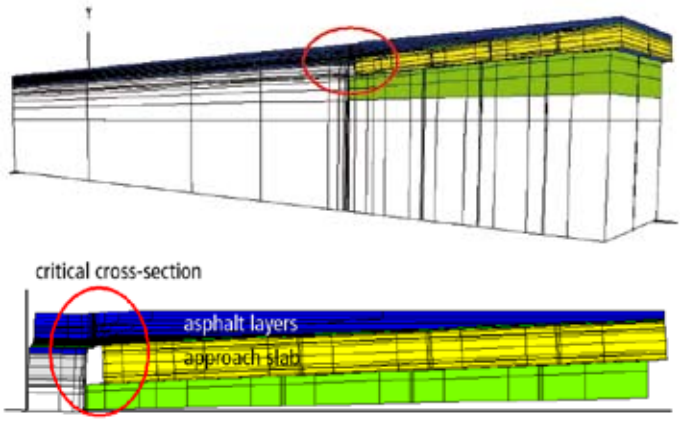
Development phase jointless / silent transitions

Constructing the (invisible and intangible) jointless transition at Son in the Netherlands in the summer of 2003

In the summer of 1999 the Bridge Division of the Dutch Public Works and Water Management department approached the Ooms Nederland Holding Research & Development department to discuss the technical options for a transition between an integral bridge and the connecting road surface. The enquiry was prompted by the fact that in the new section of the A50 between Eindhoven and Oss there are a number of bridges whose concrete decks are rigidly fixed to the supports (integral bridges). This type of structure results in substantial savings in both the construction and management stage, but there can be a considerable movement where the bridge has a large span, mainly because the approach slabs move with the expansion and contraction of the deck. This raised the issue whether the transition could also be a low maintenance type of structure. The Public Works and Water Management department made this a requirement because the bridge itself had been chosen for its low maintenance design.

A working group with members from the Bridge Division and Ooms Nederland Holding drew up a programme of requirements for the connection between the bridge section and the embankment sections of the road surface: fast construction, no adverse effects on the functionality of the (low-noise) road surface, a high level of comfort for the road user, no maintenance for 50 years and adequate supporting calculations and measurements to minimise the risk of failure. The clear preference was for a jointless (invisible and intangible) transition. In view of the fact that the 70-metre-long bridge over the Wilhelmina Canal at Son (bridge 1 along the new stretch) was expected to move around 20 mm between an extreme summer and winter, the Research & Development department was faced with a complicated, challenging problem that it tackled with enthusiasm.

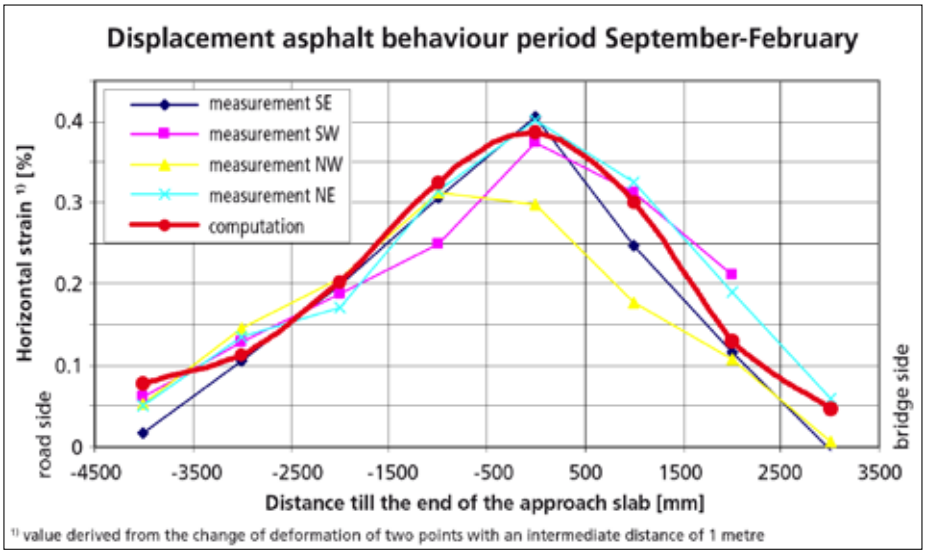
INVISIBLE JOINT SYSTEMS®



After carrying out a long series of complex finite element calculations and laboratory measurements, Ooms Nederland Holding, in collaboration with the Bridge Division, arrived at a solution which could be constructed quite easily. This 'invisible' solution consists of a bituminous 'sliding layer', various layers of a specially developed polymer modified asphalt mixture and glass fibre reinforcement. Some structural features also had to be developed. To put the solution into practice, Ooms Nederland Holding, together with the Noord-Brabant Directorate and the Civil Engineering Division of the Public Works and Water Management Department, transformed the proposed transition into specifications (with functional requirements for the asphalt mixture). A trial section was laid at a storage depot. Once an analysis of this construction trial had given the confidence in the viability of the concept, the Noord-Brabant Directorate contracted the Son Consortium (bridge 1) and the Mariaheide Consortium (bridges 26 and 29) to implement the solution on a 'contract variations' basis. In view of its experience with the construction method (and the materials used), the two consortiums engaged the Ooms Nederland Holding Road Construction department as a subcontractor to do the work, which was carried out in the summer of 2003. One of the more unusual aspects of the project was that the partnership between the Brabantse Asphalt Plant's laboratory and the Ooms Central Laboratory resulted in knowing by the end of each day, whether asphalt layers that had just been laid, did have the mechanical properties they were designed to have. This meant that each consortium knew at the end of each day, if it could confidently press ahead with construction the next day.

Measuring instruments were built into the asphalt layers to check whether the concept's performance is in line with the requirements and to verify the complex computations. These instruments generate data on the movement of the bridge deck and the strains in the asphalt layers (both as a function of temperature). The data are also used to optimise the concept for other situations. The Ooms R&D Department is presenting this work on the website www.ooms.nl/research.

In-situ strain measurement sensors make precise verification possible



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June 2009