KALCRET®
Hard Compound

Trowelled, Cast or Sprayed on Wear Protection for System Components and Pipes

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KALCRET® Hard Compound

Trowelled, Cast or Sprayed on Wear Protection for System Components and Pipes

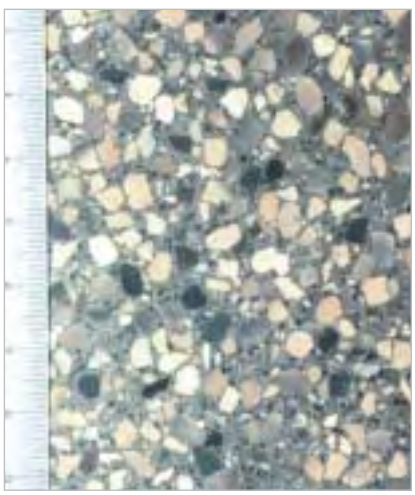
KALCRET hard compound is the general term for cement bonded wear protection materials. These are based on inorganic materials of high strength and good wear resistance.

The specific density is attained by a well balanced particle size distribution of the individual components. The pores between the cement portions are filled by the addition of superfine particles of micro silica.

KALCRET reaches high compressive strength after 8 hours. It is excellently suited for repairs.

The mixture includes defined additives and is made up of:

- hard aggregate materials
- cement binder
- micro silica



Structural composition of KALCRET: high strength cement matrix, hard aggregate materials 0.1 – 4 mm in size (bauxite or corundum)

A specific portion of steel fibers is added to enhance the structural strength. The type of steel fibers used depends on the thermal, chemical and corrosive stress to which the wear protection will be exposed. Expansion joints will be provided when KALCRET is used at higher temperatures.

Concerning its chemical resistance KALCRET is more stable than regular concrete. However, KALCRET can not be used as acid protection.

Ideal for material combinations

KALCRET is also fit for combination with other materials from the Abresist Corp. wear protection program, such as with

- ABRESIST®
  fused cast basalt
- KALCOR®
  zirconium corundum
- ALRESIST®
  high alumina ceramics

Technical advice

Numerous varying factors determine which material from Abresist Corp. will be best for solving a particular wear problem.

After having reviewed the conditions of the particular application, our experts will give you comprehensive advice and submit proposals tailored to the particular requirements.

KALCRET: wear protection material out of a bag

KALCRET trowelled compound

This compound allows protection of vertical, inclined and curved surfaces.

KALCRET cast compound

This material will be particularly useful for protecting flat surfaces against wear or if formwork can be used.

KALCRET sprayed on compound

KALCRET sprayed on compound allows large surfaces to be lined in a minimum of time. It may be applied by spraying horizontally, vertically or even overhead without any problems.

Advantages of KALCRET

- high strength and abrasion resistance to wear caused by sliding friction
- large surface lining with no joints
- varying lining thickness depending on the stress due to wear
- can be used after 8 hours
- suitable for temperatures up to 1200 °C / 2192 °F
- high thermal shock resistance
- even complicated geometries are feasible
- ideally suited for repairs
- can be installed at the site by locally available staff
- complete wear protection program
- optimal solution when used in combination with other wear resistant materials from Abresist Corp.

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Working with KALCRET

Preparation

Packing and storage

Normally, KALCRET is packed in 25 kg bags. Steel fibers are delivered in 1 kg packages.

Provided the hard compound is stored in a dry environment, it can be kept at the site up to 12 months after production.

Working temperature

The optimal working temperature ranges between 10 °C / 50 °F and 30 °C / 85 °F. Working at temperatures below 5 °C / 41 °F will not be feasible without heating the system to be lined.

We recommend the use of pre-fabricated KALCRET shapes when large surfaces have to be lined at temperatures below 5 °C / 41 °F.

Surface preparation

The use of KALCRET hard compound requires a careful preliminary treatment of the surfaces to be lined:

- Fastening of an appropriate wire mesh to the relevant surface is done with the aid of suitable accessories. It shall be mounted at a distance of 5 mm from the surface to be lined. Fastening points at a spacing of about 250 mm will be adequate. The wire mesh shall be fixed stiff and rigidly. Other reinforcements can be chosen for thicker coatings.
- Steel surfaces require cleaning. Sandblasting is not necessary.
- Concrete surfaces require cleaning (they must be free of forming oil and loose particles) and shall previously be wetted (as it is standard practice for the application of cement bonded materials).

