



TECHNOLOGY
AHEAD

IRON INDUSTRY



BLAST FURNACE LINING ENGINEERING

The crucial reason for iron-makers to achieve blast furnace life campaigns as long as possible is the high cost of relining.

While the hearth remains the most critical zone for repair, the stack can always be re-profiled. Robotic repairs or manual installations by lifting platform are today commonplace, well established techniques used worldwide.

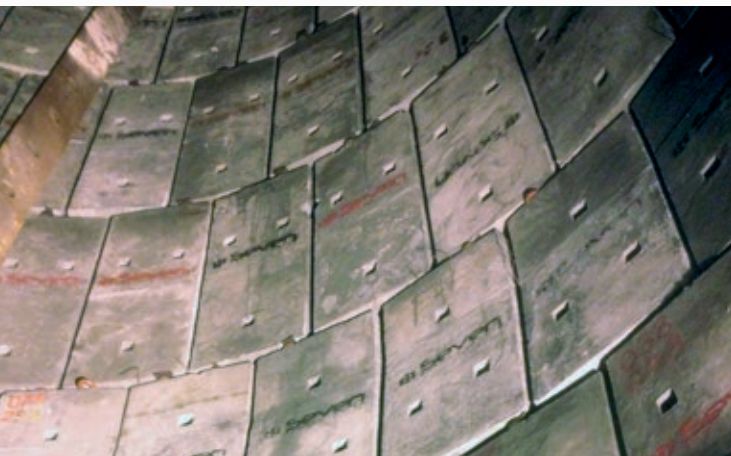
The furnace life extension is nowadays optimized by advanced engineered refractory products.



Seven Refractories offers a complete range of monolithic and precasted products suitable for any blast furnace lining or repair.

Thanks to our significant international experience, Seven can offer the best engineering support for the selection of the products, and undertake turn-key projects.

Blast furnace service life extension, related environmental/safety issues, and cost reduction are all common goals to be pursued with the client, in an open and mutual vision.



