



WORK GUIDELINE No. 11

Casting of breakthroughs in the carriageway slab

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1 Purpose and scope

The present Work Guideline specifies conditions, execution, and quality of concrete used for casting breakthroughs in bridge carriageway slabs. Such breakthroughs occur in areas of a poor concrete quality, which has to be removed throughout the slab thickness.

2 Reference documents

Bridge design documents
Certified concrete composition.

3 Preliminary conditions

The following conditions shall be fulfilled for casting breakthroughs in the carriageway slab:

- In areas where the cross-section of steel reinforcing bars is reduced by more than 10% due to corrosion, new reinforcing bars shall be added in compliance with the design.
- Exposed corroded reinforcement shall be blast cleaned to the SA 2.5 standard, and painted with two coats of SINIT L.A.2S.
- Suitable formwork shall be provided to the breakthrough opening, so that a camber of 2 cm beyond the original plane is achieved on the lower side. Wooden laths shall be inserted between the formwork and the upper plane (refer to enclosed sketches).
- The formwork shall be oiled with appropriate shuttering oil.
- All loose particles shall be removed from the breakthrough wall.
- When casting works are carried out in wintertime, i.e. temperatures below 0°C can be expected, additional steps shall be taken such as:
 - ensuring concrete mix temperature of at least +8°C prior to casting;
 - heating of concrete already cast;
 - heat protection of cast concrete.
- In summertime the concrete mix temperature prior to casting shall not exceed 30°C.

4 Safety precautions

All the requirements and regulation related to safety at works shall be fully considered. The labour shall be acquainted with hazards arising during casting breakthroughs in bridge carriageway slabs.

The formwork shall be erected firmly and tightened well. During casting breakthroughs workers must not stay below the formwork.

5 Personnel

The works may only be carried out by skilled and adequately instructed personnel who is also acquainted with the quality requirements.

6 Work instructions

6.1 Concrete composition to cast breakthroughs

Concrete shall be mixed at suitable concrete mixing plant of capacity of at least 1,000 litres.

A certified composition of ready-mix concrete shall be foreseen. The concrete mix shall be such as to enable casting by means of concrete pumps. Maximum aggregate grain size shall be 22 mm.

At the concrete mix plant, an admixture of 8% by weight with regard to the cement amount to compensate shrinkage of concrete shall be added.

Necessary corrections of concrete consistency in dependence on the temperature shall be carried out at the construction site by adding an adequate additive.

At the beginning of each daily casting the mineral aggregate moisture content, the achieved concrete mix consistency, and the pore content shall be verified. In case that the specified concrete properties are not achieved, necessary arrangements and adjustments shall be carried out at the concrete mixing plant immediately.

Just before casting in place, the pore content shall be rechecked. It shall be between 4% and 6%, otherwise the concrete batch has to be rejected.

6.2 Formwork and reinforcement

Both formwork and reinforcement shall be preliminarily checked and taken over in writing.

6.3 Breakthrough walls

Two days prior to commencement of casting, the breakthrough walls shall be continuously soaked to achieve saturated moisture of the concrete.

6.4 Casting

Concrete can be cast either directly from a mobile concrete mixer or by means of a concrete pump, depending on the location of individual breakthrough.

Spreading of concrete shall be performed by means of vibrating swords.

For breakthroughs to be cast after removal of concrete above the upper reinforcement, transportation paths for vehicles shall be arranged to prevent squeezing of steel reinforcement.

Breakthroughs shall be cast up to a height of 2 cm below the upper reinforcement. Final casting shall be carried out upon carriageway slab levelling.

6.5 Arrangements for casting in wintertime and summertime

In wintertime when temperatures are below 0°C, heating and heat protection of cast concrete shall be foreseen.

In summertime when temperatures exceed 30°C, casting shall be carried out either early in the morning or late in the evening.

6.6 After-treatment of cast concrete

Taking into account the fact that an admixture has been added to the concrete mix to compensate shrinkage, an extensive wet after-treatment of concrete shall be continuously performed for at least 7 days. Concrete surfaces shall be covered with damp felt and a PVC foil. Twice a day the PVC foil shall be removed, and the felt sprayed with water. To prevent uncovering of the concrete surface due to eventual strong wind, the felt and the PVC foil shall be additionally burdened.

7 Quality control

The quality control of concrete mix shall be carried out both at the concrete mixing plant and at the construction site.

For the needs of the current quality control of the cast concrete, three cubes shall be taken daily.

8 Enclosures

Sketch 1: A shape of a carriageway slab breakthrough

Preboji so nepravilne ... = Breakthroughs are of irregular geometric shapes

AB plošča = Reinforced concrete slab

Položaj nosilca = Girder position

Ostenje preboja praviloma ni izvedeno... =

A breakthrough wall is generally not entirely vertical, but runs to an inclined plane at the lower surface. Such places would not be perfectly filled-up upon casting. Therefore the formwork is lowered by 2 cm below the slab surface. Beforehand, wooden laths are stuck onto the concrete surface at the breakthrough course.

Dodatno izsekan beton na stropni površini plošče =

Concrete additionally cut out on the upper surface of the slab.

Letev = Lath

Sketch 2: Breakthrough formwork

Preboji se zabetonirajo do višine, ... =

Breakthroughs to be cast up to a height, which is 2 cm below the position of the upper reinforcement.

Ostenje preboja mora biti... = Breakthrough wall shall be clean and well soaked.

Stiropor = Polystyrene

Izsekan beton v globino 2 cm = Concrete cut out to a depth of 2 cm

Opaž = Formwork

Potek letev na betonu, ki so ... =

Course of laths preliminarily stuck onto the concrete

Preboj skozi ploščo = Slab breakthrough