Edge issues

Drip edges and water drips on the underside of components

By Klaus Korte

Rusting reinforcement steel and flaking concrete on the underside of components (water drips), for example on facade elements, balconies, window sills, prefabricated concrete elements, joint edges, etc., are unfortunately still a common phenomenon. But why?

Concrete cover

Ever since the regulations on structures made of reinforced concrete were first introduced in Germany on October 2, 1915, that is, 85 years ago, a minimum concrete cover of e > 2 cm at every point has been required for outdoor components. Today's reinforced concrete standard, DIN 1045 (July 1988), Sec. 13.2, Tab. 10.3, prescribes a minimum dimension min c of 2.5 cm (installation dimension nom c_v = min c + 1.0 cm).

Damage after eight years on the underside of a balcony concrete sheet with no water drip or drip edge at all

The European standard Eurocode 2, Tab. 6.2, also prescribes only 25 mm, with reference to the environmental conditions (corrosion protection). These specifications on concrete cover mean that, if a water drip is formed by insertion of a triangular or trapezoidal strip with a required height of 1.5 cm, the coverage has to be increased by this value, that is, to 4.0 cm. German concrete cover directive (Merkblatt Betondeckung), March 1991, Sec. 4.8, Design of the reinforcement, states: "Moreover, the reinforcement must be specially secured with corrosion protection when its cross-section is reduced, for example, when trapezoidal strips are used..." Unfortunately, this requirement has never been and is still not complied with in concrete structures. The damage caused by this deficiency is familiar enough: flaking concrete.

Cause of damage

If concrete construction, which has been used for more then 2000 years, is done properly, additional protection of the reinforcement is not necessary because it is highly unlikely that the carbonatation depth will reach the steel reinforcements during the normal period of use of a structure of 50 to 70 years.

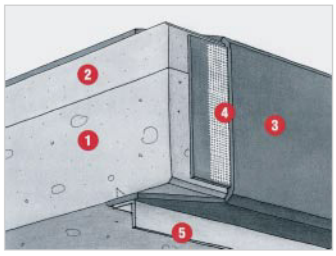
Damage to the concrete sheet of a balcony due to insufficient concrete cover. The repair illustrated where the water drip is reshaped by insertion of a triangular strip retains the weak points and will not be successful in the long term

If concrete cover is insufficient and the carbonatation does reach the steel reinforcements, normal corrosion protection afforded by passivation of the steel by the cement ceases. Water and oxygen can reach the steel, which then corrodes and expands. This comes to light as flaking concrete. The ends of the concrete components, over which the water from the entire surface above can flow, are therefore the components most at risk because the commonly known air-borne pollutants (carbon dioxide and sulphur dioxide) can only penetrate the concrete if it is absorbent and the water stands for long enough. On non-coated concrete, you can see which areas are affected by water by their typical white colouring because the lime is washed out (efflorescence). Well compacted concrete from the formwork was removed late = little efflorescence. Poorly compacted concrete from the formwork was removed early = much efflorescence. Many and large capillaries = much lime = light-coloured concrete.

Drip edge / water drip

Drip edges produced by nailing a triangular or trapezoidal strip onto the formwork without increasing the concrete cover to compensate are a problem. This is a defect (planning error) that inevitably results in damage.

Spitters made of aluminium, plastic or other material, attached using plugs, cause weak points in the region of the plugs. Moreover, they have to be sealed to prevent water running between the underside of the concrete and the top of the spitter and, especially importantly, they cannot be painted. They are therefore often unsightly for users of the balcony below them, for example. Nonetheless, in some cases, spitters are effective. However, there are spitters that satisfy architects, decorators, tradesmen and home owners alike. For a number of years, spitters have been available that comply with all these requirements – for new buildings and renovations of components made of concrete, rendering, asbestos and natural stone, that is, for all absorbent and non-absorbent substrates.

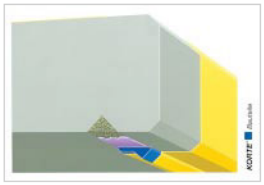


Plugged, sealed, not painted, weak point retained. Spitter shape that was previously usual on the underside.

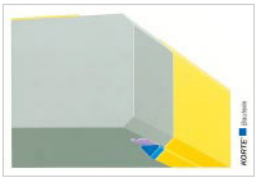
1 Reinforced concrete carrier sheet
2 Composite screed (gradient > 1.5 % towards edge)
3 Coating
4 Fabric insert
5 Plastic or aluminium bracket

The solution

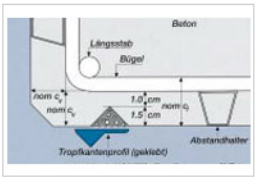
Industrially prefabricated drip strips (spitters, water drips) made completely of hardened epoxy resin for gluing onto the underside of components are the ideal solution. As a comment in the contracting rules for award of public works contracts concerning concrete preservation "VOB Betonerhaltungsarbeiten", DIN 18349 No. 4.2.21, states: "Water drip edges are required to protect surfaces. They should be located at the transition from the vertical concrete surfaces to the horizontal lower faces. [...]«



Drip strip specially for renovating existing water drips. Increases concrete cover



Spitter directly glued to the bevel or edge prevents dirtying of component undersides, especially on elastic paint coats on concrete



Detail: Repair with insufficient concrete cover by grinding off the existing water drip and gluing on a drip edge

Mounting of drip edges is also specified in the standard "Book of Standard Specifications", published by DIN Deutsches Institut für Normung e.V. "The Book of Standard Specifications for Building, Work Scope 081 Concrete preservation work No.: 01.94 081 442.43.20.01"! states: "Glue drip edge over head and paint ..."

These strips have a smooth surface and can simply be coated with any facade paint after gluing to disguise the fact they are attached components. There are various strips to choose from. The strips can be fastened with different adhesives, for example, with epoxy resin on prepared concrete or with polyurethane-based paintable, permanently elastic joint sealant on already painted surfaces. The concrete cover is therefore not weakened as it is with the use of plugs described above! Usually, the strips are glued after the damaged concrete has been knocked out and the surface has been reshaped, but before fine filling and smoothing, to ensure a perfect transition. Many installers use the up to 4-cm wide strips as formwork for repair. Of course, the drip edges can also be used preventatively by gluing them onto a previously sealed drip recess of the still undamaged component.

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