RHI MAGNESITA

RHIM's solutions for the Glass Industry

Melter Bottom Concept

September 2024

Upper & Lower Layers

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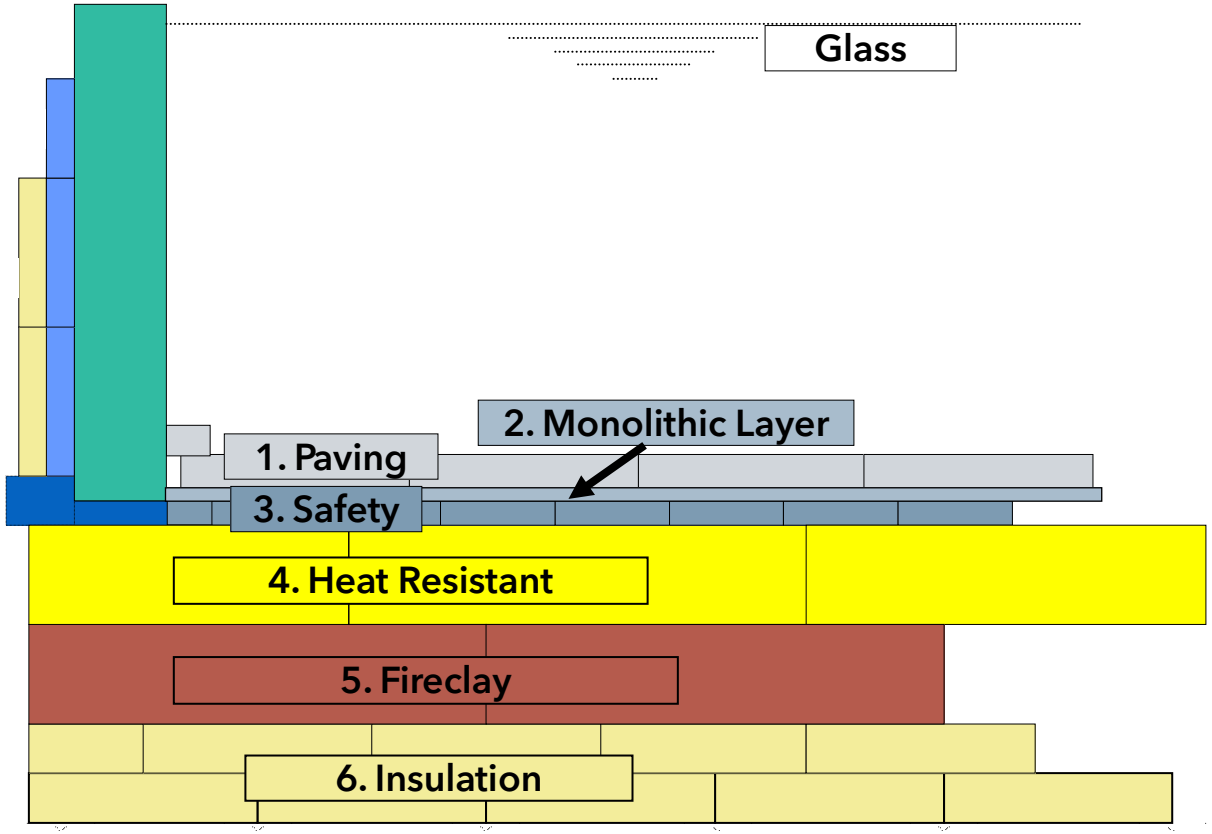
Due to specific requirements, RHIM divides the bottom in two parts



Upper Layers

1. Paving
2. Monolithic Layer
3. Safety Layer

Requirements

- ***Corrosion resistance*** against glass
- Resistance against ***metal drop drilling*** (two approaches: **metal encapsulation** and **metal corrosion resistance**)
- ***Upward Drilling*** *prevention*
- High refractoriness

Lower Layers

4. Heat Resistant
5. Fireclay Layer
6. Insulation

Requirement

- **Refractoriness** according to the expected temperature profile
- **Mechanical** Properties; Cold Crushing Strength
- Optimum **compromise between insulation and bottom lifetime**

Upper Layers

Paving – 32 % - 40% ZrO_2 AZS Fused Cast is the preferred choice for most melters

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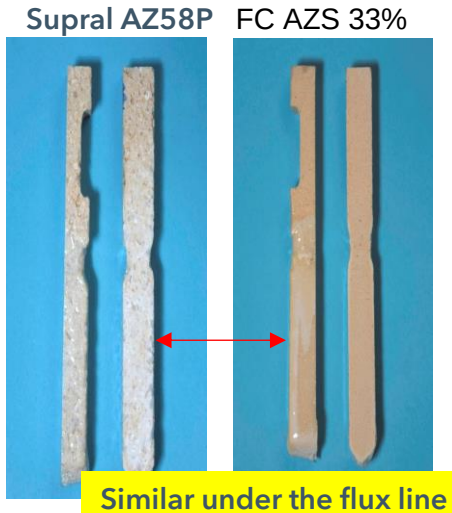
Supral AZ58P can be an option under some conditions

