

# Professional cleaning Detergents and material knowledge

Serviceerhvervene  
UddannelsesSekretariat

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### Why do we clean?

There are six reasons:

- **For hygienic reasons:** Proper hygiene ensures better health. By removing dirt, and microorganisms, we reduce the risk of infection and disease.
- **For safety reasons:** Through the cleaning process - safety is improved and the cleaning process removes inflammable materials and removes spilled fluids.
- **For maintenance:** Cleaning helps to maintain surfaces and furniture. Clean inviting rooms encourages the user to leave them in good condition.
- **To safeguard the flow of work and production:** If cleaning is under standard e.g. in a food production facility, production can be stopped, the manufacturer will lose money while the factory is closed for cleaning.
- **For aesthetic reasons:** Clean working and shopping areas often make the customers feel comfortable. It is especially important in shops, hotels, and restaurants. The customers can be encouraged to stay a bit longer in the shop; it can mean more shopping and a bigger sale.
- **For the indoor environment:** By removing dust, the indoor environment is improved. Some scented detergents may influence the indoor environment. By choosing the correct detergents, you can remove this risk.



Photo by: TEC



### Types of dirt

It is important to choose the correct detergent and cleaning method for a task, knowledge about the different types of dirt and grime is important.

Dirt is single or composed matter located in places where it is not welcome.

Workplaces produce different types of dirt depending on the work performed within the location, e.g. in a factory, a kindergarten, in a hospital or a sports centre.

Different rooms in the same building often produce different types of dirt. Dirt in the bathroom will be different from dirt in the kitchen. Dirt is defined as either organic or non-organic matter:

- **Organic matter:** Transforms over time. For instance, dust will eventually be transformed into a greasy surface if it stays too long. Examples of organic dirt: Grease, oil, leftover foods, urine, vomit, faeces, etc.
- **Non-organic matter:** Cannot be decomposed. Lime from water will build up thicker in time if not removed regularly. Examples of non-organic dirt: Lime, rust, soil, sand, etc.

Dirt will often be a mixture of organic and non-organic matter. A non-organic layer of limescale build-up on a bathroom wall will often be covered with organic dirt such as grease from soap and body fat.



### You can divide dirt into the following groups

- **Loose dirt:** Can be removed without the use of water and detergents. E.g. dust, sand, hair, and paper
- **Dirt soluble in water:** E.g. coffee, tea, and juice
- **Dirt soluble in water and detergents:** E.g. grease, leftover foods, faeces, and urine
- **Dirt, which is difficult to dissolve:** E.g. build-up lime scale, rust, ink, glue, floor polish and detergent

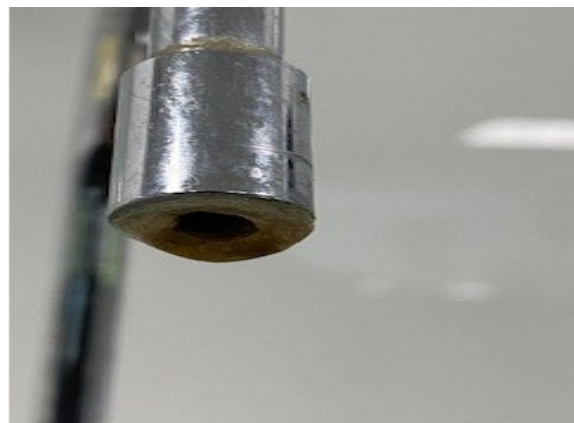
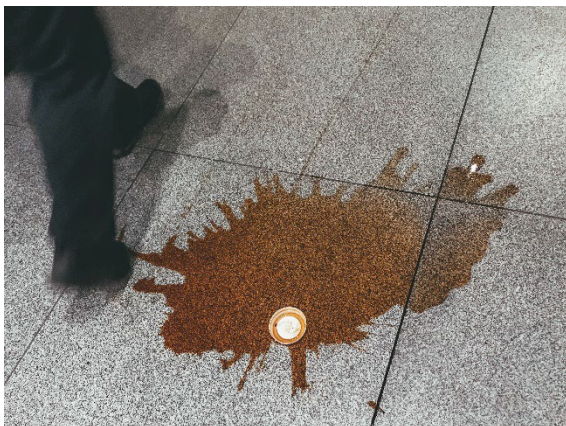


Photo 1 by: Mika Baumeister on Unsplash. Photo2 by: Steve Johnson on Unsplash.  
Photo 3 by: Jan Antonin Kolar on Unsplash. Photo 4 by: Maria Veba, TEC.