Setting time

75% of the final strength of the KALCRET will be reached after 8 hours at a temperature of about 20 °C / 68 °F. That period is identical with the minimum setting time, e.g. for repairs.

Temperatures of less than 20 °C / 68 °F will require longer setting times.

Welding the wire mesh to the surface to be lined: distance approximately 250 mm

Stiff and rigid fastening – distance to the wall to be lined: about 5 mm

Installation

KALCRET can either be applied at the Abresist Corp. plant or at the site. A comprehensive range of tools and equipment is available for installation on site.

Check list

- sufficient quantities of KALCRET and steel fibers
- clean water (potable water)
- correct power supply
- working tools
- protected working zone
- no direct sunlight
- surface sealing system
- personal protection (gloves, helmet, goggles, mask)
- duly observe safety data sheet
- duly observe working instructions

Tools Required for Working KALCRET

It is recommended to use the tools and accessories tested by Abresist Corp. for working KALCRET.

This tailor made equipment has been extensively used in actual practice. Several units have been customized and are not offered on the market.

KALCRET spraying system

Wear protected tank of a KALCRET forced circulation mixer

Tools and accessories for working KALCRET

Tools and accessoires

- KALCRET spraying system – also offered with mixer, compressor and generator as independent unit for installing 1000 kg/h
- KALCRET forced circulation mixer with wear protected tank, mixing capacity approx. 30 liters; 1.5 kW motor, 33 rpm (other mixers on request)
- various bricklayer's tools and vessels
- vibration trowel – approx. 23.5 x 13.5 cm
- internal vibrators
- external vibrators
- graduated flasks (1.5 and 3 liters)
- prebent wire mesh (material to be matched to the specific requirements)
- tools and accessories for attaching the wire mesh (material to be matched to the specific requirements)
- steel fibers (material to be matched to the specific requirements)
- surface sealing spray (curing liquid)
- polyethylene sheeting

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Spraying with KALCRET

Hard, Abrasion-Resistant and Quickly Applied

KALCRET spraying technology

Even overhead working is feasible without problem

Homogeneous structure

KALCRET-S can be sprayed to line large surfaces with KALCRET within a minimum amount of time at rates of more than 5 m^2/hour (at 25 mm thickness).

Spraying can be done horizontally and vertically. It can even be worked overhead and enables the lining of complicated surfaces without difficulty.

Investigations have shown that the properties of sprayed on linings do not differ practically from those of comparable vibration compacted linings.

The addition of steel fibers has positive effects on strength and structural stability. The fibers are added to the mixture during the spraying process.

Depending on the particular application, additional insulation may be placed between the lining and steel jacket. Heat losses are reduced and low cost unalloyed structural steels may be used thanks to a lining system characterized by an optimized temperature gradient.

Operating temperatures beyond 50 °C / 122 °F require selective provision for expansion joints. In addition, temperatures of more than 100 °C / 212 °F require observing special heat up curves.

Advantages of KALCRET-S

- time tested wear protection compound
- excellent abrasion values as defined in ASTM
- homogeneous structure with little porosity
- smooth surfaces obtained by reworking
- minimum setting time of no more than 8 hours
- short installation time due to high application rate beyond 5 m^2/hour
- overhead working feasible without difficulty
- homogeneous, jointless and intensely compacted sprayed on layer
- variable thickness options, preferably from 20 to 100 mm

Working with KALCRET spraying system

Spraying technology

- spraying system specially developed for working KALCRET-S
- continuous and homogeneous delivery of the KALCRET-S compound up to the spray nozzle
- water amounts and the timing of injection have been developed to ensure proper moisture level and distribution in KALCRET-S
- steel fibers added direct to the mixture during the spraying process
- spraying system, complete with materials and tools, can be contained for installation on site
- working distance 800 – 1200 mm from the surface to be protected
- delivery distance of the sprayed compound up to 100 m; vertically 40 m

