Technical Pamphlet for Civil Engineers

Concrete construction joints with "rough" surface texture

PRODUCTS FOR GOOD-LOOKING CONCRETE

About concrete connection joints:

Buildings with structural requirements often use steel reinforced concrete to absorb forces and tensions.

When using ready mixed concrete at construction sites, the concrete is used and poured in different sections, day by day. Construction joints are necessary to represent the interface between the concrete that has been poured and dried before a second layer of freshly poured concrete which connects them.

In order to fulfil the structural performance correctly and long-term, it is necessary for the construction joints to bond well to one another. The specific texture of the interface is of maximum importance for good adhesion and bonding performance.

A construction joint with a rather smooth surface will create low adhesion and a poor bond between the two concrete sections.

A construction joint with a rough surface will create high adhesion and a good bond. For this reason civil engineers usually specify a "rough" construction joint. For example, in Germany the roughness specified by DIN (German Institute for Norms and Standards) and DAfSTB (German Technical Committee for Steel Reinforced Concrete) must be ≥ 3 mm.

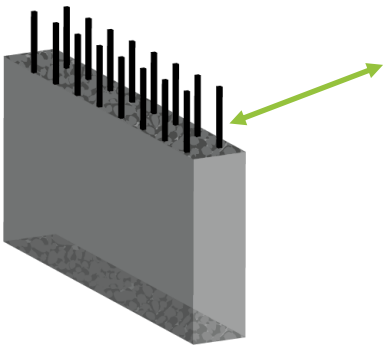
There are different ways to achieve such a "rough" construction joint. The most popular in use are: an abrasive high pressure water jet, sandblasting or a jackhammer. Needless to say, all these measures create issues, not only with eco-friendliness, with noise and dust-emissions but also with not reaching the specified texture depth and roughness easily and in a reliable manner.

Some also use a simple rake to texture the freshly poured concrete surface, but the mould is not easily accessible in many cases, or the connecting steel reinforcement does not allow this way of texturing in an acceptable way.

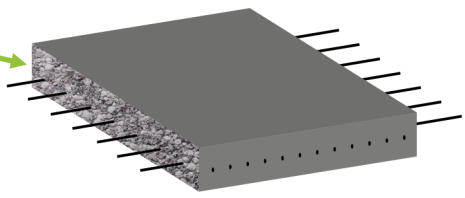
In short: Creating construction joints with suitable and quality "roughness" can be a significant challenge for the contractor. However, there is also an easy, reliable way, that has been adapted from "architectural concrete" - to be more precise, from exposed aggregate concrete.

HEBAU has modified its ***CSE® Deactivator*** technology for requirements to reveal the aggregates of construction joints easily and precisely. This data sheet explains the details of this product, the procedure, options and results.

Horizontal construction joint
- the rough texture is given to the freshly poured concrete top surface (positive side)



Close-up view of a construction joint surface which has been made with the help of a ***CSE® Deactivator***



Vertical construction joint
- the rough texture is given to the mould side (negative side)

see pages 2 and 3 for more information

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What CSE® concrete surface deactivators are:

The brand ***CSE®*** characterises a group of liquid deactivators for the production of exposed aggregate concrete surfaces, for example, to make architectural prefabricated/precast concrete panels, small precast elements and products, cast stone, cast-in-place walls and pavings and "rough" construction joints.

To achieve exposed aggregate concrete the first layer of cementitious material is removed so that the aggregates become visible. To control and ease this process the ***CSE® Deactivator*** reacts chemically upon surface contact with the fresh concrete and during the hydration and stops the cement from hardening there. The fresh concrete below the surface layer hydrates and hardens like normal. Later, usually after 24 hours, the surface can be washed off, which means that the "deactivated" cementitious material is removed by waterjet and the aggregates are revealed. It is possible to wash off the surface later but this has to be tested and verified through trials. The depth of this wash-out texture is called and specified by the exposure depth in millimetres.

CSE® Deactivator can be used in two main ways of application: **1st:** the "negative" application (when the ***CSE® Deactivator*** is applied onto a mould surface) and **2nd:** the "positive" application (when the ***CSE® Deactivator*** is sprayed onto a freshly poured concrete surface).