DOME
SHOTCRETE OR GUNNING MIX
CO RESISTANT

ARMOR PLATE
CASTABLE LOW-IRON
CO RESISTANT

UPPER AND MIDDLE STACK
SHOTCRETE OR GUNNING MIX
ABRASION AND CO RESISTANT

BACK STAVES
INJECTION MATERIAL

LOWER STACK AND BELLY
SHOTCRETE OR GUNNING MIX
ABRASION AND CO RESISTANT

BOSH
SHOTCRETE, GUNNING OR
CASTABLE
ABRASION AND CO RESISTANT

TUYERES BELT
HIGH ALUMINA SHOTCRETE
OR PRECASTED BLOCKS

HEARTH
CASTABLE, SHOTCRETE
OR PRECASTED TILES
HIGH ALUMINA OR AGS*

HEARTH BOTTOM
CASTABLE OR SELF-FLOWING
HIGH ALUMINA OR AGS*

SUB-HEARTH
SELF-FLOWING LEVELLING
CASTABLE

IRON STAVES JOINTS
RAMMING, PLASTIC OR
PLASTIC GUNNING ABRASION
RESISTANT

COPPER STAVES JOINTS
HIGH THERMAL CONDUCTIVITY
RAMMING OR PLASTIC MIX

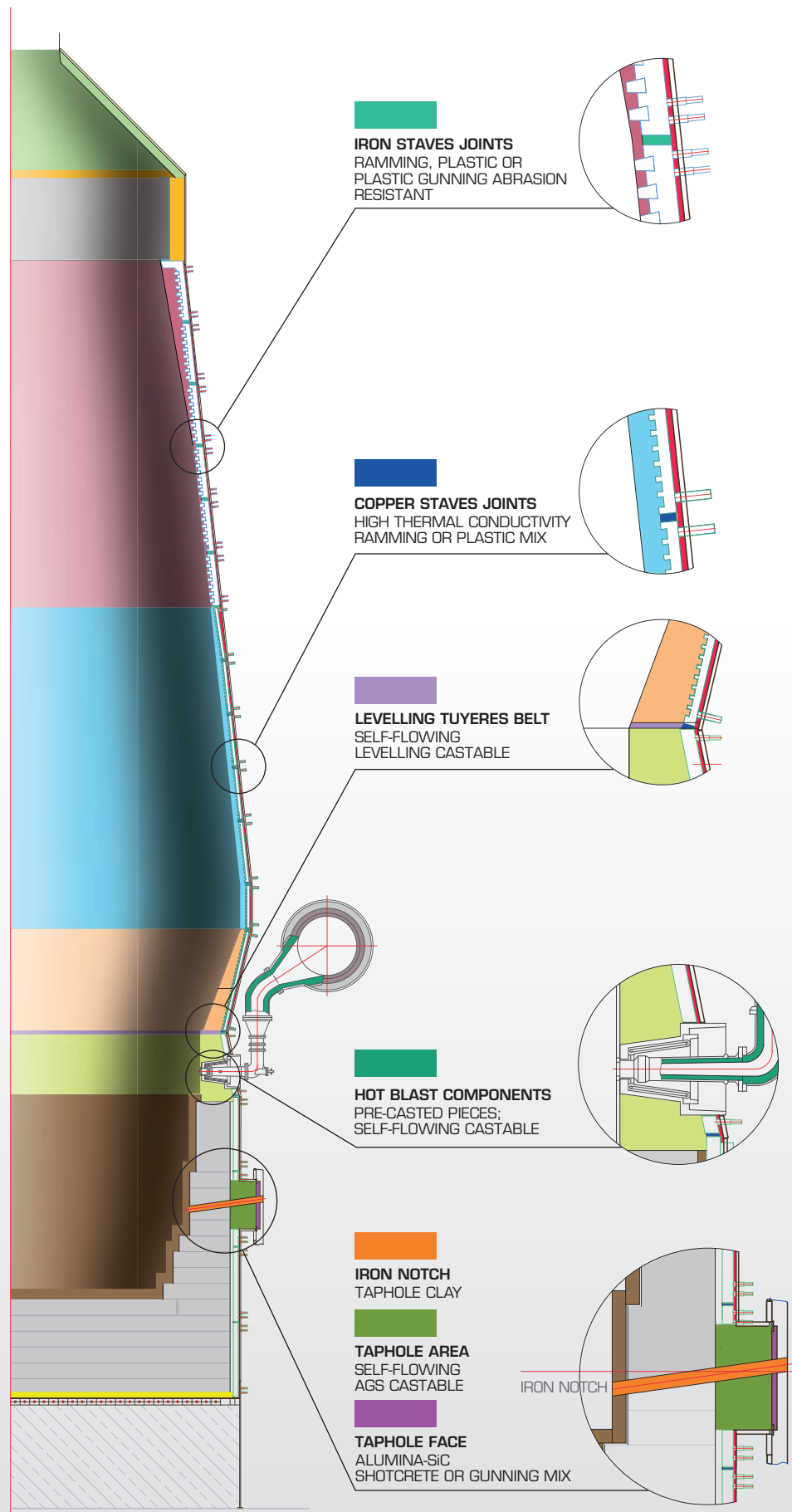
LEVELLING TUYERES BELT
SELF-FLOWING
LEVELLING CASTABLE

HOT BLAST COMPONENTS
PRE-CASTED PIECES;
SELF-FLOWING CASTABLE

