

# REFRACTORY SOLUTIONS FOR CARBON BLACK

*In collaboration with:*

**Zirc<sup>o</sup>a**

 **HWI**  
A MEMBER  
OF CALDERYS

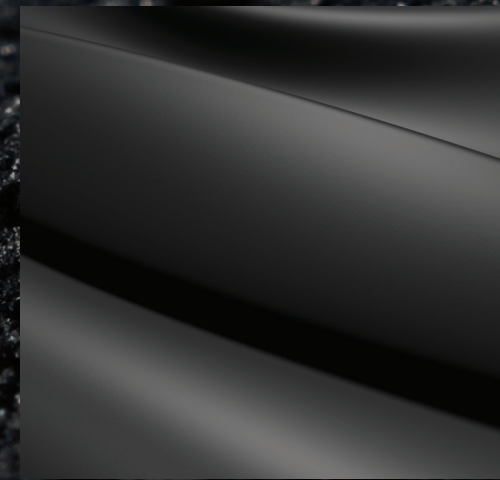
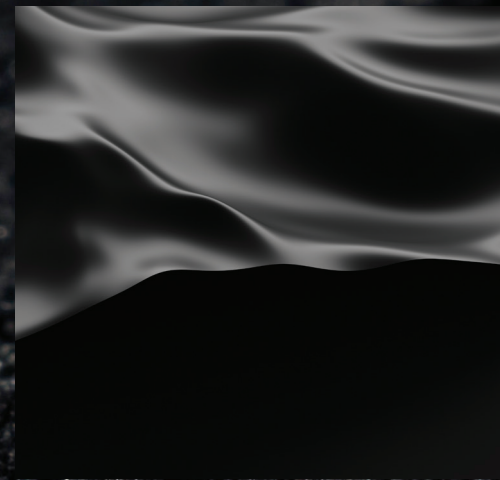
# HWI

Every day around the world, HarbisonWalker International's (HWI) people and products stand up to the challenges and pressures of every job. And for 150 years, we've been the gold standard for refractory products. We deliver one of the industry's widest, deepest lines of solutions. Our world-class products perform to the highest degree. And by bringing intensity, reliability, and passion to work every day, we're able to provide superior value to our customers and their businesses. Get to know the experts who anticipate, respond, and deliver like no one else. We're nearly 2,000 people with one goal: to keep your business moving forward.

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## Zircoa®

When we partner, expect us to focus on your lining requirements, design a cost-effective solution, deliver consistent quality on time, and provide ongoing support to optimize lining performance. Actual temperatures that can be achieved are dependent on specific reactor designs and manufacturing processes. The technology that makes these higher temperatures possible is being used successfully today. Our Application Engineers are ready to assist.



Carbon black plants need refractory linings that allow operators to produce the highest quality carbon black with the highest efficiency possible. HWI's refractory solutions have been used by carbon black manufacturers to supply a variety of grades of carbon black to the tire, industrial rubber, plastics and inks, and coatings industries. HWI has recently partnered with Zircoa, one of the leading manufacturers of high-end Zirconium Oxide-containing refractories. Zircoa compliments HWI's product portfolio by offering products that are suitable for operating temperatures of 3,800°F (2,100°C) and greater. Both companies have a strong global reach and are positioned to work together to provide solutions for carbon black producers around the world.

## COMBUSTION AND REACTION CHAMBER PRODUCT SELECTION


Carbon Black reactors are one of the harshest and highest-temperature applications that exist, pushing refractory technology and engineering their limits. With temperatures reaching 3,800°F and beyond, product selection is based on a careful balance of longevity and cost, with the main destructive mechanism being temperature. The accompanying table is a general guide to product selection for three temperature ranges. Please contact HWI or Zircoa for recommendations that meet your specific needs.