How to obtain a certain "roughness" or exposure depth?

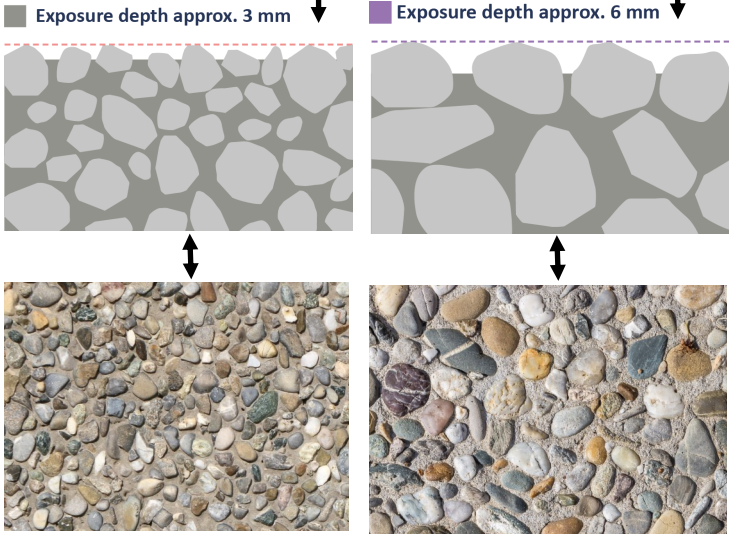
- To obtain a certain exposure depth it is recommended to select the type of the ***CSE® Deactivator*** through trials. Such a test should be duplicating the "real" construction site parameters as best as possible, above all the concrete mix design, the casting and demoulding course and time, the vibration and finishing procedures, the thickness of the concrete, its setting temperature etc.
- The exposure depth is not determined by how much ***CSE® Deactivator*** is applied as long as there is a certain minimum layer thickness. HEBAU ***CSE®*** technology is based on chemical engineering and does not rely on specific application skills of craftsmanship.
- The selection of the exposure depth, the choice of the ***CSE® Deactivator*** product and the choice and size of the aggregates are related to each other - see table below:

CSE® Deactivator **is available in 10 different exposure depth types:**

Type:	CSE® mino	CSE® 01	CSE® 02	CSE® 10	CSE® 25	CSE® 50	CSE® 70	CSE® 130	CSE® 200	CSE® 300
Size of aggregates (in mm)	0 - 4/8	0 - 4/8	2 - 8	2 - 8	4 - 8	6 - 8/12	8 - 16	8 - 16/22	12 - 16/32	16 - 32
Exposure depth (in mm)	approx. 0,3	approx. 0,5	approx. 1,0	approx. 1,5	approx. 2,0	approx. 2,5	approx. 3,0	approx. 4,0	approx. 5,0	approx. 6,0
Colour code	magenta	blue	brown	green	yellow	pink	grey	white	orange	violet

Colour coding:

CSE® Deactivators are available in 10 different exposure depth types. Therefore we have added a colour pigment to the ***CSE® Deactivators*** to enable a clearer distinction between the different exposure depths types and to simplify re-ordering. The pigment has ***no*** functional characteristic or effect. The colour is also used to visualise the amount applied and thus to avoid over and under-application.



The graphics and pictures are just non binding examples for means of visualizing and are not made to be true to scale. The real results may vary and may look different.

Recommendation:

Based on our findings and expertise we recommend type ***CSE® nova 70*** for aggregate size of 8-16 mm and ***CSE® nova 300*** for aggregate size of 16-32 mm.