- Low temperatures
  - Float charging end
  - Container coloured glasses
- Shorter Campaigns
- Working End Alterative due to the less risk of glass defects

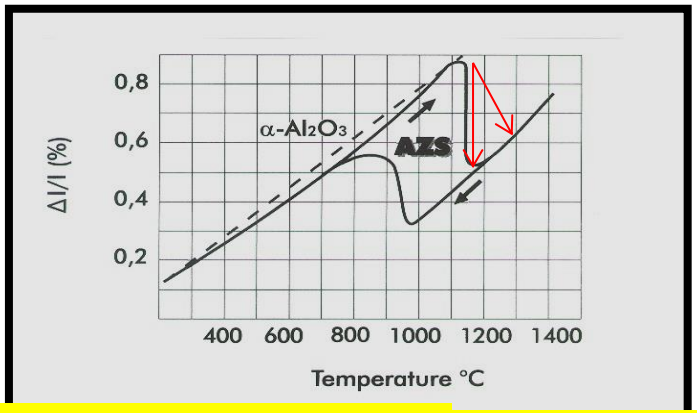
Advantages

- More stable expansion behavior
- Good corrosion resistance
- No Glassy phase (no exudation, no upward drilling boosted by exudation , low risk of cat scratches or glass defects)
- Lower thermal conductivity



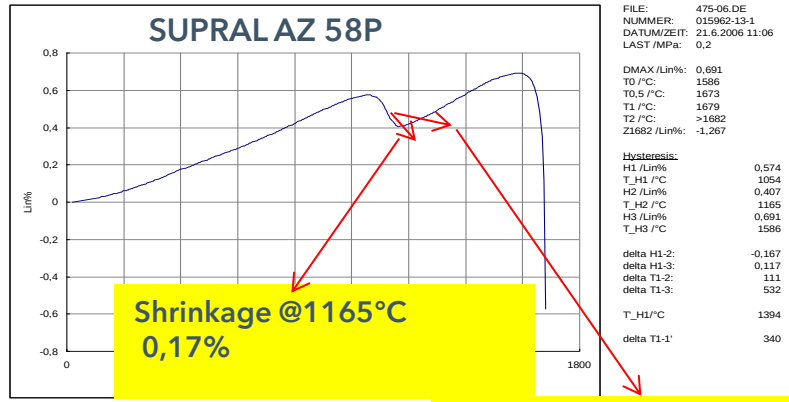
Similar under the flux line

Corrosion test with soda lime glass 1400°C – 24h



Shrinkage @1165°C
0,35%

Shrinkage @1300°C
0,25%



Shrinkage @1165°C
0,17%

Shrinkage @1300°C
0,08%

Hysteresis starts with 24% ZrO_2 content in the brick

Upper Layers

Monolithic layer

- Avoids glass penetration through the joints under the paving, prolonging the furnace lifetime
- Requires good glass corrosion resistance.
- Low shrinkage during heat-up to obtain a sealed layer with no gaps.
- Resistance against metal penetration is also needed

New developments: Self flowing mix for a faster and easier installation
DIDOFLO ZM 30-3-DE based on zircon mullite
DIDOFLO A89CR-3-DE based on Chrome alumina , metal drilling resistant, for coloured glasses

TWO APPROACHES

1) Metal corrosion resistant grades

Based on Zircon Mullite or Chrome Alumina

DIDURIT ZM 465 0-3
DIDOFLO ZM 30-3
DIDOFLO A89CR-3
RESISTIT ZM 260

2) Metal encapsulating grades

Based on Zircon Silicate

RESISTIT ZS 748

Cup Tests; Soda Lime Glass with cupper droplet 120h @1370°C

Upper Layers

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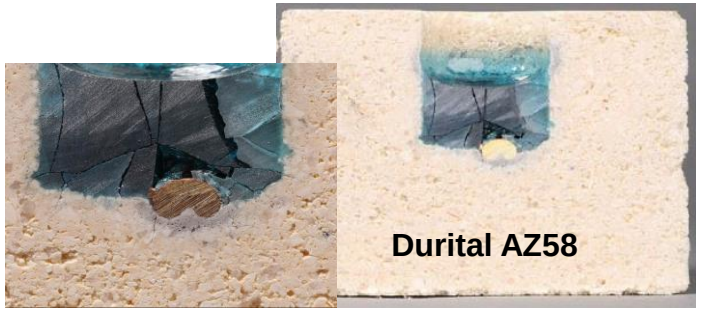
Safety Layer