Check list

- provision for all materials, including KALCRET-S and steel fibers in sufficient quantities
- safe supply of clean, potable water, power and compressed air
- surfaces must be clean
- check proper installation of wire mesh
- apply KALCRET by spraying
- check layer thickness
- generate smooth KALCRET surface
- have surface sealed after spraying or
- cover it with polyethylene sheeting

Reinforcement and wire mesh

Smooth surface

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Trowelling and Casting

Prepare KALCRET Compound

- Fill KALCRET quantity needed in a forced circulation mixer. 1 bag of KALCRET (25 kg) yields approx. 9 liters of compound.
- Mix dry hard compound for about 30 seconds.
- Duly observe water dosing rate.
- Exactly measure the required water quantity and slowly add it during mixing. Make sure only clean potable water of a maximum temperature of 25 °C / 77 °F and a minimum temperature of 15 °C / 59 °F is used.
- The desired stiff / plastic working consistency will be reached after 5 - 8 minutes mixing.
- **CAUTION: duly observe the working instructions on the KALCRET bag.**
- The mixing period and the required water quantity may vary within narrow limits depending on the ambient conditions and the product properties.
- As a general rule, we recommend to add steel fibers at a rate of 1 kg of steel fibers per 25 kg bag of KALCRET.
- The steel fibers are added towards the end of the mixing period (after 5 - 8 minutes) without causing agglomeration. Mixing period: approx. 2 minutes.
- The optimal working temperature ranges from 10 to 30 °C / 50 to 86 °F; direct sunlight should be avoided.
- KALCRET can be worked up to 1 hour after mixing subject to ambient temperatures of 20 °C / 68 °F.
- The setting time is at least 8 hours.

1. Empty the bag of KALCRET hard compound in the mixer

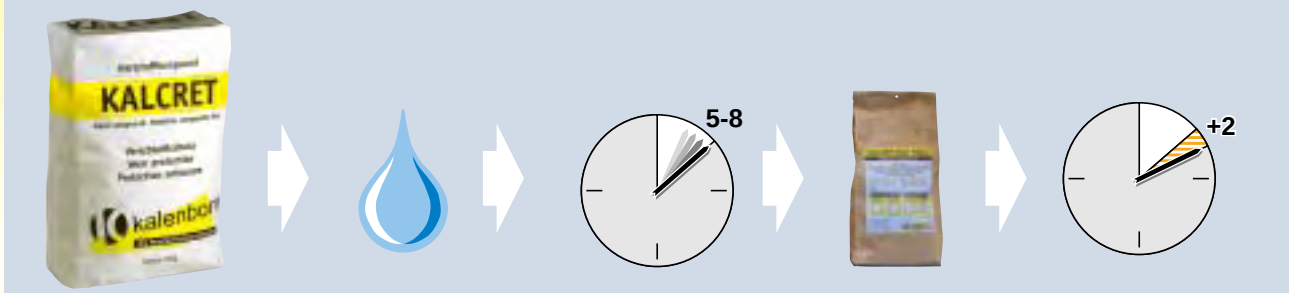
2. Add water as specified in the working instructions

3. Mix for 5 to 8 minutes and check result

4. The compound should have a plastic or stiff/plastic consistency

5. Add steel fibers

6. The stiff/plastic KALCRET compound (X) to be applied by trowelling is compacted with the aid of a vibration trowel



25 kg KALCRET ***Water e.g. 1,225 kg*** ***Mix for 5 - 8 minutes*** ***About 1 kg of steel fibers*** ***Mix at least 2 minutes***

7. Steel fiber materials matched to the specific application are offered

Check list

- clean mixer, clean potable water
- water of moderate temperature (15 - 25 °C / 59 - 77 °F)
- materials free of lumps
- duly observe water dosing rate
- maintain mixing period of at least 5 - 8 minutes in a forced circulation mixer
- in case the KALCRET compound is too dry, add water at steps of 50 ml each per 25 kg KALCRET
- add 1 kg steel fibers per bag of KALCRET after mixing period of 5 - 8 minutes
- quality of steel fibers depending on specific application
- steel fibers shall not clog, therefore add them selectively and slowly
- the KALCRET compound is ready for use as soon as it features a plastic or stiff/plastic working consistency
- the castable KALCRET compound (Y) thus treated has a good plastic consistency, the compound to be applied by trowelling (X) a stiff/plastic consistency
- not to be used at temperatures below 5 °C / 41 °F

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Working with KALCRET

Trowelled Compound

This compound allows protection of vertical, inclined and curved surfaces.