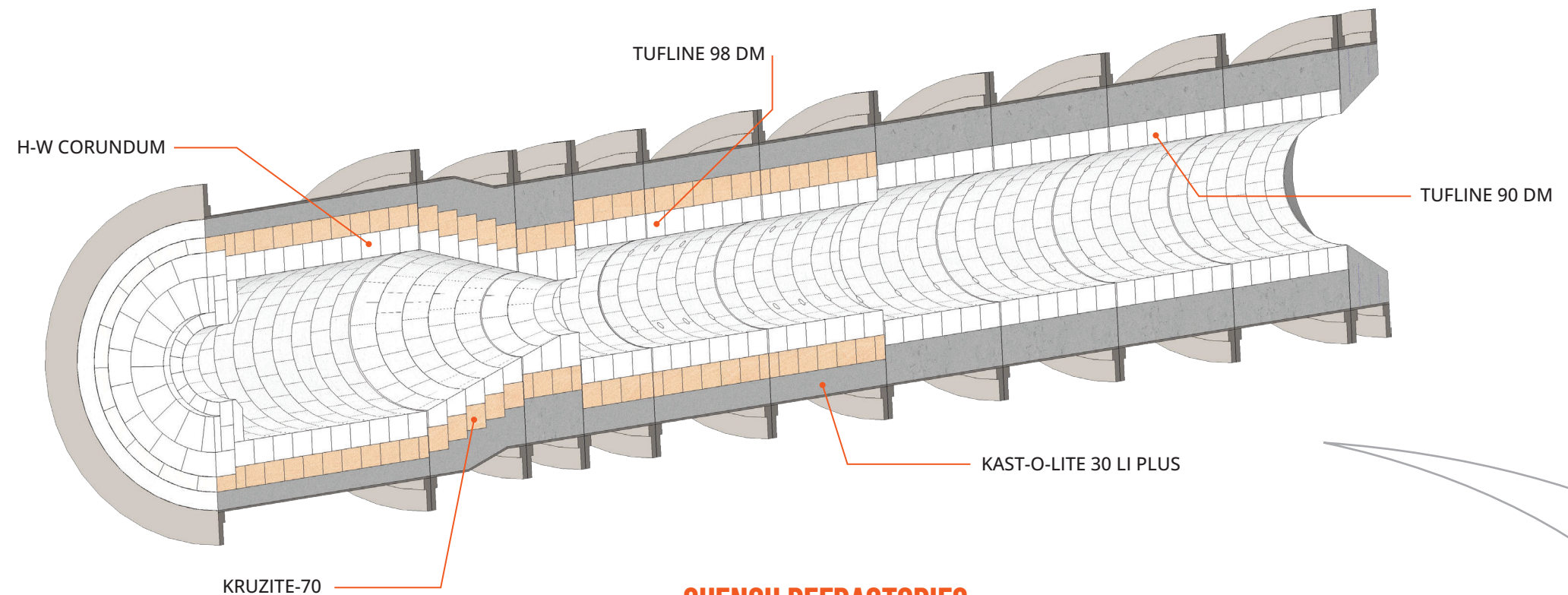


## INSULATING MATERIALS

Multi-component linings with insulating layers are required for Carbon Black reactors to reduce shell temperatures to safe limits. HWI can provide a complete lining from hot-face brick to back up insulators. High-quality bubble alumina brick and castables allow for the highest level of operational stability and efficiency.

INTERMEDIATE	BACKUP
<p><b>KORUNDAL LW</b> — Bubble alumina mullite-bonded high temperature insulating brick. Developed for excellent creep resistance to compliment HWI's KORUNDAL XD brick.</p> <p><b>TUFLINE LW</b> — Bubble alumina corundum-bonded high temperature insulating brick. Developed for low silica content (0.9%) content for enhanced resistance to hydrogen and fluorine atmospheres.</p> <p><b>High Alumina Brick</b> — A variety of high alumina bricks can also be used in the intermediate layer, depending on the desired thermal profile. Common brands include UFALA (60% alumina) and KRUZITE-70 (70% alumina).</p>	<p><b>GREENTHERM</b> — HWI's Insulating Firebrick (IFB) line with qualities ranging from 2,300 - 3,000°F service temperature rating. All qualities carry the low-iron (LI) designation meaning they are resistant to CO disintegration in reducing atmospheres.</p> <p><b>KAST-O-LITE</b> — HWI's lightweight insulating monolithic product line with qualities ranging from 1,600 – 3,300°F service temperature rating. Various options exist for both cast and dry gunnite to suit all installation needs.</p>