### How dirt comes indoors?

- Through the air e.g. dust, smoke, and insects
- Through spillage e.g. coffee, paper, and juice
- Through rubbing off from shoes or hands
- Through setting of lime, rust and grease
- In production in the food-industry and other production facilities





### Prevention

- Limescale build-up will be prevented by removing water spillage immediately - and by checking leaking in water taps, or toilets for continuous running water.
- Airborne dirt can minimises by ensuring effective air ventilation systems. Kitchen, grease-filters and kitchen cooker hoods should be cleaned regularly.
- A double door system at the entrance will minimize airborne dirt.
- Floor mats in the entrance and automatic doors, or surface treatment that rejects the dirt, e.g. floor polish can prevent rubbing off from shoes or hands.



Photos by: Maria Veba, TEC





## Detergents

If there were just one detergent available for all tasks, cleaning would be easy. However, we have different types of dirt and different types of surfaces. Therefore, we need different types of detergents.

For instance, we need an acid cleaner to remove limescale and an alkali based cleaner to remove grease and oil. When working in the cleaning industry, it is important to understand the different types of detergents available, which qualities they possess and the ingredients in which they contain, in order to choose the correct detergent.

## pH scale

Acid-alkaline strength refers to the extent in which a chemical dissociates into ions in water. The logarithmic pH scale serves as an indication of the concentration of dissociated ions with values ranging from 0-14. Pure water has a neutral of pH of 7. The logarithmic nature of the pH scale indicates that acidity or basicity multiplies by 10 for each pH interval.

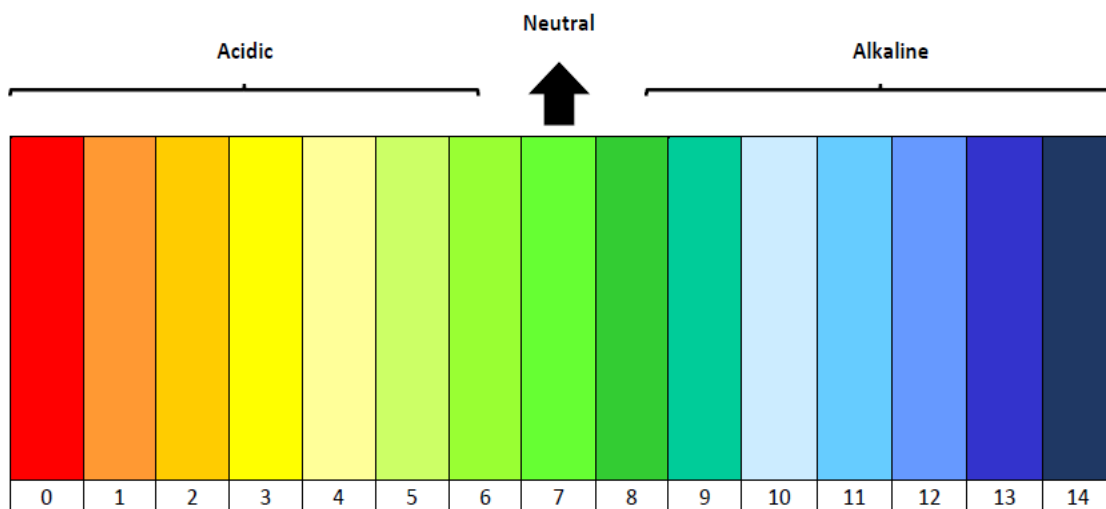


Illustration by: Maria Veha, TEC





pH indicator sticks are used to measure the pH-value of a cleaning solution. Dip the pH stick into the solution, allow it to change colour, and match it against a colour key to determine the solution's approximate pH value.



