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## Firebolt® Prefabricated blocks for long life linings

High-efficiency cement plants set increasingly high demands on refractory suppliers due to the increasing trend towards the use of alternative fuels. Fuels like tyres, plastics, rice husks, coconut shells, sewage sludge, oil, paint residues and municipal solid wastes dramatically increase the amount of the acidic and abrasive compounds.

Increased process temperatures and higher chemical loads generate high thermal and thermochemical loads, affecting the refractory lining. The result is that the refractory lining suffers from infiltration, leading to the destruction of its microstructure and changes in its physical properties. The traditional method of using alumina containing bricks as the basic lining for cement applications is not enough to solve these problems. However, Firebolt prefabricated blocks are an alternative choice for long-life linings.

High quality materials and additives with high manufacturing precision and tight tolerances, as well as unique installation method mean that Firebolt prefabricated blocks are an alternative to other lining methods. Production of blocks is done in a curing oven that is computer-controlled up to 800°C and has an area of 280cm x 280cm, a height of 190cm and capacity of 12t/batch. All blocks are delivered already dried and cured, which makes new linings more stable.

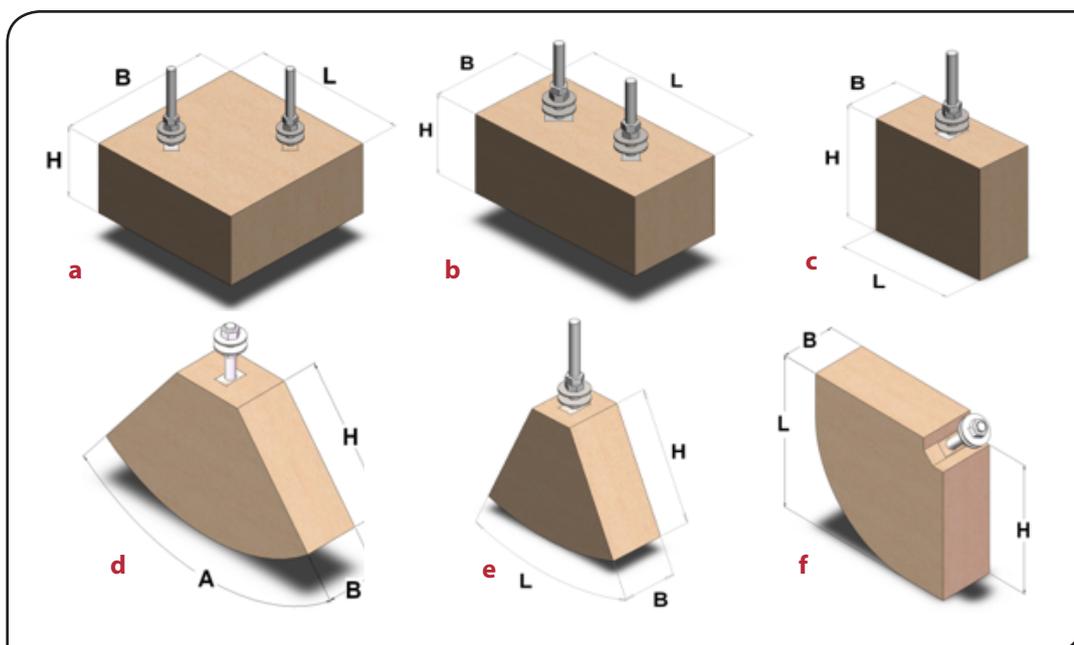
Standard blocks are available in various dimensions and qualities. The square blocks are 4552:71\_A, 4600:26\_A, 4600:30\_A, 4600:43\_A (400mm length x

400mm width) with thicknesses of 100-250mm. Half square blocks are 4552:72\_A and 4600:27\_A (400mm x 200mm) with thicknesses of 200mm and 150mm respectively. Squares and half squares can be installed straight onto the kiln hood, cooler walls and benches.

Curved block types 4600:10\_A, 4600:15\_A and 4600:06\_A can be applied on bullnose corners where the thicknesses of those blocks are 280mm and 290mm. The 4552:75\_A type block can be installed as an intermediate block.

