

CODE OF PRACTICE



Storing and Metering Concrete and Mortar Admixtures

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PRELIMINARY REMARKS

This 2nd edition of the Code of Practice „Storing and Metering Concrete and Mortar Admixtures“ was prepared by a project group appointed by Deutsche Bauchemie's Special Committee 2 „Concrete Technology“ and subsequently discussed and adopted by Special Committee 2. Its purpose is to provide information to users and other specialists in the trade on storing and metering concrete and mortar admixtures.

Practically all liquid concrete admixtures (BZM) are organic products and like food, they can spoil if not stored properly. Preservatives are also added to concrete admixtures just like they are to many foods. However, to protect the environment, there limits concerning the preservatives that can be added. Hygiene therefore plays an essential role when storing and metering concrete admixtures. This Code of Practice deals with these subjects in particular.

1. ORDERING ADMIXTURES

In conjunction with storing and metering concrete admixtures, the following important notes should be taken into account when ordering concrete admixtures:

- When ordering, always state the complete product name.
- When specifying delivery dates, take the necessary order or production lead time into consideration.
- Provide exact information on size of container or, if delivered in bulk in a tank vehicle, information on how much product the tank can hold.
- Calculate an estimate on rate of consumption until delivery date (as a rule, when delivered in bulk, the tank vehicle cannot take back goods if too much has been ordered).
- Provide exact information on quantity, specifying the unit in litres or kilograms (if applicable, convert kilograms to litres based on the density of the concrete admixture).
- If delivered in bulk, note the number of product or batch labels required.
- If applicable, note how many multi-way containers/tanks are to be returned.

2. STORING ADMIXTURES

Different quantities of admixtures are stored and metered at practically every mixing plant in which concrete and/or mortar is produced. The following check list serves as an aid for planning and maintaining storage areas:

- The site of the storage tanks should be as close to the mixers as possible.
- The storage room used should provide protection from frost and direct sunlight. If the storage room can be heated in winter, the quality and consistent properties of the admixtures can be continuously ensured.
- The storage room should have a lock on the door to limit access to authorised or qualified personnel.
- Additional utilisation of the storage room for other purposes (laboratory, work shop, etc.) without spatial separation should be avoided.
- Storage tanks should be protected from contamination, e.g. binders or mineral aggregates.
- The type, material and size of storage tanks should be coordinated with suppliers. Suitability for storing admixtures should be determined and approval obtained.
- Tanks should always be kept tightly closed to protect the admixtures from contamination and biological infestation.
- Free access allows containers to be filled cleanly and safely.
- Tanks should be clearly and legibly marked to avoid mistakes when filling.
- Collection reservoirs/dip pans must be used. Local regulations on environmental protection must be observed. Rule of thumb: The collection reservoir must hold the content of the largest storage tank plus 10 % of the volume of all other storage tanks.
- When planning the storage area, take future cleaning and maintenance work into account.

If storage rooms are planned and equipped based on the information given above, the quality and consistent properties of the admixtures can be continuously ensured.

3. MAINTENANCE, CLEANING OF STORAGE TANKS

The chemical and/or physical action of concrete admixtures (BZM) positively influences the properties of fresh and/or hardened concrete which makes them essential for the production of most concrete qualities today. Because of their importance and value, thought should be given to how they are stored and metered. This includes clean and well maintained concrete admixture warehouses (see also section on storage) as well as keeping storage tanks and metering equipment clean.

The shelf-life of the concrete admixture given by the manufacturer is another factor that must be taken into account. In the case of concrete admixtures that are only used in small quantities, such as air entraining agents or retarders, it is advisable to coordinate the quantity stored to actual requirements. Otherwise the admixtures may exceed their use by dates.

Notes and recommendations on maintaining/inspecting storage facilities for concrete admixtures are found in the following.



Recommendations for the Maintenance of Storage Tanks

The contents of the tank should always be protected from all types of contamination; otherwise, biological infestation may occur resulting in the rapid growth of germs and fungi. Filling and inspection openings should be kept closed in general to prevent contamination with dust and similar substances to ensure that the preservative maintains its effect in the gas phase of the storage tank as well. If tanks are continuously left open, the preservative escapes through the gas phase and loses its effect. This reduces the shelf-life of the admixture and biological infestation may spread to the walls of the tank and the surface of the admixture.

Maintenance	Time/frequency	Measures
General controls	Continuous/regularly	Control of tanks for: <ul style="list-style-type: none"> ■ Tightness Control of the concrete admixture in the tank for: <ul style="list-style-type: none"> ■ Shelf-life of the product according to the manufacturer's information ■ Biological infestation of the concrete admixture, if applicable ■ Stability of the concrete admixture, if applicable
Full inspection	At least once a year	Control of tanks when the filling level is low for: <ul style="list-style-type: none"> ■ Residue and deposits/adhering substances ■ Formation of sediment ■ Biological infestation Documentation of the state of the storage facilities

Recommendations for Cleaning Storage Tanks

Storage tanks for concrete admixtures should be cleaned once a year regardless of any additional requirements. The best time for cleaning is during the course of a full inspection when the tank is empty or the filling level is low. This measure should include regular removal of sediment deposits on the bottom of storage tanks which is inherent to some products. Due to the raw materials used, sediment deposits are mostly found with lignin sulphonate products.