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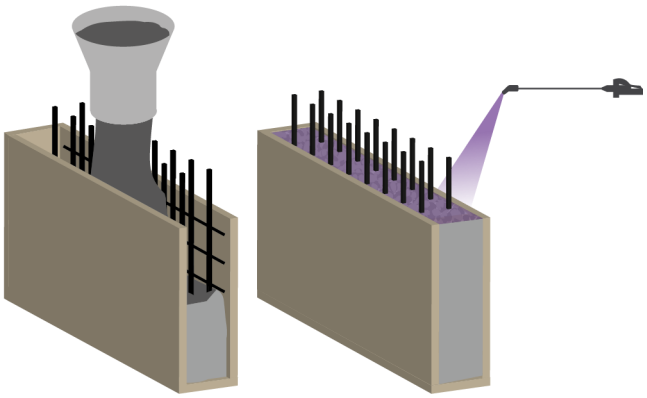
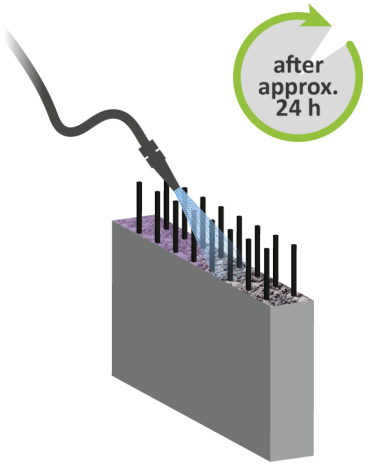
Application:

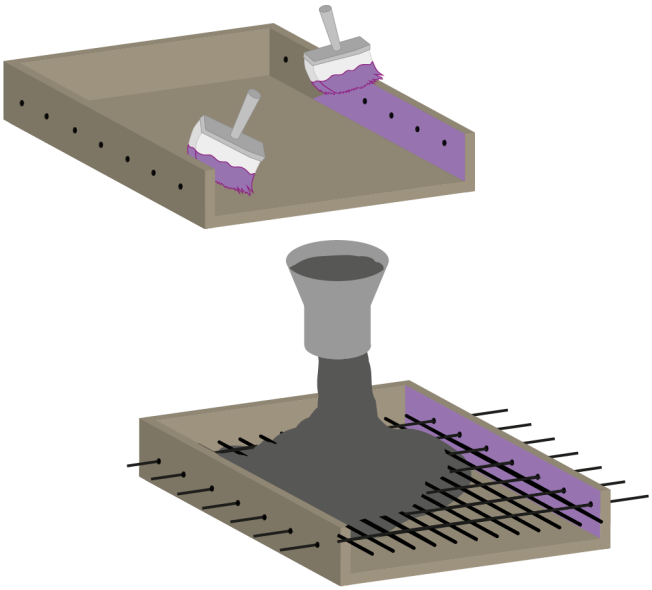
1.A. The freshly poured concrete construction joint surface is sprayed with ***CSE® Deactivator.***



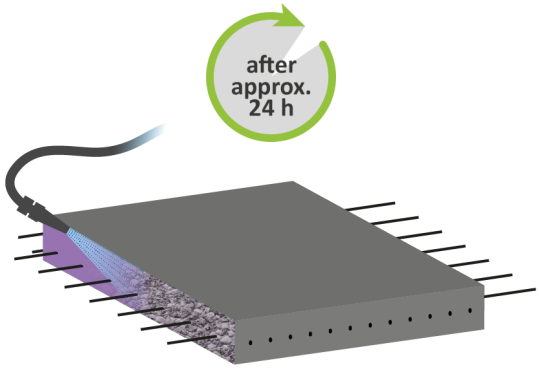
2.A. After approx. 24 hours: The surface is washed off with a pressure water jet. Ready.



1.B. The ***CSE® Deactivator*** is applied onto the mould surface and is given time to dry. The concrete is cast as usual.



2.B. Right after demoulding:
The surface is washed off with a pressure water jet. Ready.



Please note, all the information about the exposure depths and recommended ***CSE®*** types is only a guideline, because the final exposure-depth is not only controlled by the chosen type of ***CSE® Deactivator***, but also effected by many other factors, for example by the amount of cement and sand, by the type of cement (grey/white, fast setting/slow setting), from the water-cement-ratio, by the period of time until demoulding / wash-off etc.
We recommend using a pressure water washer to wash off the concrete surface.
The chemical reaction of ***CSE® Deactivators*** is based on materials like citric acids and similar non-hazardous materials, which react and neutralize with the concrete. Therefore if the ***CSE® Deactivator*** is applied appropriately and according to our recommendations specified in the technical data sheet, no residues of the active ingredients of the ***CSE® Deactivator*** should be found in the wash-off water.
Further information about application, consumption, storage, packaging ... is available on www.hebau.com.

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