Photo by: Maria Veha, TEC

### **pH and detergents:**

Strong acidic detergents pH 0-5:

- Lime and rust remover/descaler (in Danish: Kalkfjerner)
- Toilet bowl cleaner (in Danish: Toiletrensemidler)

Detergents for daily cleaning pH 6-9:

- All-purpose cleaner (in danish: Universalrengøringsmidler)
- Bathroom cleaner (in danish: Sanitetsmidler)
- Floor care product (in danish: Vaske-plejemidler)







Strong alkaline detergents pH 10-14:

- Degreasers (in danish: Grundrengøringsmidler)
- Polish remover (in danish: Polishfjerner)

Detergents are divided into different groups according to usage and ingredients. Each group of detergents have benefits and limitations.

In the table below, the detergents are described in accordance with their detergent group:



	<p><b>All-purpose Cleaners:</b> Suitable for all materials that are water repellant, including furniture and floors. It removes light day-to-day dirt.</p>
	<p><b>Bathroom Cleaners:</b> Suitable for daily cleaning of sanitary areas. It cannot remove lime scale from the surfaces but it impairs lime build-up.</p>
	<p><b>Floor Care Products:</b> Suitable for all flooring that requires special care. It removes ordinary dirt and leaves a nourishing/protective coating on the surface. It is recommended to wash the floor with all-purpose cleaner in between, as the protective layer may build up and become sticky and greasy.</p>
	<p><b>Toilet Bowl Cleaner:</b> Suitable for cleaning toilet bowls and urinals. Dissolves lime and rust. <b>Caution:</b> Acid cleaners can be detrimental to many types of surfaces such as paint, stainless steel, and aluminum. Not recommended for use on limestone and marble. <b>Never</b> use acid cleaners in combination with bleach or hypochlorite solutions. This combination will produce toxic chlorine gas.</p>
	<p><b>Lime and Rust remover/Descaler:</b> Suitable surfaces resistant to acid, e.g. porcelain. Dissolves lime and rust. Not suitable for daily usage. Remember to rinse the surface with clean water after use. <b>Caution:</b> Same as for Toilet Bowl Cleaner</p>
	<p><b>Degreasers:</b> Suitable for surfaces resistant to strong alkaline products. Removes grease and oil. Not for daily use. You have to rinse with clean water after use. <b>Caution:</b> Take precautions when using alkaline detergents on linoleum. These detergents can remove the linseed oil component in linoleum, and adversely affect the wood flour component.</p>

Fatty acid soaps, like soap flakes and soft soap, are mostly used on hardwood floors.

Furthermore, there are special products available for particular tasks. E.g. chewing gum remover, disinfectant, polish or oil for floors, and polish remover.



### Surfactants – Surface-active agents

There are four main classes of surfactants:

- Anionic
- Cationic
- Nonionic
- Amphoteric

#### Anionic surfactants:

Are negatively charged molecules.

They are cheap to manufacture, very efficient, and the petroleum industry is a starting point for the base raw material. The anionic surfactants are used extensively in most detergent systems, such as dish wash liquids, laundry liquid detergents, laundry powdered detergents, car wash detergents, shampoo's etc.



Illustration by: Maria Veha, TEC

#### Cationic surfactants:

Are positively charged molecules.

Have poor detergency, they are used for germicides, fabric softeners, and specialized emulsifiers. You cannot mix cationic and anionic surfactants, as it causes precipitation. However, some companies have manufactured products which can be mixed with an anionic, and these are powerful anti-static products.



Illustration by: Maria Veha, TEC

#### Nonionic surfactants:

Are neutral charged molecules. They are an enormous group of detergents and they are often combined with anions.



Illustration by: Maria Veha, TEC



### Amphoteric surfactants:

Are positively and negatively charged molecules. They have the characteristics of both anionic detergents and cationic fabric softeners. They tend to work best at neutral pH, and are found in shampoos, skin cleaners, and carpet shampoo. They are very stable in strong acidic conditions.



Illustration by: Maria Veba, TEC

### The function of surfactants

Hydrophobe

Hydrophile



Illustration by: Maria Veba, TEC

A particular type of molecular structure performs as a surfactant. This molecule is made up of a water-soluble (hydrophilic) and a water insoluble (hydrophobic) component.

The hydrophilic end of the surfactant is strongly attracted to the water molecules and the force of attraction between the hydrophobic and water is only slight. As a result, the surfactant molecules align themselves at the surface, and internally so that the hydrophilic end is toward the water and the hydrophobic is squeezed away from the water.

