

PRECAST

REFRACTORY SHAPES



Global **Refractory** Solutions



Allied Mineral Products is a world leader in the design and manufacture of monolithic refractories and precast shapes. With strong sales and service teams in the foundry, aluminum, steel, heat treat/forge and industrial markets, our success is based on our dedication to *Being There Worldwide with Refractory Solutions*.

Producing quality, consistent products is top priority at Allied and we have the products to meet your refractory needs. Our extensive product line includes innovative refractory technology and longstanding refractory alternatives.

Allied's focus on quality at every stage in the production process is unparalleled. A stringent raw material standard and global quality control testing before and after each batch is produced, provides customers with consistent products. We provide quick response times to any urgent request through flexible manufacturing systems at all our manufacturing facilities.

Global **Refractory** Solutions





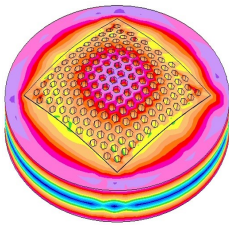
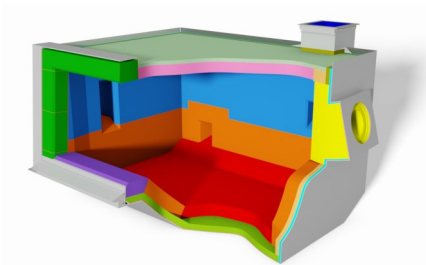
RESEARCH & ENGINEERING

After gaining a detailed understanding of your specific needs, our team evaluates operating criteria and physical design parameters to create a detailed engineered design encompassing:

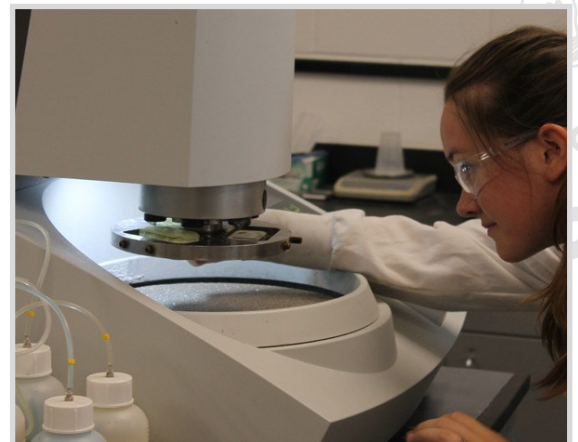
- Patented technologies
- Optimized product zoning
- Thermal models to optimize and validate designs
- Proven safety lining system designs
- Unique installation properties and techniques
- Leading edge refractory system designs

We're focused on developing new products, improving existing products and perfecting installation techniques. Our product development and testing is conducted in our state of the art research and technology center. We have an on-site gunning and shotcreting lab allowing extensive testing of installation properties.

As an innovative, technology-driven supplier we're devoted to providing customized refractory solutions for various industry operations. We offer a wide variety of high performance refractory products with superior raw material quality.



FEA Thermal Analysis



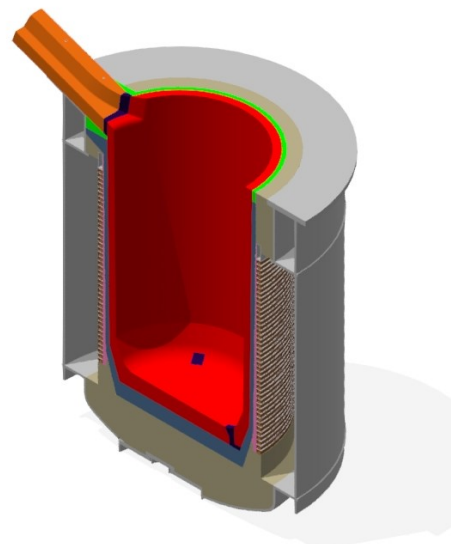
Flow Testing



Contact Tests



Strength Tests





ALLIED'S PRECAST CENTERS

Allied's precast shape centers have access to over 1,000 refractory product formulations to cater to the requirements of specific applications. With over 50 years of experience in refractory shapes production, we pride ourselves on delivering high quality shapes to our customers all over the world.