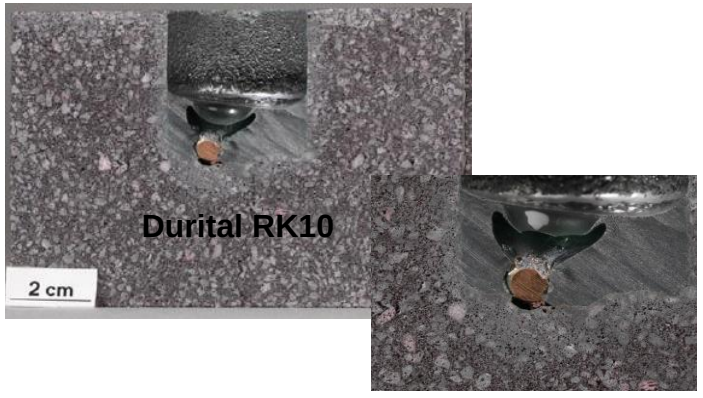
- Final protection against metal or glass penetration, having grade and thickness alternatives to target the specific need.
- Requires good glass corrosion resistance.
- Resistance against metal penetration is also needed

TWO APPROACHES

1) Metal corrosion resistant grades
Based on Zircon Mullite or Chrome Alumina

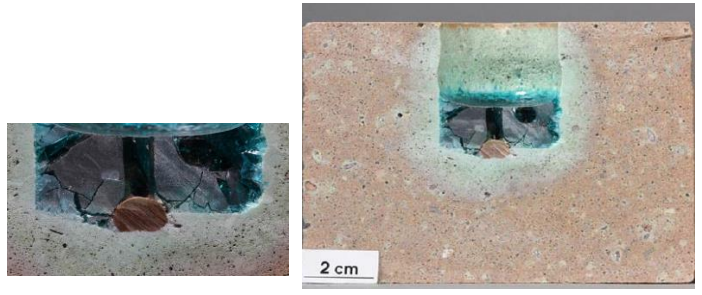
SUPRAL AZ 58P; performs as a second paving layer
DURITAL RK10





2) Metal encapsulating grades
Based on Zircon Silicate

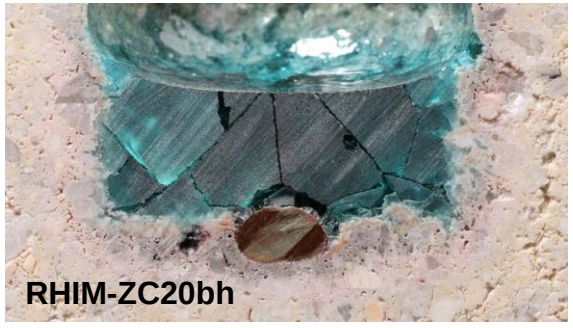
ZETTRAL 65 GG



Cup Tests; Soda Lime Glass with cupper droplet 120h @1370°C

1) + 2) Metal encapsulation and metal corrosion resistance balance

RHIM ZC 20 BH
Based on Zircon Corundum ; during heat up a mullitisation process occurs, and the Zircon Silicate excess contributes to the metal encapsulation



Highly Boosted Furnace Bottoms

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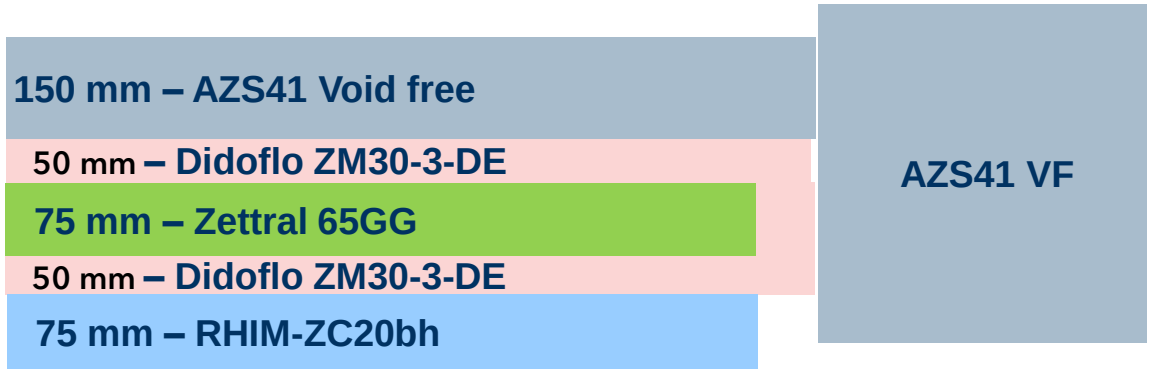
For increased bottom boosting , due to higher temperatures, it is crucial to reinforce the bottom and avoid glass penetration.

