

**Zeitschrift:** IABSE reports = Rapports AIPC = IVBH Berichte  
**Band:** 83 (1999)

**Artikel:** French experience in prestressed structures repair  
**Autor:** Poineau, D. / Lacombe, J.-M.  
**DOI:** <https://doi.org/10.5169/seals-62908>

#### **Nutzungsbedingungen**

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

#### **Conditions d'utilisation**

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

#### **Terms of use**

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

**Download PDF:** 05.02.2026

**ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>**



## French Experience in Prestressed Structures Repair

**D. POINEAU**  
 Technical Director  
 S.E.T.R.A.  
 Bagneux, France

Born 1937.  
 Throughout his carrier  
 he has worked on  
 engineering structures.  
 For about 25 years,  
 specialised in pathology.



**J-M. LACOMBE**  
 Senior Engineer  
 D.R.E.I.F.  
 Vincennes, France

Born 1959, civil  
 engineering degree 1983.  
 Experience in concrete  
 and composite bridges.  
 For about 10 years,  
 specialised in pathology.



### 1. Introduction

#### 1.1 History of prestressing in France

On France's national roads, only 19% of bridges are made of prestressed concrete, but they account for 48% of the deck surfaces! In fact although Eugène Freyssinet filed his patent on prestressed concrete back in 1928, it was only after the second world war that this technique really began to develop and particularly since 1970.

#### 1.2 History of prestressed bridge repairs

Like every other type of bridge, prestressed concrete bridges have shown specific defects. There are many reasons for these defects: inadequacies in calculations of some structures built before 1975, corrosion of tendons with insufficient protection, and so on... Furthermore, there are more and more socio-economic demands such as widening or live load increases.

In France, the first significant operations on prestressed concrete bridges took place in the early seventies. A recent inventory shows that about fifty large prestressed concrete bridges have been reinforced or repaired, in most cases with additional external prestressing. Most of the defects encountered in France, principally tendon corrosion or structural defects, concern deck girder bridges and box girders using staged construction.

### 2. Repair techniques

#### 2.1 The different techniques

Depending on the origins of the defects, various repairing or strengthening techniques can be used. We will limit the scope of this paper to the repair technique by the addition of force, currently widely used in France [1].

#### 2.2 Additional prestressing

Additional prestressing, generally external to the concrete, is the best known repair and/or strengthening method for bridges and other prestressed concrete structures. It can be used on bridges cracked through errors in design or construction, on bridges with highly-corroded prestressing reinforcements and even on bridges in good condition but whose load-carrying capacity must be increased.

In France, many structures have been strengthened by this technique, in which structural detailing and efficiency checks have made great progress since the first repairs in the seventies. The additional prestressing may be longitudinal, transversal or vertical.



### 3. The lessons drawn

France has 25 years experience of repairing prestressed structures in order to extend their life span or to update their performance for contemporary needs.

#### 3.1 Lessons drawn for repairs

##### 3.1.1 *Methodology*

It is essential to use a strictness methodology for expert appraisals and repairs [2], which must respect the following three stages:

- preliminary diagnosis ;
- performance of tests and studies specified in the investigation programme;
- synthesis and finalisation of a diagnosis to explain the causes of observed defects and quantify the resulting weak points in the load-carrying capacity. Experience has shown that repairs made without this prior analysis have more often than not been failures.

##### 3.1.2 *Repairs by additional prestressing*

For repair work by additional prestressing, specific requirements must be met, such as stop traffic during the hardening phase of the additional concrete or do radiographies before drilling, etc.

#### 3.2 Lessons drawn for new structures

We can also draw lessons from this experience to design new structures.

##### 3.2.1. *Basic rules to limit the ageing of structures*

For example :

- Any change in usage requirements of a bridge (future widening, increase in load-carrying capacity) must have been already taken into account in the design.
- All monitoring and maintenance operations on all parts of the structure must be simple, easy to perform and must not adversely affect durability.
- Systematically carrying design regulations to their limits results in a build-up of reinforcements and tendons incompatible with good installation of the concrete, proper concrete cover and positioning of the reinforcements.
- etc.

##### 3.2.2. *Technological changes and durability*

The durability problems that sometimes occur with bonded post-tensioning (grouting with cement) may induce engineers to consider new methods of protecting prestressing.

But experience has shown that opting for such solutions is sometime like jumping out of the frying pan into the fire, due for example to the incompatibility that may exist between some cements and some additives when preparing a grout mix with a controlled grouting time, that make cause settlement phenomena and grout setting defects in the prestressing ducts.

### 4. Conclusion

In order to improve the Quality of structures, it is important to draw lessons from experience and build it up. This analysis made in France has resulted in a considerable reduction in defects, even though further progress remains to be made.

Requirements in terms of durability must remain the absolute priority and it is particularly important for future European technical approvals for prestressing systems to take them into account.

### References

- [1] Réparation et renforcement de structures de bâtiments et d'ouvrages d'art - N° 501 des Annales de l'ITBTP, February 1992,
- [2] La méthodologie des expertises et de la réparation - Ouvrages d'Art N° 31, bulletin de liaison du CTOA du SETRA,