- Solution driven - collaboration between sales, research, engineering and manufacturing
- Commitment to superior quality
- Extensive product offerings including the ultimate ceramic-metal composite for shapes, METAL-ROK®
- Shapes manufactured from Allied's proven successful product lines
- Shapes ranging from 1 kg to 15 metric tons (2 lbs to 10 tons)
- Engineering capabilities at all Allied locations

Some of our most popular shape capabilities include foundry crucibles, furnace structural parts, EAF deltas and spouts, tilters and skimmer blocks, incinerator shapes, and rotary furnace shapes.

Our application engineering capabilities allow us to design and manufacture complex pieces of virtually any shape and size. Precast shapes can be designed and created based on existing drawings or an existing shape.

Allied's first precast shapes facility was founded in 1995 in Columbus, Ohio when it acquired American Precast Refractories. This facility was constructed specifically for forming, firing and finishing precast refractory shapes. Being at the forefront of quality materials and outstanding technical support is critical.



Allied Mineral Products Headquarters
Columbus, Ohio, USA



Columbus, Ohio Capabilities

- 9,290 sqm (100,000 sq. ft.) casting facility constructed specifically for shapes production
- High intensity paddle mixers capable of handling material quantities for large cast shapes
- Two 18 metric ton (20 ton) overhead cranes with full-building bridge travel range
- Improved firing abilities and a flexible daily firing schedule
- Casting room with atmospheric control for specialty applications
- High-temperature firing capabilities up to 1260°C (2300°F)



GLOBAL SHAPES FACILITIES

Our precast division has expanded to meet the growing demands of our customers and their markets. We're a leading manufacturer of custom engineered precast, pre-fired refractory shapes for a variety of industries.

In 2012 our Tianjin, China precast facility expanded by adding high fire capacity and additional casting process abilities.

Allied opened its European precast facility in Tholen, Netherlands in 2014. This expansion enables us to provide refractory shapes to the foundry, industrial and steel markets in Europe.

We've added two more USA precast locations in Chehalis, Washington and Pell City, Alabama.

Our newest precast facility was built in Germiston, South Africa in 2019.

Benefits & capabilities:

- Over 50 years of precast shape experience
- Monolithic refractories and precast shape purchases from one location
- Locally sourced materials for lower cost estimates
- Dedicated research and engineering teams providing technical expertise and support

Allied's precast shape locations

- Ohio, USA
- Alabama, USA
- Washington, USA
- Tianjin, China
- Tholen, The Netherlands
- Germiston, South Africa