- Higher glass temperature and lower viscosity allows easier movement between layers.
- Increase of Glass Currents amplifies the corrosion mechanisms.

- **A second Monolithic Layer is suggested for highly boosted bottoms and for extreme cases even a second Safety Layer can be considered.**
- The second monolithic layer stops glass infiltration. Situated at a lower temperature it would perform better towards more viscous glass, also considering the lower shrinkage risks.



Lower Layers

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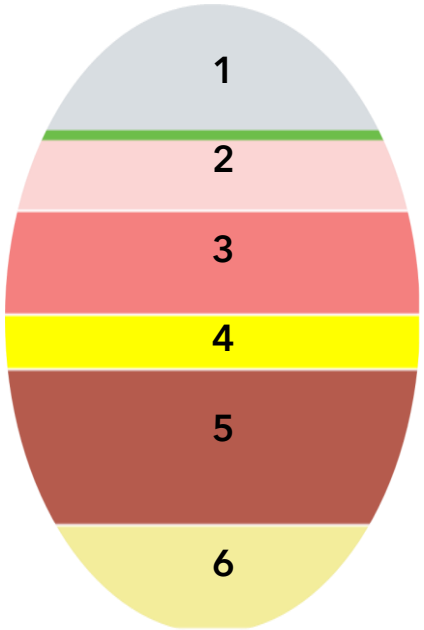
Requirement

- Refractoriness according to the expected temperature profile
- Mechanical Properties; Cold Crushing Strength
- *Balance between a good insulation and furnace bottom lifetime.*
- The application of unfired insulating bottom blocks, provided with the same features of the fired grades, offer the advantage of a high dimensional accuracy directly after the pressing process (+0-2mm) and consequently a more competitive price with an overall lower CO_2 footprint

Grade Selection and Layer Thickness According to the expected Temperature Profile



4. Heat Resistant Layer - - 75 to 150 mm Thick
RHIM-S60bh
RHIM-S60b

5. Fireclay Layer –
RHIM-F40bh
RHIM-F40b

6. Insulating Layer –
RHIM-LiF13bh
RHIM LiF12b

Other insulation grades are available as necessary

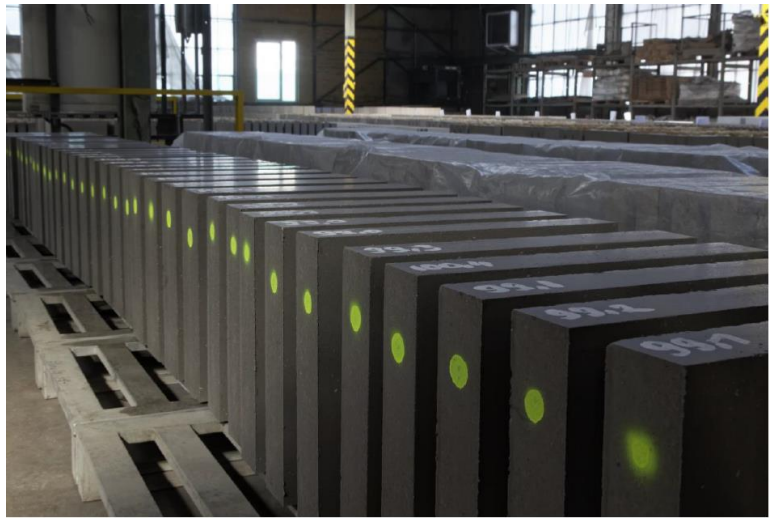
Unfired – Pressed - Large Blocks

Unfired Key-points
- Hydraulic Bonded
- Less energy for production therefore lower CO_2 footprint
- Shorter production times without the firing process

Pressed Key-points
- Hydraulically pressed block offers very homogenous macrostructure & microstructure (no cavities, voids or irregular porosity in the block)
- The surface appearance is homogenous and smooth
- Dimensional consistency from pressing process

Size Key-points
- Large shapes to minimize Joints
- Provides a faster installation
- High dimensional accuracy, (+0-2)mm

Hydraulic Press



4. Heat Resistant Layer RHIM-S60bh
   - Sillimanite
   - 1000x498x300 mm Max size

5. Fireclay Layer RHIM-F40bh
   - 1000x500x350 mm

6. Insulation Layer RHIM-LiF13bh
   - 1000x500x200 mm

Fired grades are also available

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Thank you for your attention

Get in Touch

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