

# Design criteria for the new Italian high speed rail bridges

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**Design Criteria for the New Italian High Speed Rail Bridges**  
**Caractéristiques de projet pour les ponts sur les lignes ferroviaires**  
**à grande vitesse en Italie**

**Entwurfskriterien für neue Eisenbahnbrücken**  
**italienischer Schnellfahrstrecken**

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**1. INTRODUCTION**

The Italian railway network will be improved in the future by the construction of about 1200 Km long new lines. Because of the topography and environmental restraints up to 15% of these lines will be on viaducts, many of them more than 1 Km long.

The Italian Agency managing the national railway - FS - has considered it advisable to define some preliminary standard structural elements to utilize for the design of the viaducts. This standardisation will improve the industrialised production and the control of quality, specially for the prestressed concrete decks.

Additionally, an automatic procedure finalized to select the optimum span of long viaducts has been prepared.

**2. THE STANDARD ELEMENTS**

Some general features were preliminary decided = (i) decks will be independent for each track in order to allow their maintenance (i.e. change of joints and bearings, remaking of waterproofing membrane etc.) with the trains running at least one way; (ii) simply supported beams will generally be utilized; (iii) prestressed concrete decks will be adopted as far as possible. Pretensioning must be preferred because of the risks of bad injection of the cables. (iiii) cantilevering construction of the p.c. decks will be allowed for long spans but no precast segments will be accepted.

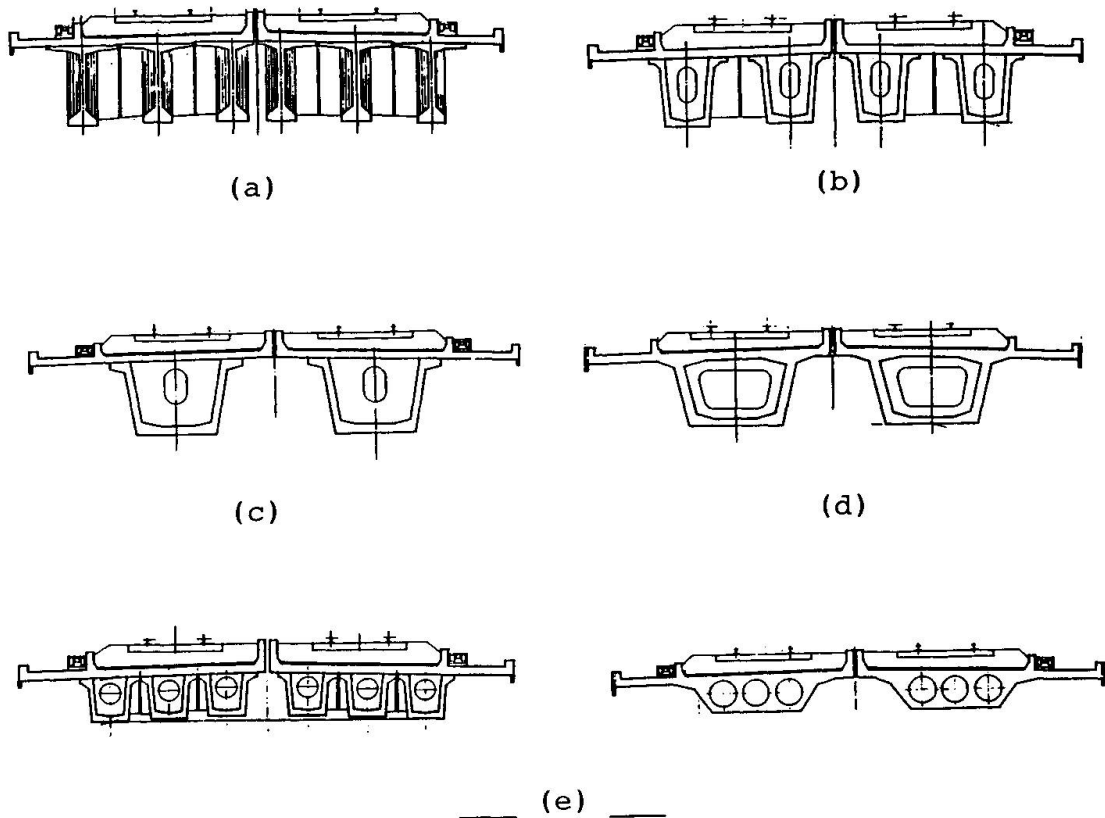
Fig. 1 shows the standard p.c. decks proposed. Type "a" can be used for spans ranging from 15 to 40 m and the beams can be precast in the factory as well as in the yard;

The same is for type "b" but with spans up to 35 m; type "c" has been studied for spans up to 30 m. In this case the weight of the precast element is about 1500 KN and the transportation on the roads cannot be done; the same for type "d" that must be cast in situ or in the yard. In the latter case a launching equipment able to handle up to 2600 KN (30 m) must be available.

Finally the decks type "e" have been proposed for short spans when the height of the structure must be kept as low as possible.

Standard piers for each type of deck, with height up to 35 m, have been studied. They are composed by a single cellular element supporting both the tracks, i.e. two separate decks. Only in special cases and for no more than 20 m height two single piers, one for each track, will be employed.

The actions to be considered in the design have been derived mostly from the draft prepared by UIC for the Eurocode 9 - Part 13 (Now CEN - TC 250 - SC 1) Only the loads due to stationary vehicles have been maintained the same as specified by the Italian code since 1945. They are about 20% heavier than UIC Loading 71.



**Fig. 1** Standard p.c. decks

### 3. THE CHOICE OF THE SPANS

A P.C. package has been prepared to compute, for each viaduct, the most economical spans has been prepared. It is divided into five sections: (1) materials and unit prices file; (2) structural elements file; (3) viaduct's characteristics; (4) computational section; (5) utilities.

In section (3) the soil and rail profile are memorized, as well as the limits where abutments can be located and the zones, if any, where no piers can be placed.

Once the type of deck to utilize is defined, the program gives the cost for each solution fitting the boundary restraints.