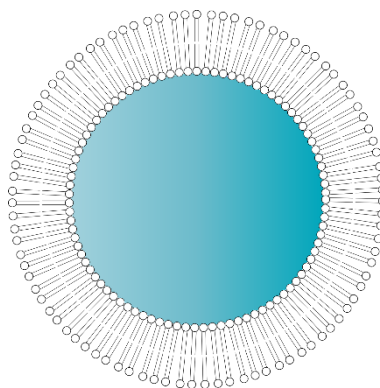
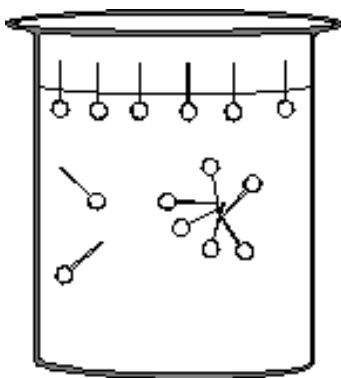


Illustration 1 by: SUS. Illustration 2 by Microbiology Club on Pixabay.



Because of this characteristic behaviour of surfactants to orient themselves towards surfaces and to form micelles, all surfactants perform basic functions.

The function of detergents is a complex combination of all the previous functions. The surface is cleaned, and the dirt to be suspended, solubilised, dissolved, or separated in some way so that the dirt will not just re-deposit on the surface in question.

### User manuals and Safety Data Sheets

Detergents can be dangerous to nature and to us. All cleaning detergents are required by law to carry a Safety Data Sheet (sikkerhedsdatablad) with include 16 points, listing all information concerning the detergent.

If the detergent is marked with a hazard pictogram there must be a work place description available for the product, informing about how to use the detergent at a particular workplace (brugervejledning).

Since 2017, the old orange hazard pictograms have been substituted with the new global pictograms.

Old



New



Illustration by: TEC



### Environmental symbols



Illustrations from: SUS

The Swan symbol is the Nordic environment symbol. The Flower is the European environment symbol. They are both officially approved by the Danish authorities and the control of the symbols is impartial.

When you use a detergent with an environment symbol, it will guarantee:

- The product is amongst the least environmentally damaging ones of its kind
- Quality and function are at least as good as the equivalent products
- Public health is taken into consideration, e.g. the detergents do not contain any hazardous ingredients

The manufacturer of the product must comply with the requirements from the Danish Environment Agency, who mark their product with the flower or the swan. The manufacturer is required to pay a fee before the environment symbol is placed on the product.

### Other symbols

If you suffer from asthma or other allergies, you should look for this symbol. It tells you that the product is amongst the least allergenic available.



**Astma-Allergi  
Forbundet**

Illustration from: SUS





## Water

**Water has an important function within the cleaning industry:**

- It loosens water soluble dirt
- It dissolves and distributes the detergent in the most effective way
- It transports the dirt away

**Water presents two challenges:**

- The water has a surface tension which makes it impossible to use alone
- Water contains calcium which can be useful for cleaning (lime soap) but can pose a big problems in connection to cleaning

Water will spread out in drops if you pour it on a surface. The drops are formed by the water's surface tension.

Detergents and soaps lower the tension of the water so that it more readily soaks into soiled areas.

## Water hardness

Water hardness is defined as amount of dissolved calcium and magnesium in the water. We measure the hardness in dH°. If the water has 1 dH°, it means 100 litres of water contains 1 gram of calcium and magnesium. The map below shows water hardness in Denmark.