KALCRET is homogeneously mixed and can be applied with the appropriate tools to the prepared sub surface. Depending on the lining thickness, the material is applied and compacted by layers. The KALCRET vibration trowel ensures systematic compacting. Normally, the layer thickness ranges between 20 and 80 mm. The surface is subsequently smoothed.

Steel and concrete surfaces require fitting a prebent wire mesh to ensure good adhesion.

The minimum setting time is 8 hours at an ambient temperature of 20 °C / 68 °F.

Protect the surfaces against quick evaporation of the residual moisture. This can be done either with a surface sealing spray or by covering with polyethylene sheeting.

Operating temperatures above 50 °C / 122 °F require provision of expansion joints. In addition, temperatures of more than 100 °C / 212 °F require observing specific heat up curves.

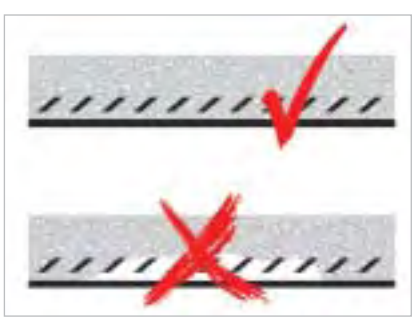
We recommend either the KALCRET spraying technology or the use of prefabricated shaped elements for overhead linings.

Check list

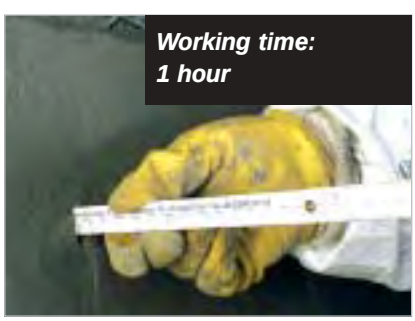
- make sure the surfaces are clean
- safely fasten the wire mesh
- prepare a good stiff/plastic KALCRET compound for trowelling
- make sure the correct water quantity is added
- mix for at least 5 - 8 minutes
- check whether the mixture is free of lumps; if not, mix again
- mix for 2 minutes after adding steel fibers
- apply KALCRET a little thick and compact
- completely back-fill wire mesh and compact the compound
- use vibration trowel
- check layer thickness
- establish smooth KALCRET surface
- immediately apply surface sealing or
- cover with polyethylene sheeting

1. Prepare compound to be trowelled as instructed

2. Generously apply compound and compact it



3. Ensure good backfilling of wire mesh



4. Check layer thickness and equalize it, if necessary

Cast Compound

KALCRET cast compound is particularly effective in lining flat surfaces. Normally, simple formwork will do. Special formwork will be made for vertical and inclined surfaces; that formwork will then be backed. The formwork should be as smooth as possible on the KALCRET side.

The cast compound is mixed as specified, filled in the prepared formwork and compacted with the aid of a vibrator. Slow admission and compacting of small quantities at a time will ensure uniform wear protection.

Surfaces supported in formwork can be stripped after about 8 - 24 hours (depending on the layer thickness) at ambient temperatures of 20 °C / 68 °F. They shall be protected afterwards against quick evaporation of the residual moisture. This can either be done by means of a surface sealing spray or by covering with polyethylene sheeting.

Operating temperatures above 50 °C / 122 °F require provision for expansion joints. In addition, temperatures of more than 100 °C / 212 °F require observing specific heat up curves.