Tianjin, China



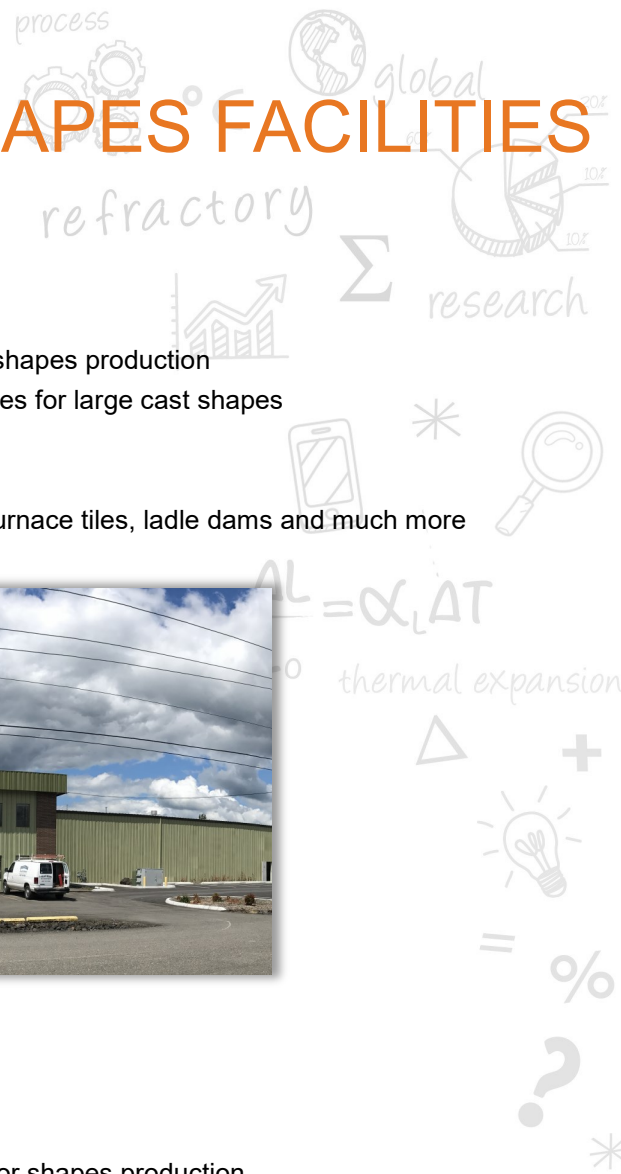
Germiston, South Africa



Tholen, The Netherlands



DOMESTIC SHAPES FACILITIES



Chehalis, Washington Capabilities

- 278 sq m (3,000 sq ft) casting facility constructed specifically for shapes production
- High intensity paddle mixers capable of handling material quantities for large cast shapes
- Improved firing abilities and flexible daily firing schedule
- High-temperature firing capabilities up to 815°C (1500°F)
- Ability to produce ladles, pizza ovens, deltas, skid blocks, glass furnace tiles, ladle dams and much more



Pell City, Alabama Capabilities

- 1,395 sq m (15,000 sq ft) casting facility constructed specifically for shapes production
- High intensity paddle mixers capable of handling material quantities for large cast shapes
- Improved firing abilities and flexible daily firing schedule
- Firing capabilities up to 650°C (1200°F)
- 4,535 kg (10,000 lb) shape handling capacity
- Tear-out and reline capabilities





FOUNDRY INDUSTRY

Allied uses innovative technology to create unique precast shapes that withstand harsh temperature changes in molten metal transfer applications. Our customers have access to expert recommendations and are backed by extensive engineering and design capabilities. Allied's vast product catalog ensures the right product for your vessel and operating conditions.

Foundry shapes

- Coreless Furnaces
- Channel Induction Furnaces
- Cupolas
- Gas-fired Furnaces
- Resistance Rod Furnaces
- Heat Treating & Forging Furnaces
- Reverberatory Furnaces
- Vacuum Tundishes
- Transfer Ladles
- Ductile Treatment Ladles
- Pouring Tundishes / Boxes
- Launder
- Centrifugal Casting Feed Equipment
- Impact Shapes



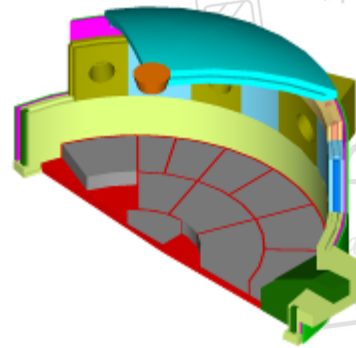


ALUMINUM INDUSTRY

We have a large, diverse collection of refractory products designed specifically for the aluminum industry, ensuring a perfect material for each area of your furnace/vessel. We apply these standards of product specialization to our precast shapes, bringing high-performing, specialized pieces to your molten aluminum applications.

In 2010, Allied and Pyrotek joined efforts to better serve the aluminum industry with precast shape solutions. Some of our unique capabilities include:

- Reverberatory Furnaces
- Diecasting Holding Furnaces
- Runners
- Tundishes
- Funnels
- Custom Pouring Components
- Reverb Dome Covers
- X-Act Technology for Crucibles





HEAT TREATING & FORGING INDUSTRY

process
refractory

Allied has several tradenamed refractories designed for use in the heat treating and forging industries. We use these industry-leading products to create customized precast shapes for high temperature applications.

