

Processing instructions V 6.4

REFRARAM® CB DRY

Note: Please read the product information sheet first, to ensure that these are the right processing instructions for your product. This document describes the application procedure for **REFRARAM® CB DRY** ramming mixes. It does not apply for **REFRARAM®**, **REFRARAM® AB** or other **REFRARAM® CB** products.

The instructions contained in this document must be complied with during processing and installation of the respective refractory concrete. Modification of or deviations from the processing instructions can lead to major problems during installation, and possibly to total failure of the installed refractory material. These instructions provide general guidelines for storage, processing, and installation of the specific refractory material. If, due to specific site conditions, it appears necessary to deviate from the procedures described here, please consult Refratechnik Steel GmbH before starting work.

Storage

- In general: Store under cool, dry, and frost-free conditions.
- The shelf life stated in the product information sheet is valid from the production date, and only if storage is in accordance with our recommendations. The production date is stated on the packaging label.
- Under certain circumstances, material that has been properly stored may still be usable even after expiry of the stated shelf life. In such a case, conduct a processing test with a sample before using the material. In case of doubt, the expired material can be checked by Refratechnik Steel GmbH.
- Incorrect storage can greatly reduce shelf life, and can impair product quality. Even short periods of exposure to frost can impair the dry material's shelf life, and also affect the quality of the liquid binding agent supplied.
- The original pallet wrapping foil should be left intact for as long as possible to

protect the product. However, the foil is not a substitute for storage under cover.

- Also standing water, e.g. due to inadequate drainage of the storage area, can damage the material.
- Stacking of the goods supplied by us (in sacks, Big Bags, etc.) is done under the sole responsibility of the shipping company or customer. Refratechnik Steel GmbH accepts no liability for possible consequential damage (damaged packaging, personal injury, etc.).

Health and safety

- Always wear suitable safety goggles and working gloves. Avoid eye and skin contact. Prolonged skin contact can lead to skin irritation
- Keep eye washing equipment ready.
- Always wash thoroughly after working with the material.
- Observe the safety data sheets of the dry mixture and the liquid binding agent.

National and industrial safety regulations must be observed.

General information

- This product is a chemically binding ramming granulate that is mixed with a liquid binding agent. Delivered dry in 25 kg sacks or in Big Bags, it is mixed with liquid binding agent on site, and then applied. The material sets as it dries.
- Always mix complete packaging units (1 sack or 1 Big Bag). The use of partial quantities can lead to demixing and changed material properties.
- The type of mixing liquid to be used (drinking water or liquid binding agent) is stated in the corresponding information sheet of the product.
- In cold weather, the dry material must be stored at higher ambient temperatures (at least 5 °C) before processing. **REFRARAM® CB DRY** may only be processed at temperatures above 5 °C (heat the installation site if necessary).

- Please take the expansion of the refractory material for your specific furnace application into account. The reversible and irreversible expansion values and the respective material properties are given in the product information sheet. Depending on the furnace operating conditions and the specific characteristics of the refractory material, any arising stresses and pressures must be compensated by suitably designed expansion joints.
- During installation of the monolithic refractory material, please ensure correct anchoring to the existing furnace structure and/or to the existing or adjacent refractory material (e.g. with steel anchors, ceramic anchoring systems, etc.).
- Suitable measures must be taken to ensure that the water or water vapour generated during the drying & heat-up process is removed from the refractory lining without pressure build-up.
- With certain kiln structures and refractory linings, the drying process can cause the generated water or water vapour to diffuse outwards in the direction of the furnace shell instead of inwards to the hot side (kiln chamber). Therefore, suitable measures must be taken to ensure that the water or water vapour can escape to atmosphere. For this purpose, 10-mm holes drilled into the kiln's outer steel shell (at least 5 per m²) have proved to be successful.
- Regarding the build-up of water vapour pressure, attention must be given to the entire wall structure of the lining (wear lining/permanent lining/insulation). In the area behind the wear lining, it must also be ensured that only such materials are used, which provide an adequate (highest possible) permeability to the steel shell.
- If the permanent lining/insulating layers are used several times and only the wear lining is replaced, they can become clogged in the course of time due to moisture transport with dust contamina-

tions, salts, etc., thereby also impeding moisture transport. Consequently, multiple use of such layers must be seen as counterproductive in terms of dewatering performance. It might even be safer also to replace the permanent lining, in order to ensure perfect flowthrough to the cold side.

- To ensure a continuous drying process, the complete kiln chamber must always be flushed with an adequate amount of fresh air during the entire drying and heat-up procedure. The air circulating in the kiln chamber may never be saturated with moisture.
- During heat-up, it is essential that flames do not impinge on the refractory lining only in small areas. Local overheating can result in severe damage of the refractory material. Therefore, it must be ensured that the entire lining surface is heated uniformly and without significant temperature differences.