< 3,400°F (1,870°C)	< 3,800°F (2,100°C)
<p><b>KORUNDAL XD</b> - Mullite-bonded 90% alumina brick. Excellent hot strengths and chemical resistance. Industry-leading purity make KORUNDAL XD® the mainstay in a wide range of applications.</p> <p><b>TUFLINE</b> - Mullite-bonded high-alumina brick that incorporates HWI's Dense Matrix (DM) technology for reduced porosity and extra strength. Available in 90%, 95% and 98% alumina compositions. Featuring a proprietary thermal shock-resistant additive, TUFLINE® is an excellent choice for refractory chokes where thermal shock can be a cause of significant wear.</p> <p><b>H-W CORUNDUM</b> - Corundum-bonded high-alumina brick (99.6% alumina) with ultra-high purity for maximum refractoriness. Best used in high temperature zones where thermal shock resistance is not required.</p>	 <p><b>RUBY SR</b></p> <p><b>RUBY SR</b> - 10% chrome brick. Chrome provides extraordinary resistance to chemical attack, corrosion, and high temperatures. RUBY SR serves as an initial upgrade option over HWI's extra-high alumina brick options. RUBY SR Utilizes Shock Resistance (SR) technology to provide excellent thermal cycling and shock resistance for use in any zone of a CB reactor.</p> <p><b>AUREX 30 SR</b> - 30% chrome brick offering additional refractoriness over RUBY SR. Uses the same Shock Resistance (SR) technology as RUBY® SR to provide excellent resistance to thermal shock.</p> <p><b>AUREX 75 SR</b> - HWI's premium chrome-alumina spall-resistant brick brand. 75% chromic oxide content makes AUREX 75 SR HWI's top-end problem solver for niche applications where the highest refractoriness is needed.</p>



## QUENCH REFRACTORIES

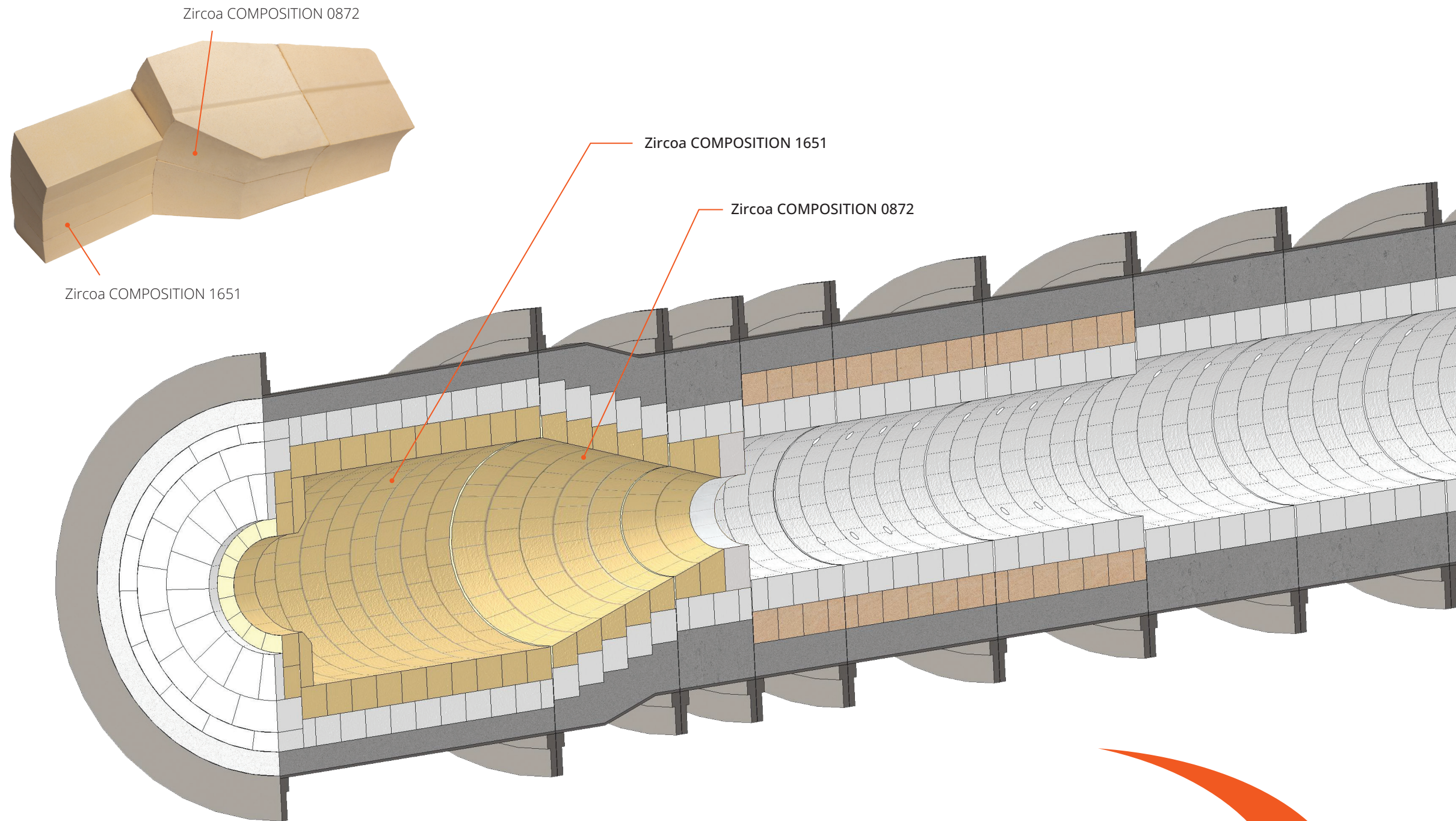
The quench section is a critical stage of the carbon black process, and can require special thermal shock-resistant refractories. Multiple products have been used successfully that incorporate a variety of shock-resistant technologies.