IRON NOTCH
TAPHOLE CLAY

TAPHOLE AREA
SELF-FLOWING
AGS CASTABLE

TAPHOLE FACE
ALUMINA-SiC
SHOTCRETE OR GUNNING MIX

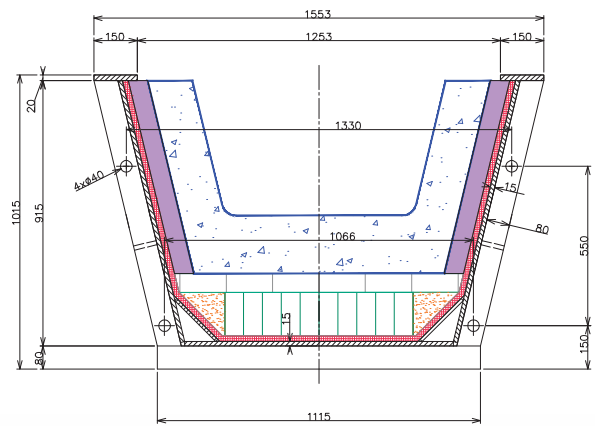
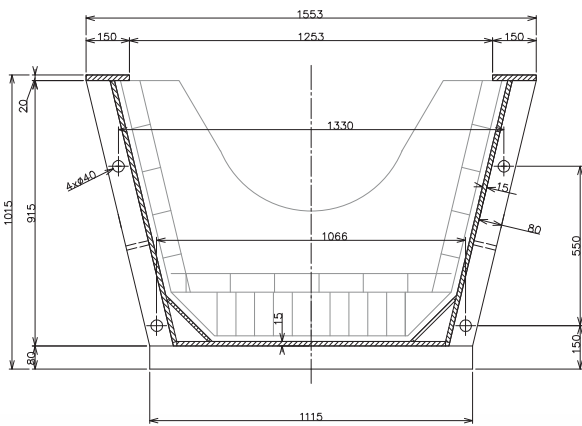


*AGS - Alumina - Graphite - Silicon Carbide

CASTHOUSE ENGINEERING

Runner design, product architecture, and application technology, contribute to determine the performance of the casthouse units.

Seven Refractories provides reliable high alumina - silicon carbide - carbon products for all working and safety linings of the runners.



Working lining characteristics

- Designed for long campaign service life
- Low and ultra-low cement castable
- Brown fused alumina and silicon carbide based
- High erosion resistant
- Iron and slag resistant
- Thermal cycling/thermal shock resistant
- Low cracking behaviour
- Pitch-free and no toxic emission