If there is no indication of contamination during inspection, this measure can be dispensed with. In this case, documentation is always advisable (e.g. with photographs).



For proper cleaning, tanks should be equipped with sufficiently large inspection openings (see also section on storage). Procedures for reliable inspection and cleaning of tanks must be documented.

The necessary time intervals for cleaning and the measures to be taken are listed in the following table.

Cleaning	Time/ frequency	Measures
Standard cleaning	Once a year	<p>Clean tanks, best with a filling level as low as possible or empty:</p> <ul style="list-style-type: none"> ■ Rinse with water or a high pressure water jet. ■ Loosen adhering material with a high pressure water jet or brush. ■ Rinse several times and drain with a pump to completely remove sediment and adhering material.
When the supplier is changed or the product switched	During the course of switching	<p>Clean tanks, best with a filling level as low as possible or empty:</p> <ul style="list-style-type: none"> ■ Rinse with water or a high pressure water jet. ■ Loosen adhering material with a high pressure water jet or brush. ■ Rinse several times and drain with a pump to completely remove sediment and adhering material. <p>If there is no contamination in the storage tank when the product is switched, intensive cleaning may be dispensed with after consultation with the manufacturer of the concrete admixture. Make sure that the subsequently used products are compatible with the previously used concrete admixture (immediately and long-term). It is essential that this is clarified with the manufacturer of the concrete admixture.</p>
In case of biological infestation (germs, fungi)	Immediately	<p>Clean tank:</p> <ul style="list-style-type: none"> ■ Drain remaining material with a pump, if applicable. ■ Rinse with water or a high pressure water jet. ■ Loosen adhering material with a high pressure water jet or brush. ■ Rinse several times and drain with a pump to completely remove sediment and adhering material. <p>After cleaning: It is extremely important to disinfect the tank and the lines or metering devices following consultation with the supplier of the concrete admixture; otherwise the new material may immediately become infested after the tank is refilled.</p> <p>In exceptional cases, a product with biological contamination can be treated with a preservative again and still used. Consult with the concrete admixture supplier for this. After the material has been used, the tank should be thoroughly cleaned and disinfected.</p>
In case of heavy sedimentation, adhering materials	Promptly	<p>Clean the tank, best with a low filling level or empty:</p> <ul style="list-style-type: none"> ■ Rinse with water or a high pressure water jet. ■ Loosen adhering material/sediment with a high pressure water jet or brush. ■ Rinse several times and drain with a pump to completely remove sediment and adhering material.

4. METERING ADMIXTURES

There are various systems from several manufacturers on the market for metering admixtures.

When selecting dispensing lines, metering pumps and accessories, make sure that suitable materials are used.