Check list

- carefully prepare formwork
- make sure surfaces are clean
- check use of wire mesh
- prepare a good plastic KALCRET compound for casting
- duly observe correct addition of water
- mix for at least 5 - 8 minutes
- check whether the mixture is free of lumps; if not, mix again
- mix for 2 minutes after adding steel fibers
- cast and compact KALCRET
- use vibrator
- check filling
- establish smooth KALCRET surface
- have surface sealed after casting or
- covered with polyethylene sheeting

1. Prepare formwork

2. Prepare cast compound as instructed

3. Carefully fill formwork

4. Use external vibrator for compacting

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Prefabricated Products

KALCRET Pipes and Pipe Bends

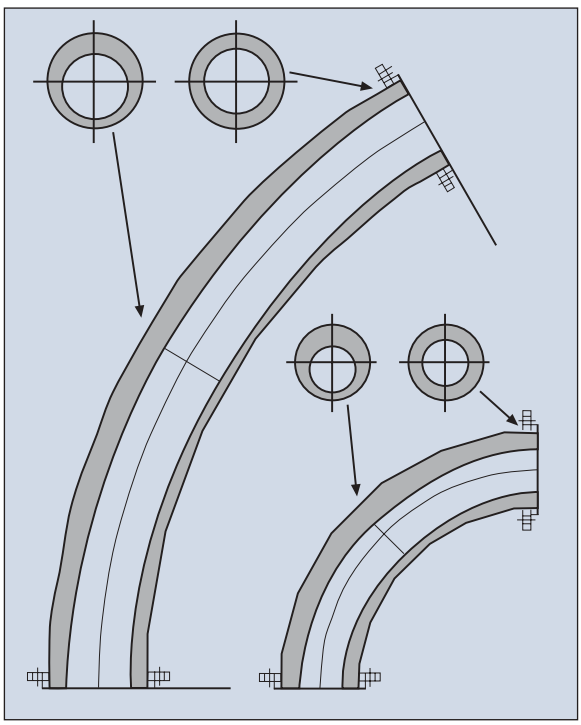
Pipes and pipe bends lined with KALCRET are produced with a standard inside diameter of more than 40 mm.

Inside diameters up to 600 mm are lined with castable KALCRET whereas the use of trowelled KALCRET is more economical for inside diameters beyond 600 mm.

One benefit of the KALCRET wear protection lining is that the lining can be made thicker in the outer radius of the bend (extrados) which is subject to the greatest wear (asymmetric cross section).

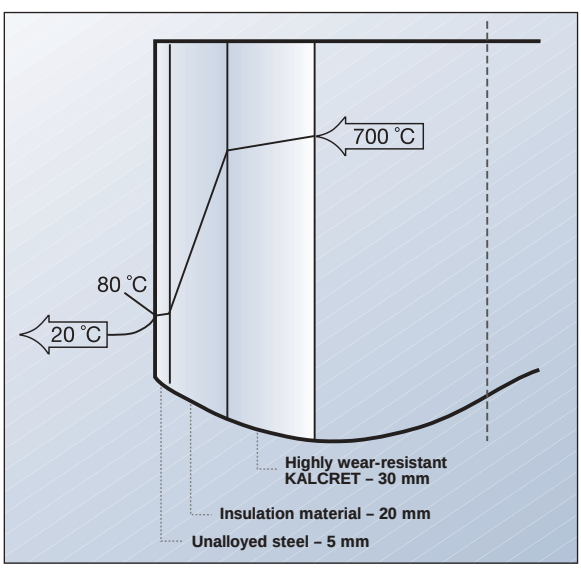
The fabrication method allows high flexibility when fixing the bend radii. Specially narrow bend radii are realizable as well.

All well known pipe connections from the Abresist Corp. program can be used. Wear of the protective lining can be monitored by KALDETECT.



Advantages

- inside diameters of more than 40 mm
- radii from 500 mm onward (variable)
- pipe lengths up to 5000 mm
- jointless lining from 20 mm layer thickness onward
- asymmetric cross section (see picture)
- available with standard Abresist Corp. flanging
- lining wear monitored by KALDETECT



KALCRET for high temperatures

KALCRET featuring a specific wall setup is offered for use at high temperatures. A special insulation material is mounted between the steel jacket and the abrasion resistant KALCRET compound.