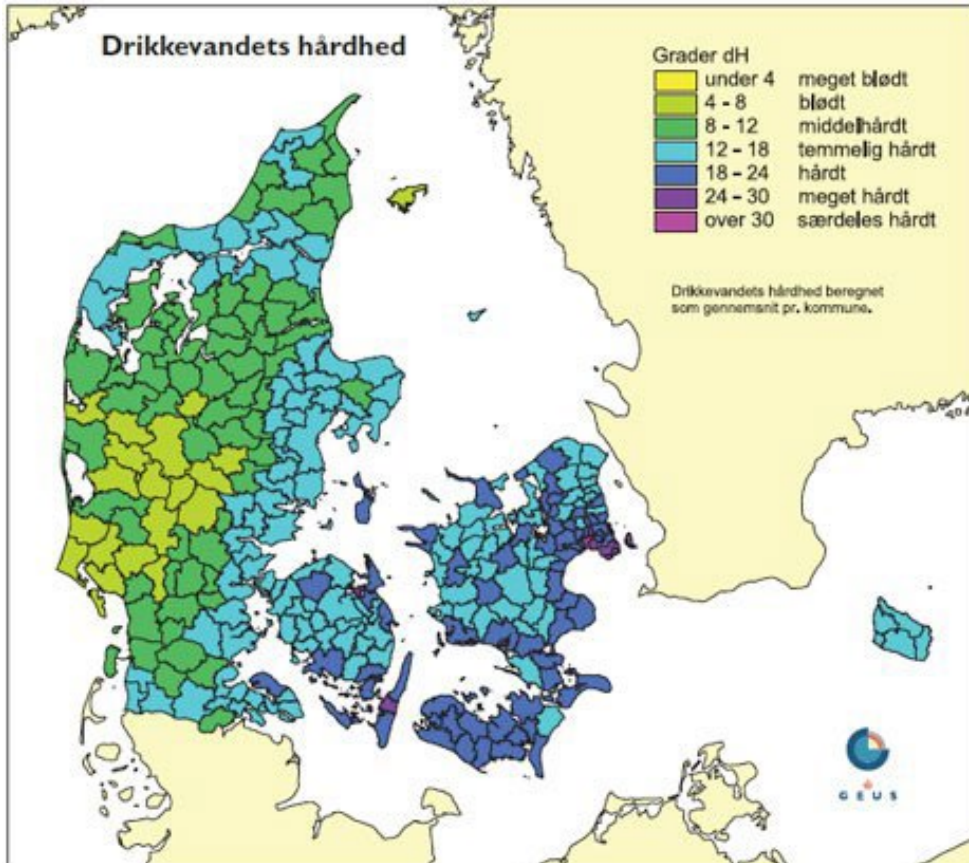


Illustration from: Geus



### Dosage

Hard water requires more soap and synthetic detergents for washing and cleaning. The correct dosage can be found on the safety data sheet or on the label of the detergent.



Pictures by: TEC

### Mohs' Scale of Hardness

The Mohs' scale of mineral hardness is a qualitative scale that characterizes the scratch resistance of various minerals through the ability of a harder material to scratch a softer material. It was created in 1812 by the German geologist and mineralogist Friedrich Mohs.



Photo by Maria Veha, TEC

In cleaning, the scale is useful for highlighting how cleaning equipment may damage different surfaces. E.g., the white scouring nylon is equal to 1-2 in the scale and the green scouring nylon is equal to 7-8 in the scale.



### Different types of materials and surfaces

Cleaning correctly requires a certain knowledge of materials and surfaces.

- Some materials are porous, they have an open structure, and they will absorb liquids.
- Some materials are not porous, their structure is closed, and liquids will pool on top of the surface.

Materials like stone (marble, slate) and natural materials (cork, wood, linoleum) have a porous surface. Artificial materials (vinyl, epoxy) will have a non-porous surface.

It is important to know which detergents and equipment can be used on different surfaces. For instance, will a low pH damage marble and a high pH will damage linoleum?

#### Cork Flooring:

Cork floors are made by peeling off the bark while saving the tree. They are good for insulating the home and keeping it relatively soundproof. It is **anti-allergenic** unlike most flooring types and resistant against insects well. Since cork is all natural, it is environmentally friendly and sustainable. Cork floors are resistant to abrasion and can be cleaned easily.

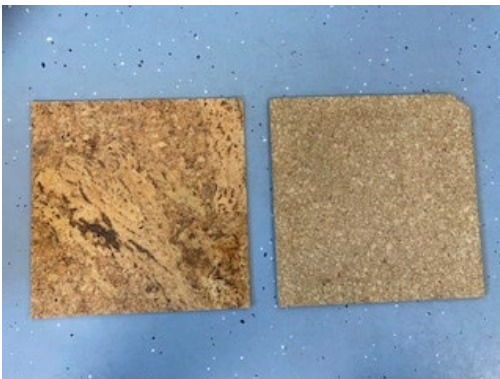


Photo by: Maria Veha, TEC



### **Laminated Flooring:**

Laminated flooring presents itself as an option for those who want to capture the grandeur of wood or stone without breaking the bank. Laminate is sturdy and will show no signs of fading or stains for a decade. Unlike wood, it is not easily affected by moisture, and it requires less care than authentic wood or stone flooring. Clean-up consists only of sweeping and mopping.



