

**Technische Universität Dresden  
Faculty of Civil Engineering  
Institute of Concrete Structures**

**Doctoral Thesis**

**Suggestion to adapt the structural  
verification of decompression for  
existing prestressed concrete  
bridges built by the incremental  
launching method**

by

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# Summary

Existing road bridges constitute a considerable part of the fixed assets of the federal infrastructure of Germany.

These road bridges rise to a challenge for the responsible authorities.

A large part of the existing bridges are of prestressed concrete. Many of today's existing structures were built during the time of economical rise after the 1960s in the Federal Republic of Germany. The prestressed concrete construction method was researched and developed at the same time of its application. Certain types of structures and methods of erection were created and are applicable until today.

In the present those bridges are subject to changing requirements. Older bridges are under heavier and rising loads.

The structural re-calculation is an aid to engineers to assess existing bridge structures.

On this behalf in the year 2011 a guideline for re-calculation of road bridges (*Nachrechnungsrichtlinie*) was issued by the German Federal Ministry of Transport. Experiences and findings of its application were published.

For many prestressed concrete bridges analytical deficits were calculated that lead to a limitation of its further service life. Therewith those prestressed concrete bridges may not be used as long as originally planned.

Responsible for this limitation among others may be the structural verification of decompression, when no tension stresses are allowed in the concrete or very small tension stresses by application of the present issue of the *Nachrechnungsrichtlinie*, respectively.

Prestressed concrete bridges are considered that were built by the incremental launching method. For those bridges this method provides certain structural features that mainly the verification of decompression will lead to the limitation of the service life only.

The basics of the verification of the serviceability are described with reference to the approved concept of allowable stresses according to the former German code for the design of prestressed concrete members. This code is compared to the concept of European model codes up to today's binding Eurocodes.

On the action side the former load cases are fit into today's valid concept of combination of actions at the serviceability limit state. For the resistance the backgrounds of the former allowable tensile stresses in the concrete are described. The former limits are critically reviewed.

It will be worked out that the present regulations of the guideline for the verification of the decompression are too conservative. A more distinguished verification method is suggested that will not lead to a limitation of the service life. Whilst no other limitations, with the suggested method those prestressed concrete bridges could be used at least as long as they were originally designed.

For its application limitations are to be considered. The suggested method may be transferred to other types of structures of prestressed concrete bridges.