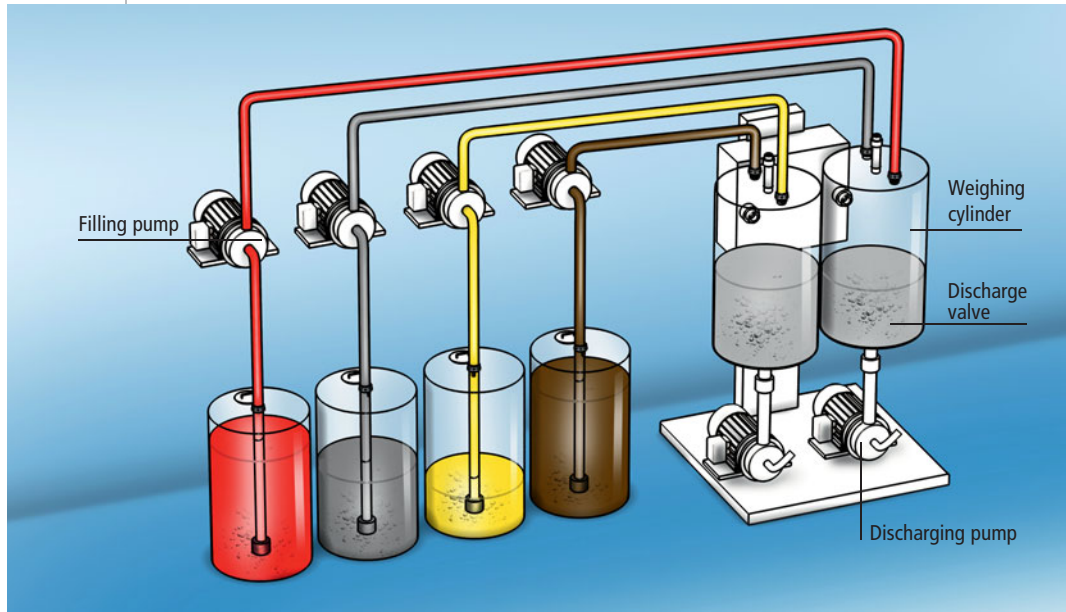


Illustration 1: Schematic set-up of a metering system for admixtures

	Recommendation	Note
Number of weighers / weighing cylinders	If possible, there should be a weighing cylinder for each concrete admixture. If this is not possible, observe the notes given by the supplier of the concrete mixture concerning miscibility of products in metering systems.	Even if they are compatible with each other in cement, some concrete admixtures cannot be directly mixed with each other!
Volume of the weighers/ weighing cylinders	Weighers/weighing cylinders should be dimensioned sufficiently large.	Special concretes such as UHPC require large quantities of concrete admixtures up to approx. 30 l/m ³
Material of hoses and pipelines	Use only plasticizer resistant hoses and pipelines that are suitable for chemicals (e.g. hoses made of EPDM and pipes made of stainless steel or PE-HD). Do not combine different metals in pipelines.	High range water reducing and super plasticizers in particular contain de-foaming agents which can act like plasticizers on plastic and rubber components. A list of sources for suitable products is given in the Annex.
Material of the packings	Use only plasticizer resistant packings, e.g. made of fluoroplastic (FPM) such as Viton® or polytetrafluoroethylene (PTFE), such as Teflon®	
Line layout	Make sure, especially with pipelines, that there are no "dead ends" in which the material does not flow. In the case of hoses, there should be no sagging areas in which pools can form. A check valve should always be mounted at the beginning of the filling hose to make sure that the filling line does not run empty.	There is an especially high risk of biological growth in dead ends and pools!

Filling and discharging pumps	If possible, use a gear pump with sufficient output.	At low temperatures, the viscosity of some concrete admixtures can substantially increase (up to approx. 300 mPas) which reduces the ability of the admixture to flow.
Discharging the weighing cylinders	If possible, use a discharge pump; if discharged by gravity, use a hose with a diameter of at least 3/4", better 1".	
Cleaning and maintenance	<p>The entire metering system, including all lines and packings, should be regularly maintained, i.e. cleaned, inspected and, if applicable, repaired. Control pumps as well as dispensing lines for:</p> <ul style="list-style-type: none"> ■ Functionality of the pumps ■ Correct assignment of lines according to system control plan ■ Tightness of lines/hoses <p>Control of concrete admixture weighers and weighing cylinders for:</p> <ul style="list-style-type: none"> ■ Functionality of weighers ■ Compatibility of the products assigned to the respective weighing cylinder (see above) ■ Cleanliness of the weighing cylinders (e.g. deposits) ■ Control of the point in time the admixture is added according to system control plan 	Weighing cylinders and dispensing lines should be rinsed frequently, especially when different concrete admixtures flow through the same lines.
Metering system control	The order in which addition takes place and the point in time when individual concrete admixtures are added should be variably adjustable. The weighing cylinder should be rinsed after weighing/metering.	When several concrete admixtures are added to one concrete, it is advisable to follow a certain order when adding. As a rule, concrete admixtures are especially effective if they are added later (after the water has been added).

If the items described above for storing and metering concrete admixtures are observed, frequent repairs should not be necessary and operation should be trouble free. A few suppliers and manufacturers of plasticizer resistant hoses and pipes have been listed in the Annex.

5. DISPOSAL OF LEFTOVER ADMIXTURES AND RINSING WATER

Leftover concrete admixtures no longer suitable for use (e.g. because of biological infestation) should be filled into suitable containers (IBC) or drums that have been assigned for specific types of admixtures. The material must be collected on site by an authorised disposal company for disposal.

In Germany, all disposal companies that are members of the Federal Waste Management Industry Association [Bundesverband der deutschen Entsorgungswirtschaft (BDE)] are approved for disposal.

Along with leftover concrete admixtures, rinsing water must also be properly disposed of. The principles stated in the previous section also apply to rinsing water.

In exceptional cases, rinsing water that is not contaminated with biological growth which has been strongly diluted can be pumped into the concrete producer's residual water recycling system. To avoid errors, the supplier of the concrete admixture should be consulted first. Rinsing water that contains air entraining agents, foaming agents or admixtures for the production of mortar should never be pumped into the residual water recycling system, even if strongly diluted.

ANNEX SUPPLIERS AND MANUFACTURERS

In the following a few suppliers and manufacturers for storage tanks, collection reservoirs as well as plasticizer resistant hoses and pipes are given.

Storage tanks and collection reservoirs

Alltech Dosieranlagen GmbH

www.alltech-dosieranlagen.de

Dehoust GmbH

www.dehoust.de

PE and PP pipes

Kunststoff-Verarbeitung Schermbeck GmbH

www.kvs-schermbeck.de

ThyssenKrupp Schulte GmbH

www.thyssenkrupp-schulte.de

Chemical hoses, purple ring

Gossler Fluidtec GmbH

www.fluidtec.de

Rala GmbH & Co.

www.rala.de

Plasticizer resistant hoses

BM Anlagenbau und Dosiertechnik GmbH

www.bm-anlagenbau.com

Finke Dosiertechnik GmbH

www.finke.com

HSI – Schlauch- & Armaturentechnik GmbH

www.hsi-schlauchtechnik.de

Würschum GmbH

www.wuerschum.de