Photo by: Maria Veba, TEC

### **Linoleum Flooring:**

Linoleum flooring is a composite of cork wood dust, limestone, recycled wood flour, and linseed oil. It is considered as one of the more environmentally safe choices when it comes to flooring materials. Linoleum floors are resistant to impact and dents. Oils cannot effect linoleum flooring nor damage it. A floor using this type of tile feels smooth and comfortable to touch.



Photos by Maria Veba, TEC



### Stone Flooring:

Since there are different kinds of stones, natural stone tiles also come in different types such as limestone, clay, granite, pebble, sandstone, slate, travertine, and onyx. Stone tiles are generally durable and provide an unmatched elegance to home interiors. Stone floors also resist high temperatures and are suitable for placements near sources of radiant heating like fireplaces, stoves, or furnaces.

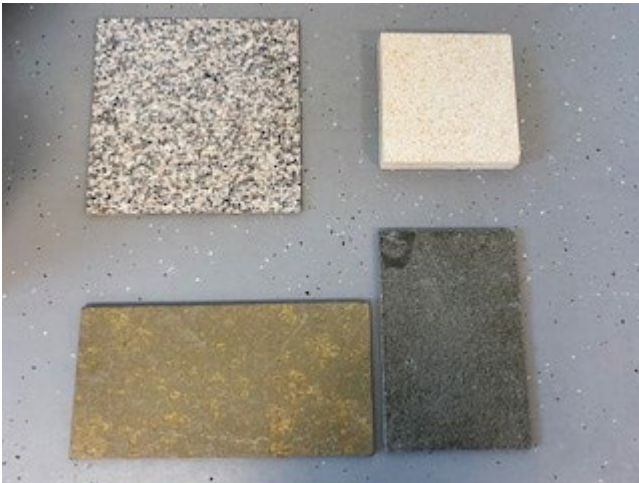
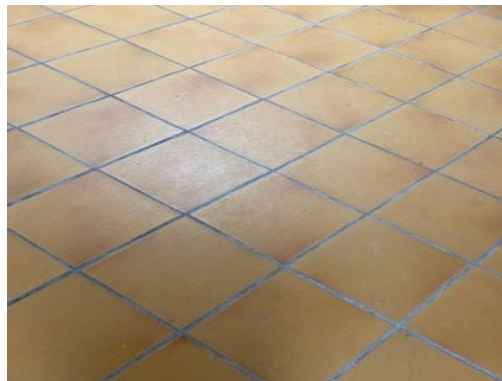


Photo by Maria Veba, TEC

### Tile Flooring:

Tile flooring comes in various materials like ceramic, porcelain, quarry, and mosaic. Installers need grouting in order to lay them down on the floor. Glazed tiles can be stain-resistant.

Tile flooring shares the same quality of heat resistance as stone floors and as such, they can also be used near fireplaces.



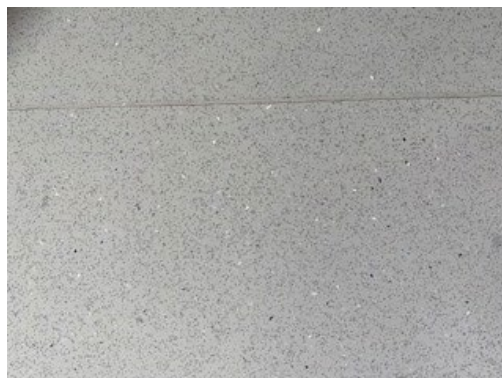




Photos by: Maria Veba, TEC

### **Vinyl Flooring:**

Although synthetic by origin, vinyl flooring achieves the rich, deep, and elegant look of wooden floors. This floor type also comes in different colours and patterns since vinyl manufacturing processes have been upgraded throughout the decades. Vinyl floors are durable and will ably resist impacts and scratches against their surfaces.



Photos by: Maria Veba, TEC





### **Wood Flooring:**

Wood flooring is the classic option, and wooden floors come in oak, maple, and bamboo. With proper care and maintenance, wood floors have great durability. Cleaning wooden floors only requires sweeping and the application of a polishing shine solution while scrubbing from time to time.



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