Mixing instructions

- Mixer, tools, conveying equipment, etc. must be clean and free from any form of contamination.
- Mixing is done with a clean and powerful positive mixer that is suitable for processing plastic granulate ramming compounds.
- Mix only as much material at a time, as can be processed within about 20 minutes.
- Data on the maximum and minimum amounts of mixing liquid to be added is given in the product information sheet or on the packaging label.
- Make sure that you have the right kind of mixing liquid on site. The type of mixing liquid is stated in the product's information sheet.
- On no account may the type of **REFRARAM® CB DRY** intended for

mixing with water be mixed with liquid binding agent.

- Similarly, the type of **REFRARAM® CB DRY** intended for use with liquid binding agent may not be mixed with water. Not even small amounts of water may be added.
- First, briefly mix the dry material for about 30 seconds to restore the consistency after any demixing that might have occurred during transport.
- Next, add the minimum amount of liquid binding agent while continuing to mix the material. Continue mixing for about 3 minutes until a thorough mix is obtained.
- Frequently, the required consistency is obtained only at the end of the mixing period, because the fine portions in the product must be broken down first. Therefore, you should wait until the full mixing time has elapsed, and don't try to obtain the required consistency in a shorter time by adding more mixing liquid. The material's consistency can change quite abruptly from "too dry" to "exactly right". If necessary, the remaining amount of mixing liquid can be added until the required consistency is obtained. Hereby, the maximum amount of liquid may not be exceeded.
- Then continue mixing for about 6 more minutes.

Processing

- If using formwork, make sure it is sufficiently stable, and that its surfaces are smooth. Unstable formwork has a tendency to bulge under the ramming pressure. Use formwork release oil.
- Before starting work, all surfaces that are to be lined with **REFRARAM® CB DRY** must be carefully cleaned of rust flakes, scale, oil, grease, and other substances (e.g. paint, rust inhibitor, etc.) by suitable means, e.g. sand blasting.

- Depending on installation conditions, compaction is achieved by means of a suitable pneumatic ramming hammer or a motorized vibratory rammer. In some cases, a heavy hammer (mallet) may be used.
 - During ramming, the desired lining thickness is obtained by individual rammed layers. Only in this way can the necessary compaction be achieved.
 - Depending on the ramming tool used, the following layer heights are recommended: about 60 mm with a pneumatic ramming hammer, and up to 200 mm with a heavy vibratory rammer. Depending on the material, a compaction ratio of approx. 1,6 : 1 can be assumed.
 - Continue ramming until no further compaction is observed.
 - Apart from achieving optimum material compaction, the bond between the individual rammed layers is critical for the quality of the overall lining. Therefore, the previously rammed layer must always be intensively roughened before applying the next layer. This can be done by scratching, by ramming with splined ramming feet, or with vibratory rammers fitted with spikes on the ramming plate.
 - During work interruptions, the most recently rammed layer must be covered with film to prevent it drying out.
 - **REFRARAM® CB DRY** can be processed as long as it can be kneaded easily by hand. Do not use material that has a crusty surface, and never attempt to make it reusable by adding water or liquid binding agent.
 - Remove residual material from the tools at regular intervals by washing thoroughly with water, and then dry them well.
 - Depending on layer thickness and heating-up time, it may be advisable to drill or punch evaporation holes through the entire layer (not in areas subjected to the liquid phase)
- Drying and heating up**
- **REFRARAM® CB DRY** linings should be heated up immediately after installation.
 - If this is not possible, all rammed surfaces must be covered carefully with a foil. In this condition, the lining must be protected from frost and mechanical stress, e.g. vibrations.
 - The supporting formwork of suspended linings must also be heated up.
 - **REFRARAM® CB** materials only cure when subjected to temperatures above approx. 200 °C.
 - To ensure homogeneous solidification of the material, a temperature of at least 400 °C should be reached during the first heat-up, and must be maintained for at least 10 hours.
 - In order to achieve a ceramic bond, **REFRARAM® CB** products must be tempered at a temperature of more than 1000 °C. Only then can they be fully loaded.
 - Suitable equipment must be provided for drying. Do not use steam (boiler steam) for this purpose.
 - Direct contact of newly lined surfaces with open flames should be avoided,
 - Please check the product information sheet to ensure that you have the right heat-up instructions for your product.
 - The heat-up instructions must always be followed precisely. Hereby, it must be ensured that the respective heating curve is followed, monitored, and recorded by means of several correctly-positioned thermocouples. Moreover, a homogeneous temperature distribution must be ensured throughout the refractory lining.