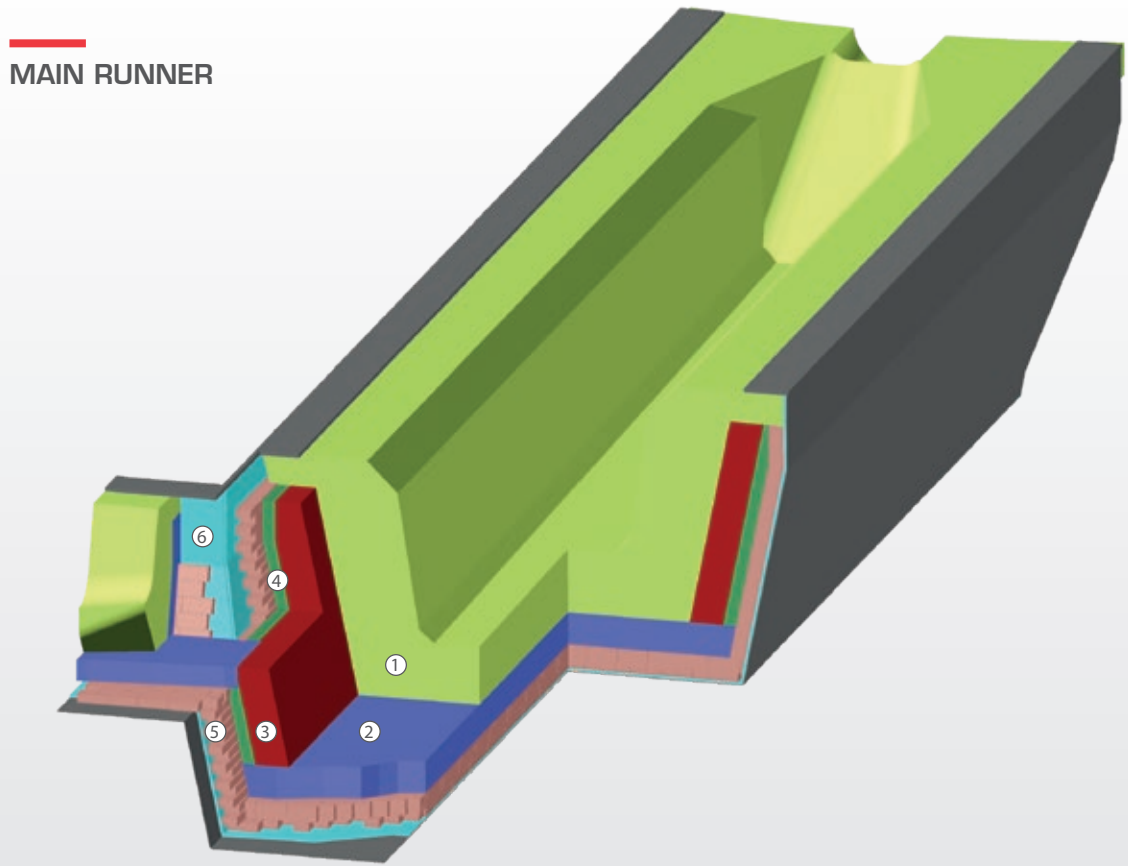
Safety lining characteristics

- Long service life
- No cracks formation
- Oxidation resistant
- High mechanical properties
- Casted on site or supplied in precasted blocks
- Designed for zoned lining
- Pitch-free and no toxic emission



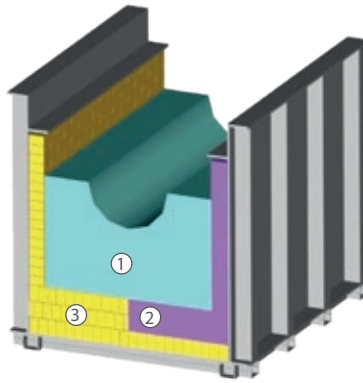
Seven Refractories offers different lining solutions for every casthouse. Based on layout, installation technique, experience and customer preferences.

Seven cast	Regular, low and ultra-low cement vibrating castables for any application
Seven flow	Self-flowing low and ultra-low easy to install castables
Seven gun	Dry dense and regular hydraulic mixes for all general maintenance
Seven ram	Ramming mix chemically and ceramic bonded mixes for any kind of application
Seven plast	Shaped plastic chemically and ceramic bonded mixes for special applications
Seven shot	Low and ultra-low cement spraying castables for dedicated quick lining and repairs
Seven grout	Hydraulic and chemically bonded self-flowing mixes used for hot and cold injection
Seven dry	Special dry chemically bonded mixes for dedicated applications
Seven cem	Special chemically bonded mortar for jointing precasted blocks and bricks lining
Seven shape	Special ready shaped dried blocks for special use



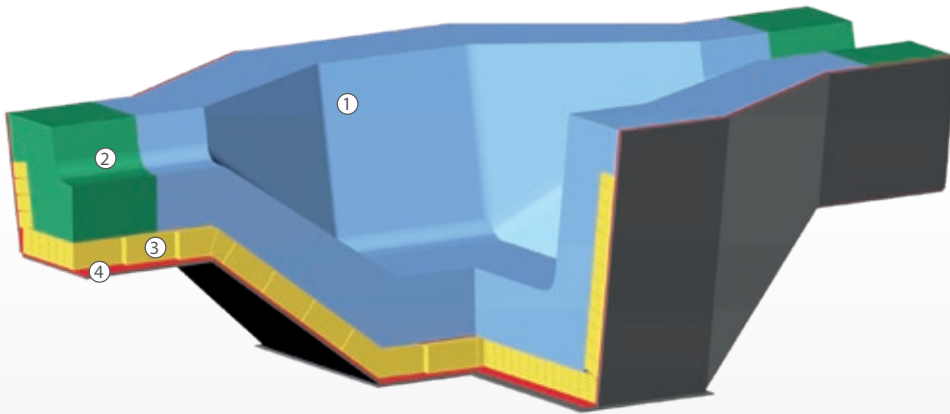
Color	Zones	Material type	Attention to
①	Working lining	Vibrating ags castable, shotcrete or ramming mix	Iron and slag resistance, thermal shock, oxidation, abrasion resistance
②	Bottom safety lining	Vibrating or shotcrete castable	Thermal shock, mechanical characteristics
③	Sidewalls safety lining	Vibrating castable or precasted blocks	Thermal shock, mechanical characteristics
④	Back filling	Self flowing castable, dry mix	Thermal shock, thermal conductivity
⑤	Permanent lining	Vibrating castable or chamotte bricks	Thermal shock, mechanical characteristics
⑥	Shell protection	Insulating board, insulating paper	Thermal conductivity