Our capabilities

- Car Decks
- Pier Blocks
- Burner Tiles
- Skid Rails
- Lintels
- Jambs
- Flues

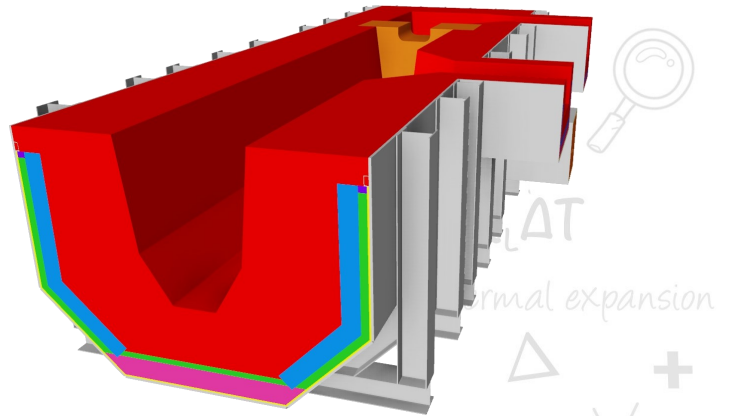




STEEL INDUSTRY

Allied's precast centers work closely with the engineering and research departments to enhance furnace productivity through design innovations. We offer a complete line of specialized precast, pre-fired refractory shapes for the steel industry including:

- Iron Troughs
- Runners
- Slag Runners
- Tilting Runners
- Transfer Equipment
- Blast Furnace Subhearth / Hearth
- EAF Roof Deltas
- EAF Spouts
- EAF Electrode Rings
- Skid Rails

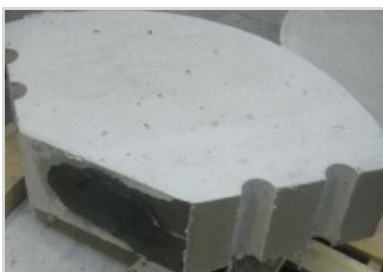
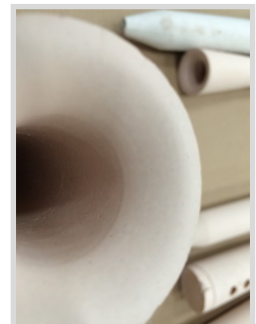
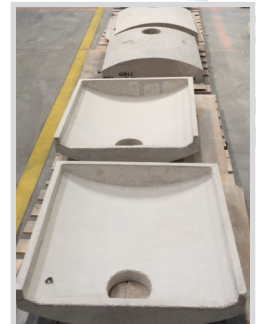
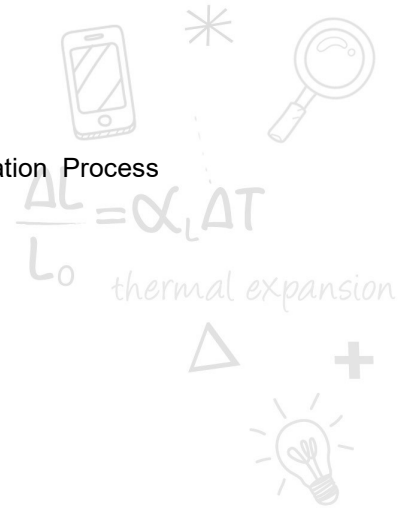




INDUSTRIAL MARKET

Allied precast shape materials for industrial applications include a variety of durable, versatile products. One such product is METAL-ROK[®], our ultimate ceramic-metal composite for pre-fired shapes. Allied's research and development team created METAL-ROK[®] to be strong and dependable in a variety of abrasive conditions. Additionally, we have an extensive product line of manufactured shapes specifically suited for the following:

- Asphalt Process
- Boilers
- Cement
- Hazardous & Bio-incineration
- Iron Ore Processing
- Incineration Process
- Lime Kilns
- Power Generation
- Waste to Energy Gasification Process