Advantages

- temperature difference up to 620 °C / 1148 °F at a wall thickness of 55 mm
- low weight due to minimized dimensions
- use of low cost unalloyed steel as structural material
- excellent wear protection even at high temperatures up to 1000 °C / 1832 °F

Prefabricated Shaped Elements Made of KALCRET

KALCRET hard compound as prefabricated shaped elements has performed well in practical operation. Tiles and shaped elements made from the cast compound are prefabricated at the Abresist Corp. plant and equipped with well known attachment hardware, such as weld bolts.

The shaped elements are compacted on a vibrating table. The dimensions of the shaped elements depend on the handling required. Dimensions of 300 x 1000 mm at a thickness of 30 mm are available.

Advantages

- minimized number of different shaped elements
- homogeneous compaction of the prefabricated shaped elements, producing consistently high quality components
- drastically reduced installation time; large surfaces can be lined quickly and precisely – even overhead – with prefabricated shaped elements
- the lining can be used immediately after installation; no setting times are needed
- there is no problem to fit linings with prefabricated shaped elements made from KALCRET during the winter months at temperatures below +5 °C / +41 °F; costly heating of the components to be lined is not necessary

Lining of preheater cyclones in a cement plant

Prefabricated KALCRET shaped elements are used with insulation and mechanical fastening to the steel plates (see pictures). This will ensure not only high wear protection, high thermal insulation but also short installation times. The complete installation of more than 200 square meters has been implemented in less than 2 weeks – at temperatures below 0 °C / 32 °F. The system could resume operation immediately afterwards.

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Range of KALCRET Products

The Right Material for Every Application

		KALCRET
Hard compound particle size	mm	0.1 – 4
Density	g/cm³	2.7 – 2.9
Ultimate compressive strength	MPa	170 – 190
Ultimate bending tensile strength	MPa	22 – 26
Max. application temperature	°C (°F)	400/1200 (752/2152)
Percentage of hard compound	%	70

Raw meal duct in a cement plant

KALCRET	___	___	___

Working procedure

X = applied by trowelling
Y = applied by casting
S = applied by spraying

Temperature limits

N = up to 400 °C / 752 °F
T = up to 1200 °C / 2192 °F

Wear rate

B = hard compound bauxite
C = hard compound corundum

Hot gas cyclone designed for temperatures of 1000 °C / 1832 °F

Prefabricated shaped elements, e.g. for bunker lining

Example 1

KALCRET	B	N	X

B = hard compound bauxite
N = up to 400 °C/752 °F
X = applied by trowelling

Example 2

KALCRET	C	T	Y

C = hard compound corundum
T = up to 1200 °C/2192 °F
Y = applied by casting

Example 3

KALCRET	B	T	S

B = hard compound bauxite
T = up to 1200 °C/2192 °F
S = applied by spraying

Lined cyclone in a cement plant

Typical Applications

KALCRET has Excellently Stood the Test for Many Applications

Lining of a raw meal grinding mill in a cement plant

Pulverized coal bends for a power plant with prefabricated KALCRET pipe bends

Lining of the impact wall of a coke loading bay

Lining of a wind box underneath a sintering belt in steel works

Prefabricated shaped elements, e.g. for cyclone lining

Clinker dust transport pipe in a German cement plant

Typical applications

Applications

- bunker
- channels
- chutes
- cyclones
- deviation hoods
- dust collecting ducts
- gas purifying systems
- hoppers
- hydraulic conveying systems
- pipe bends
- pipes
- pneumatic conveying systems
- separators
- silos
- vessels

Industries

- aluminum smelters
- cement industry
- coal fired power plants
- glass factories
- iron/steel production
- mineral wool production
- mining
- non ferrous metal mining and beneficiation
- waste incinerating plants

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KALCRET is Hard, Wear Resistant and Easily Applied

The KALCRET spraying technology allows quick and reliable lining of large surfaces; this illustration shows lining of a scrubber in a steel making plant with KALCRET-S hard compound

Lining the separator of a ball mill used by the cement industry with KALCRET-BNX hard compound

Lining of a cooler pipe that handles clinker in a cement plant with KALCRET-BNY hard compound; the prefabricated shaped elements with integrated insulation have been provided with mechanical fastening system

Ask Abresist Corp. for additional information

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