QUENCH
<p><b>TUFLINE 90 DM</b> - Mullite-bonded 90% alumina brick. Incorporates HWI's Dense Matrix (DM) technology for reduced porosity. With its proprietary thermal shock resistance additive, TUFLINE® 90 DM is an excellent choice for areas requiring high refractoriness, chemical resistance, and thermal shock resistance.</p> <p><b>Andalusite-Containing Brick</b> - HWI manufactures a variety of mullite brick products based on andalusite grains. These bricks exhibit high purity, good refractoriness, and excellent thermal shock resistance. Brands suitable for application in the quench include UFALA XCR, UFALA UCR, and NIKE S65W.</p>



## ZIRCOA SOLUTIONS FOR THE HIGHEST TEMPERATURE REACTORS

Carbon Black reactors operating at temperatures greater than 3800°F (2100°C) require special attention to refractory product choice, as well as lining design as a whole. The depicted lining illustrates a combination of Zircoa's customized zirconia brick backed up by a combination of high alumina HWI insulating brick and castable products. Combinations such as this have been successfully used up to 4000°F (2200°C) while maintaining the shell temperature below 600°F (315°C).



### ZIRCOA PRODUCT OPTIONS

**Zircoa COMPOSITION 1651** — Zircoa's premium calcia-stabilized pressed shape. Stable at temperatures greater than 3800°F (2100°C). With proven refractoriness for extreme temperatures, and 2 times the insulating value of alumina, Zircoa 1651 will take the heat.

**Zircoa COMPOSITION 0872** — Zircoa's calcia-stabilized, pre-fired, custom shapes formed with performance characteristics of Composition 1651. Frequently used in applications requiring complex geometry where brick installation can be time consuming.

### SPECIAL SHAPES

HWI and Zircoa both offer custom shapes for carbon black reactors for nearly all product options. These products offer the same great performance as dry-pressed brick, but with additional design flexibility. Usage of these shapes allows for a faster and higher quality installation with fewer joints.

### THERMAL DESIGN

Refractories are critical for containing a process, as well as providing insulation. A successful installation requires careful attention to the thermal design by manipulating products choice and layer thicknesses to suit the individual customer needs. Zircoa is eager to meet with you to determine together the most important aspects for your process (e.g. low shell temperature, low heat loss, etc.). Solutions are uniquely tailored to maintain optimal lining stability.





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