HAZARDOUS WASTE INCINERATION

Rotary Kiln Incineration System



Kiln Head

- TUFFCRETE® ARZ
- TUFFCRETE® 65 M
- TUFFCRETE® 47
- INSULMIX® 2460 LI

Rotary Kiln

- TUFFCRETE® 60 M ARZ
- TUFFCRETE® 65 M
- TUFFCRETE® 5R
- DURACON 3450CR
- DURACON 35LS
- INSULMIX® 2460 LI

Secondary Combustion

- TUFFCRETE® 65 M
- TUFFCRETE® 60 M
- TUFFCRETE® 47
- INSULMIX® 2035 LI

Kiln Head Hood

- TUFFCRETE® 60 M
- TUFFCRETE® 47

Transition Area

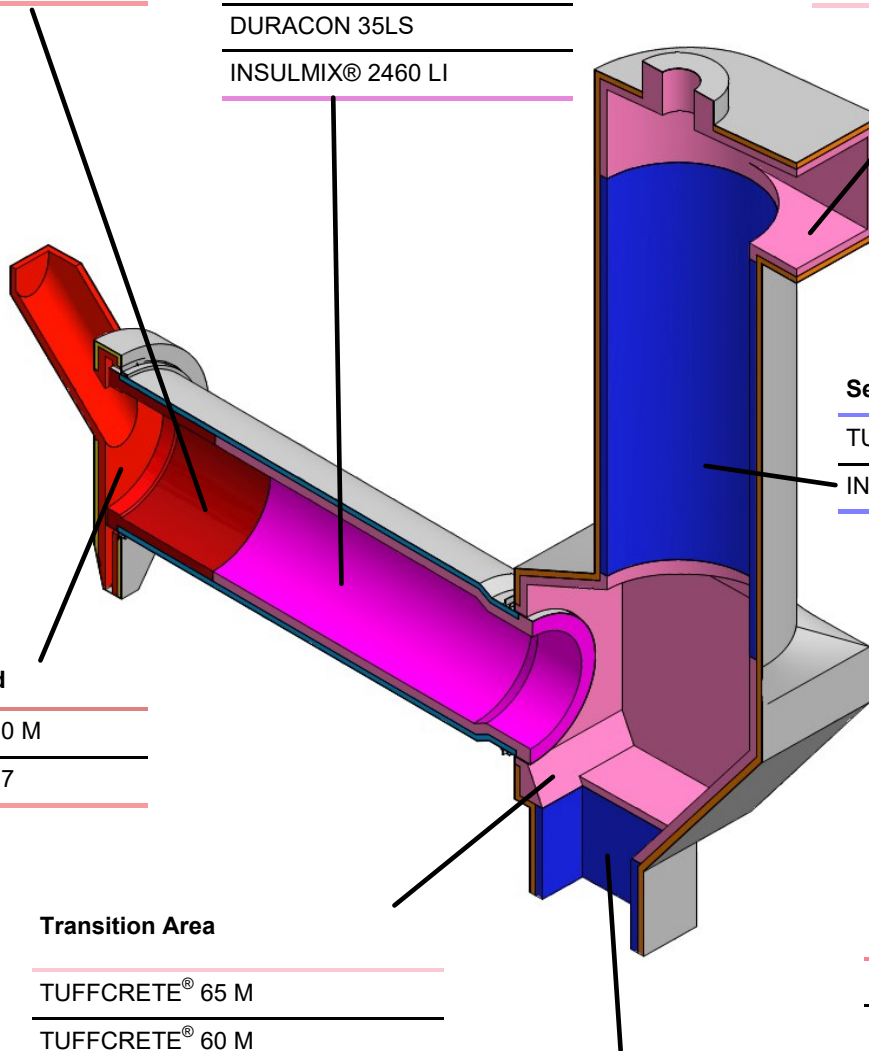
- TUFFCRETE® 65 M
- TUFFCRETE® 60 M
- TUFFCRETE® 47
- INSULMIX® 2035 LI

