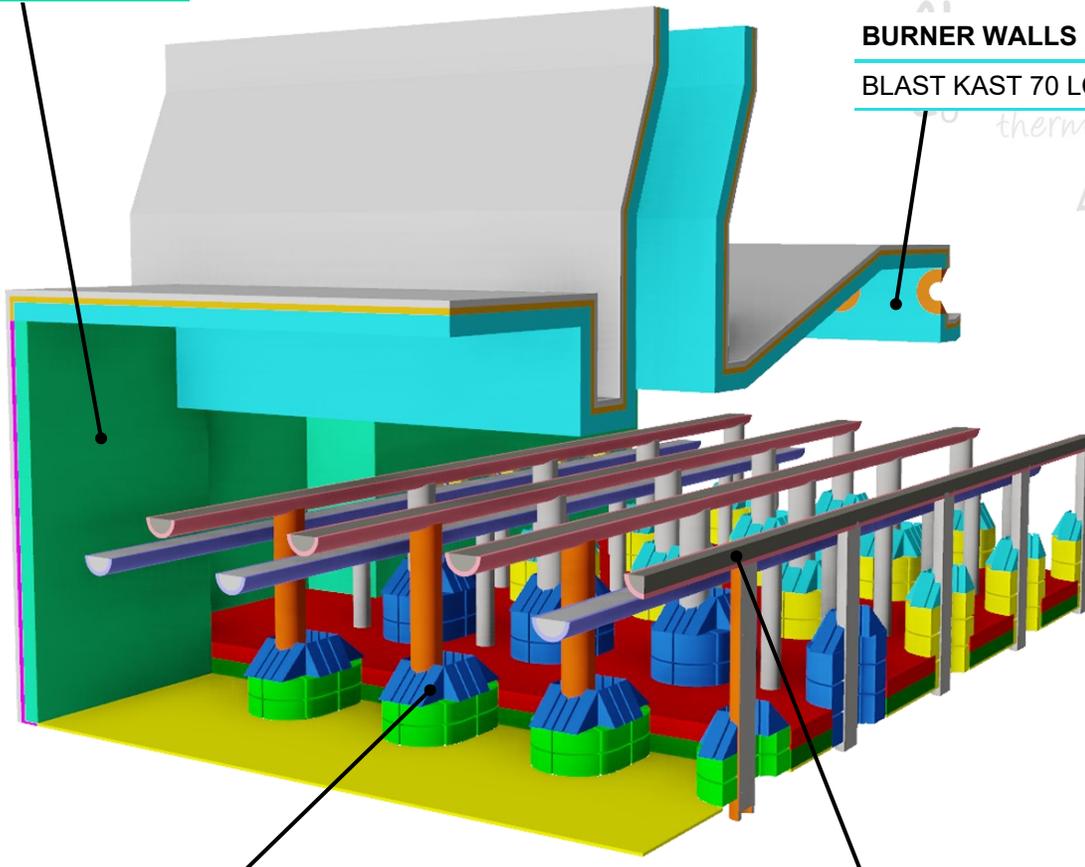
BLAST KAST 70 LC

TUFF-FLO 50

BLAST KAST 45 LC

BURNER WALLS & ROOF

BLAST KAST 70 LC



HEAT ZONE SLOT & DEFLECTOR BLOCKS

ALAKAST 45 LC
(Precast shape)

TUFF-FLO 50
(Precast shape)

ALAFLOW 60 LC-P
(Precast shape)

TUFF-FLO 65M
(Precast shape)

WET SKID SYSTEM

ALAKAST 68 LC-P

ALAFLOW 60 LC-P
(Precast shape)

TUFF-FLO 65M





REHEAT - ROTARY HEARTH



ROOF

BLAST KAST 70 LC

BURNER BLOCKS

LCF 798A

BRICKMIX 81

KAST TECH 60

MATRIPHOS 85AC

QUICK-FIRE® 88

SIDE WALLS

BLAST KAST 70 LC

TUFF-FLO 50

BLAST KAST 45 LC

CURBS

ALAKAST 68 LC-P

ALAKAST 50 LC-P

TUFF-FLO 65M

SKID BLOCKS

ALAKAST 98 EZC
(Precast shape)

ALPAHMAX T

ULTRACON 34C

INSULATION

Super Firetemp X

HEARTH

ALAKAST 90 LC-P

ALAKAST 68 LC-P

TUFF-FLO 60A

ALAKAST 50 LC-P

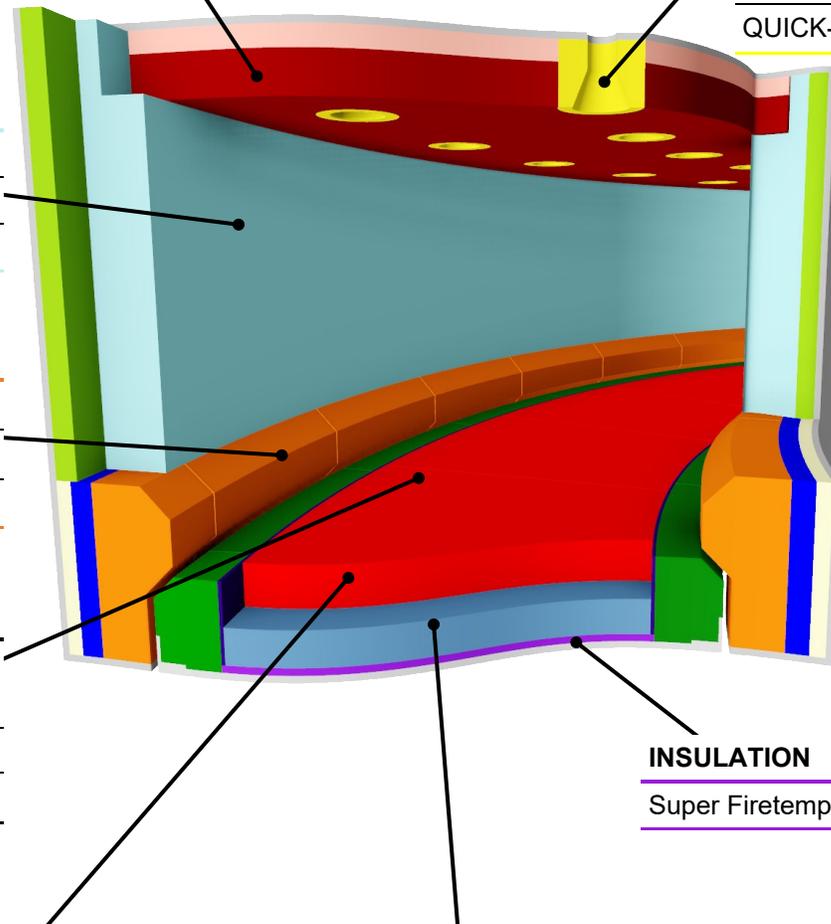
DURACON 32

SUBHEARTH

ALAKAST 45-P

ALAKAST 50 LC-P

TUFF-FLO 50



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