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Discrete Prestressing of Structures through Local Moments

Précontrainte discrète des structures par des moments locaux

Diskrete Vorspannung der Tragstruktur durch Lokale Momente

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1. INTRODUCTION

For attaining more efficiency in the structural design, among others, the discretness idea of solid continuum has appeard, as one of the most fruitfull, for both theoretical approach and physical achievment. Sothere is to underline the convenient match, between the precast erection of structures and their analysis by finite method.
An active step in order to profit of the discretness concept it might be, the improvement of the structural bearing capacity by introducing favourable couples through prestressing.

2. SOME EXAMPLES OF DISCRETE PRESTRESSING

Fig. 1 shows a large span frame made of precast and prestressed linear elements; the joinings between column and beam segments are performed by prestressing high tensile bolts, able to introduce locally, advantageous positive moments.
Meanwhile, at the frame crown, a staying cable system, prestressed by a central screw, ensures the connection between the frame elements bringing also favourable negative moments in the near zone.

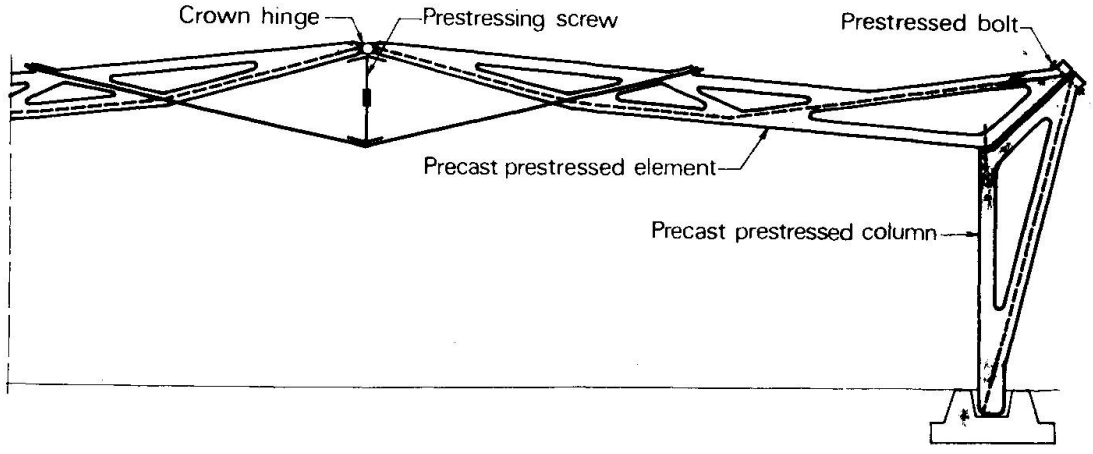

Fig. 1

Greater benefits may be obtained by introducing couples in the connection sections of an arch made of precast segments, as it may be seen in fig. 2.

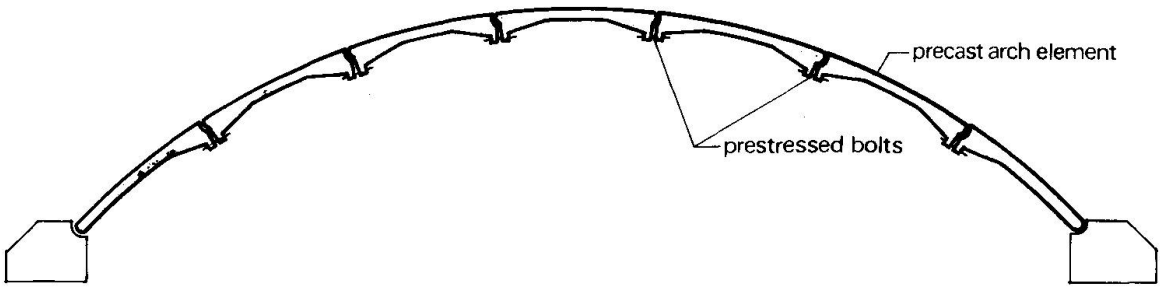

Fig. 2

Fig. 3 presents an extension of the discretness idea to bidimensional forms like shells, where bending moments acting in opposite sense to the main service load, are introduced by wedges fixed through bolts at the outside part of the shell. The shell integrity is ensured by posttensioned cables axially passing through the panels.

Finally fig. 4 shows a ductiliser prototype, conceized as to ensure -at a given tensile stress- finite displacements. This device may be introduced instead of tensioned bolts, thus limiting the increasing of the local moments.

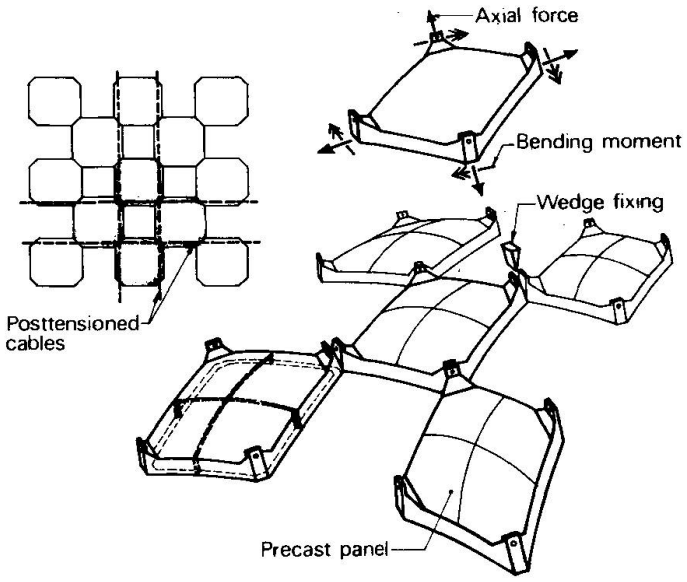

Fig. 3

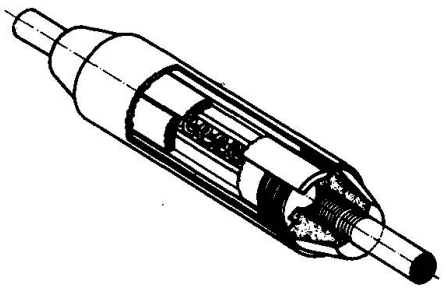

Fig. 4

The principal advantages brought by the above described procedures consist of: (i) the improvement of the structure stiffness, avoiding local instability, (ii) the raising of a better and more facile assambling of the precast elements, related with favourable economic aspects and finally (iii) the perfect agreement between the actual achievement and the mechanical model of the finite element.