**IRON RUNNER
SLAG RUNNER**



Color	Zones	Material type	Attention to
①	Working lining	Ags vibrating castable, shotcrete, precasted blocks or ramming mix	Iron/slag resistance, thermal shock, abrasion resistance
②	Safety lining	Vibrating castable, self flowing castable	Thermal shock, mechanical resistance
③	Safety lining	Chamotte bricks	Thermal shock, mechanical resistance

TILTER



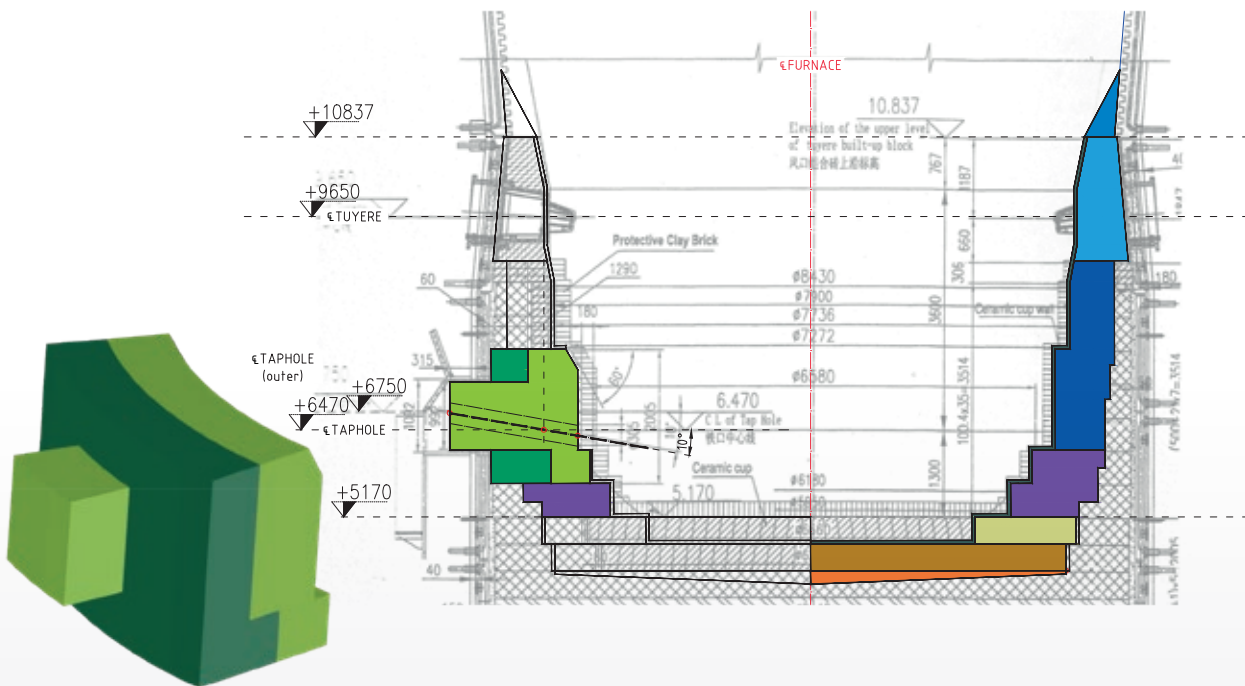
Color	Zones	Material type	Attention to
①	Working lining	Ags vibrating castable, shotcrete or ramming mix	Iron/slag resistance, thermal shock, abrasion and impact resistance
②	Working lining	Vibrating ags reinforced castable	Iron/slag resistance, thermal shock, abrasion and impact resistance
③	Permanent lining	Chamotte bricks or vibrating castable	Thermal shock, mechanical characteristics
④	Shell protection	Insulating board or insulating paper	Thermal conductivity



TAPHOLE CLAYS

Cast rate, corrosion resistance and balancing the taphole wear and the renewal of the “mushroom” are all aspects creating synergy between the user’s demand and the producer’s capability.

Special attention is paid to the product design and manufacturing to ensure stable furnace operation and hearth walls protection.