Slag Discharging Area

- TUFFCRETE® 47
- INSULMIX® 2035 LI

Burner

- DURACON 34
- TUFF-FLO 60A



Secondary Combustion

- TUFFCRETE® 47
- INSULMIX® 2035 LI

thermal expansion





HAZARDOUS WASTE INCINERATION



Liquid Waste Incinerator

Upper Area

TUFFCRETE® 60 M ARZ

FAST-TURN 65 M

TUFFCRETE® 47

NANOTEK FS ULTRA

GUNCAST 28 LI

INSULMIX® 2460 LI

INSULMIX® 2035 LI

Lower Area

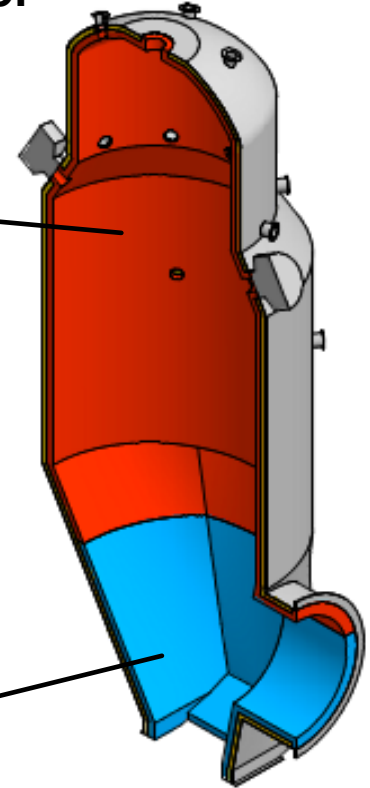
TUFFCRETE® 47

TUFFCRETE® 20 SIC

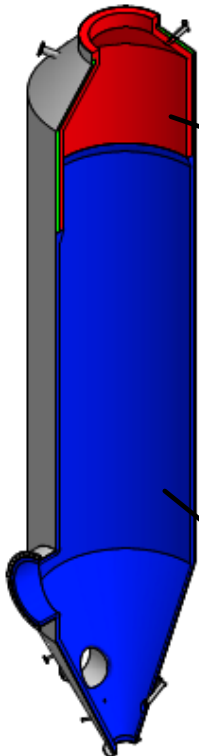
TUFFCRETE® ARZ

INSULMIX® 2460 LI

INSULMIX® 2035 LI



Cooling Tower



Upper Area of Cooling Tower

TUFFCRETE® FS

STACKLINE B PC

NANOTEK FS ULTRA

INSULMIX® 2035 LI

Middle and Lower Area of Cooling Tower

Anti-corrosion layer is coated on furnace shell

STACKLINE B PC/
NANOTEK FS ULTRA

TUFFCRETE 847/
GUNCAST 26 LI





HEARTH RELATED PRODUCTS

Precast shapes for the home and hearth industry are designed to be resistant to alkali attack, mechanical abuse and high temperatures. Allied can create unique precast shapes for the following:

- Fireplaces
- Woodstoves
- Pellet Stoves
- Bio-mass Stoves
- Indoor/Outdoor Wood Boilers
- Gasifiers

process

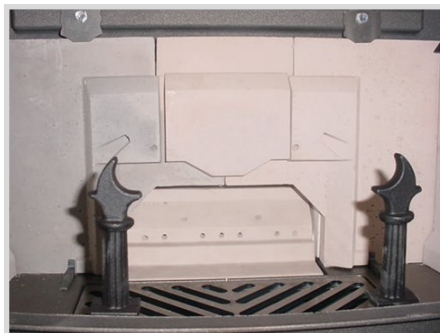
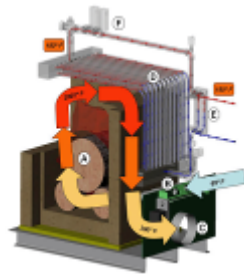
refractory

global

research

$$\frac{\Delta L}{L_0} = \alpha_L \Delta T$$

thermal expansion



in our
element

process



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NOTES

refractory



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research



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$$\frac{\Delta L}{L_0} = \alpha_L \Delta T$$

thermal expansion

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The Allied Difference

Being There Worldwide with Refractory Solutions



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