Block installations can also be carried out on inlet chambers, riser ducts and cooler roofs. The installation of blocks requires 'Assembly kits,' that consist of threaded rods and nuts made of high quality, high temperature-resistant stainless steel EN 1.4835. Washers and nuts are also part of the installation kits. Assembly kits vary in length, depending on insulation and shell thicknesses.

Customised ranges of blocks can be produced in areas where brick linings are not possible due to complicated geometries. Höganäs Bjuf's Firebolt-system can give optimised results offering various advantages such as no dry out period being required.



**Left:** Blocks from Höganäs Bjuf:  
 a) 4552:71\_A, 4600:26\_A, 4600:30\_A, 4600:43\_A  
 b) 4552:72\_A, 4600:27\_A  
 c) 4552:75\_A, 4600:19\_A  
 d) 4600:10\_A  
 e) 4600:15\_A  
 f) 4600:06\_A



## References

- Holcim Lägerdorf:** Bullnose, cooler walls and roof.
- Holcim Dotternhausen:** Cooler walls.
- Deuna Dyckerhoff:** Cooler walls.
- Norcem Kjøpsvik:** Bullnose and cooler walls.
- Norcem Brevik:** Bullnose, cooler walls.
- Cemex Chelm:** Bullnose.
- Holcim Prachovice:** Bullnose, cooler walls and roof.
- Holcim Dotternhausen:** Riser duct.
- Deuna Dyckerhoff:** Riser duct.
- Holcim Höver:** Cooler walls, roof, bullnose, benches and kilnhood.
- HeidelbergCement Poland:** Inlet chamber.
- Cemex Poland:** Bullnose, cooler roof.

Blocks can be used as an insulation mould to reduce installation time and cost, followed by easy replacement on site. Some of the customised blocks that can be produced include those for cyclone roofs, inlet chamber arches, burner tips, satellite cooler outlet rings and air blasters.

### Firebolt Prefabricated blocks for cooler and bullnose applications

Clinker cooler conditions are severe, as the clinker is quickly cooled down from 1300°C to 100°C, to give C3S as the main phase in cement. Potential degradation mechanisms that exist in this area include abrasion due to clinker movement, thermal shock due to cooling from high temperature and chemical attack due to release of alkalis.

The preferable lining castable for the cooler hot zone and bullnose is 80% alumina, known as Höganäs DC 80 (low cement castable based on high mullite chamotte) or coupled with SiC for better abrasion resistance like Höganäs DC SiC 30 (low cement castale

based on 30% silicon carbide and chamotte). The cold zone of the cooler can be lined with lower alumina content of 50-60%, Höganäs DC 50 AF (alkali resistant low cement castable based on chamotte).

The installation of the blocks is quick and easy. Holes are drilled on the bullnose or wall shell so that the threaded bolts can be fixed from outside and bolted in place (below). The shell, existing load supports and separation of the new block lining from the existing lining are covered by a 13mm ceramic blanket. 3mm 'ceramic paper' is installed between the block rows and the vertical joints are approximately 500mm apart from each other.

Cooler benches require materials that are highly abrasion resistant, combined with excellent temperature resistance properties. A life long lining can be obtained with Firebolt blocks made of Höganäs DC Sic 30 and Höganäs insul G (insulating conventional castable based on light weight material). For every other block, 3mm ceramic paper can be used as a vertical joint. This design can obtain four years of life under severe operational conditions (bottom right).

### Summary

Firebolt® Prefabricated blocks have been successfully developed under strict manufacturing and quality control conditions and have high performance physical, mechanical, thermo-mechanical and thermo-chemical characteristics to suit various applications in the cement manufacturing process.

They have already been installed in all areas of cement plants around the world, where they have been found to have long service life. 

**Right:** Mounting a bullnose Firebolt prefabricated block.

**Far right:** Completed installation of bullnose Firebolt prefabricated blocks.



**Right:** Condition of bullnose and cooler hot roof after four years of operation.

**Far right:** Condition of cooler side walls and benches after four years of operation.