Seven Refractories taphole clay is the right answer to:

- Daily iron production up to 12,000 t/d
- Short intermediate tapping time, 20 min
- Prolonged continuous operation on the same taphole, more than 20 days
- Easy drilling at the scheduled time, no O₂ utilization
- Long and stable taphole length
- Low specific consumption
- Long cast duration, over 200 min
- Lowest emission to atmosphere
- Controlled cast rate

Several families of products for different requirements have been designed:

Seven TAP 100	suitable for small blast furnaces.
Seven TAP 200	engineered for consistent performance in small and medium size blast furnaces.
Seven TAP 300	a higher content for anti-abrasion additives increases the taphole performance and makes it more suitable for medium and large blast furnaces.
Seven TAP 400	top grade of the range, where the high content of SiC, Si ₃ N ₄ and carbon make the products suited to extreme operating blast furnace conditions.

Brand name	BF typology	Mineral base	BF daily productivity	Si ₃ N ₄ addition	SiC+Si ₃ N ₄ +C [%]
Seven TAP 200	Small size	BFA Bauxite	< 3.000 t	no	29
Seven TAP 300	Large size	BFA	3.000 - 5.000 t	yes	34
Seven TAP 375	Large size	BFA	5.000 - 13.000 t or higher	yes	38
Seven TAP 400	Large size	BFA	5.000 - 13.000 t or higher	yes	40
Special applications					
Seven TAP 055 PL		BFA		yes	42
Seven TAP HB 30		BFA		yes	34



All Seven taphole clays are resin bonded green products, environmental friendly and safe for human health.

The fast curing and the low atmospheric emission ensure that the clay adheres to the current stringent EC legislation. No warning labelling is required.

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Seven clays are designed for any type of mudgun. Their binding system has an improved temperature threshold preventing hardening in the mudgun barrel and cone.

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SERVICES PROVIDED

- Preliminary study and investigation for the entire project
- Design and architecture including bill of materials and thermal calculation
- Full range of products for lining and maintenance
 - Regular, low, ultra-low and no-cement castable
 - Regular and dense low-cement gunning mix
 - Ramming
 - Shotcreting
 - Self flowing
- Supply of mixers, gunning machines, pumps, etc.
- Training on mixing, gunning and maintenance techniques
- Training on equipment usage
- Supervision and monitoring by experienced technicians
- Global research & development
- Technical advice by experts
- Monitoring and targeting of results



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▶ SLOVENIA

Seven Refractories d.o.o.
Poslovna cona Risnik 40
6215 Divača
Tel. +386 5 739 57 60

▶ AUSTRIA

Seven Refractories GesmbH
Am Heumarkt 10
1030 Vienna
Tel. +43 1 343 01 64

▶ RUSSIA

Seven Refractories LLC
Liteyny prospekt, 26, liter A,
premise 475, office 522
191028 Saint-Petersburg
Tel. 0078 12 616 13 73(4)
Fax 0078 12 616 13 73(4) 105

▶ UKRAINE

Seven Refractories Ukraine LLC
Glinki str., 7, office 1102
49000 Dnipro
Tel. +38 067 612 6346

▶ ITALY

Seven Refractories Srl
Via Carlo Mussa 832
15073 Castellazzo Bormida
Tel. +39 013 127 8868
Fax +39 013 129 3911

▶ KAZAKHSTAN

Seven Refractories Asia
Karaganda region
Doskey village, Block 028
Building 1655
Tel. +7 721 240 4777

▶ INDIA

CORPORATE OFFICE
Dalmia Seven Refractories Limited.
4, Scindia House, Connaught Place
New Delhi - 110001
Tel +91 11 23457100

PLANT DALMIASEVEN KATNI
Dalmia Seven Refractories Limited.
Plot No 8 & 13
Phase-III, Lamtara Industrial Area
Katni - 483501, Madhya Pradesh
Tel : +91 7622 266259/266306

▶ GERMANY

Seven Refractories Deutschland GmbH
Düsseldorf:
Becherstraße 20
40476 Düsseldorf
Tel. +49 211 544 770 25
Fax +49 211 544 793 50

Neuwied:
Dierdorfer Straße 411
56566 Neuwied
Tel. +49 2631 511 98 98