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Segmental Prefabrication Method for Long Span Preflexedf Beam

Méthode de préfabrication pour une poutre préfléchie de grande portée

Elementweise Vorfabrikation für vorverformte Balken großer Spannweiten

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OUTLINE OF SEGMENTAL PREFABRICATION METHOD

The preflexed beam is a kind of concrete-encased steel beam. The concrete enveloping lower flange is prestressed by release the bending force of steel beam after concrete curing. In Japan, the preflexed beam is called by the pre-beam composite girder. Already many bridges more than 350 have been built until now.

Generally, the lower concrete casting of preflexed beam is carried out at a field near the erection site of bridge. However, to find out such fabrication yard near the site are becoming very hard, especially in urban areas. Also, it is difficult to transport long span beams. Accordingly, it is demanded to fabricate the preflexed beams at the shop by dividing the girder into some segments. Therefore, two segmental prefabrication methods as shown in Fig.1 were developed. Method A is to give prestress to lower concrete by the same method applied for the isolated beam. Before concrete casting, the steel segments are jointed by the splice plates. Then the concrete is casted along the lower flange excepting the jointing parts. After curing of concrete and a check of development of the strength, prestress is introduced by release the preflexion forces and the joints are solved to transport the each segment to the site. At the site, again the segments are connected by splicing and then in situ concrete is casted to the remain parts.

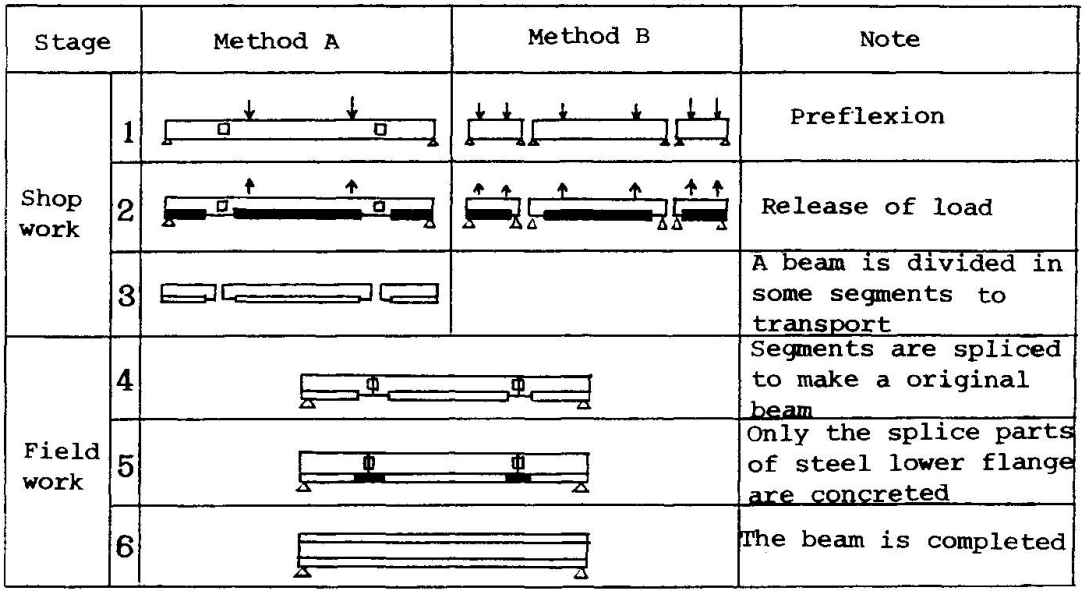

Fig.1 New Fabrication Methods for Long Span Preflexed Beam

In the case of Method B, the each segment is fabricated separately as individual beams. However, the concrete at the splice part is not casted. At the site, the concrete is casted as Method A.

PRESTRESSING METHOD FOR THE POST-CASTING OF CONCRETE TO THE SPLICE PARTS

How to give prestress to the post-casting concrete of splice parts is a key point in these segmental prefabrication methods. For the prestressing technique, three methods were considered as shown in Fig.2. The first one is to install inner prestressing bars. After cast of concrete, appropriate prestress is given by tensionnig of the bars. The second one is to give a preflexion before the concrete casting by a out cable set on the upper flange. After curing of the concrete of splice part, by release the tensionning of bar the prestress can be introduced. The third one is a method to give preflexion by counter weights. Concrete- or steel blocks are available for the weights. Each prestressing method has merits and demerits and should be selected from the view point of economy and field works. However, the third method seems to be the most simple and economy.

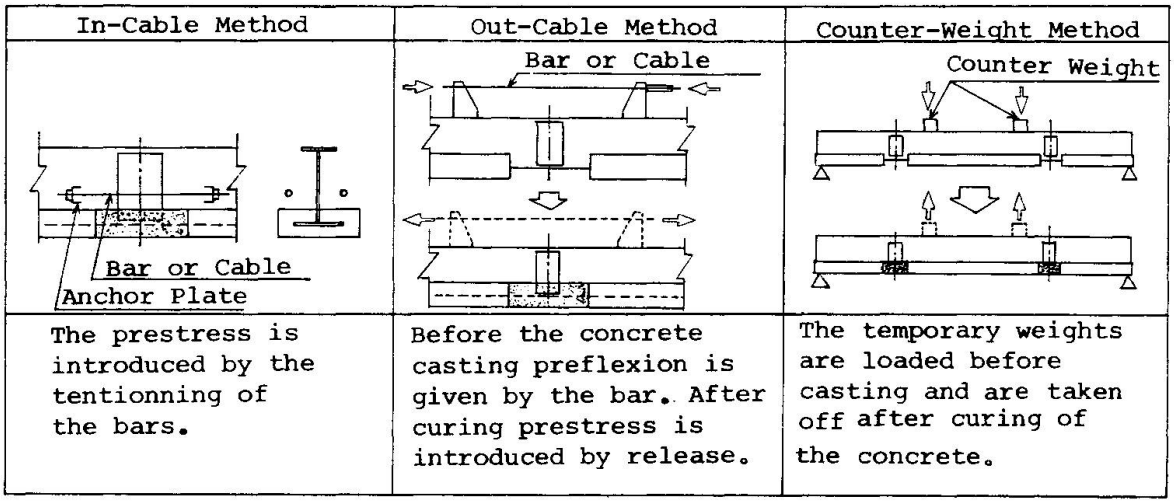

Fig.2 Prestressing Method for Post-Casting Lower Flange Concrete

EXAMPLES OF ACTUALLY CONSTRUCTED BRIDGES

Already 15 bridges have been constructed by these new methods. The longest one is Noichiwaki bridge of which span length is 47.8 m. The ratio of the beam height to the span length is about 1/30. Main actually constructed bridges are listed in Table 1.

Table.1 Constructed Bridge Examples

	Type of Preflexion	Prestressing Method	Type of Bridge	Span (m)	Completed year
Kuchiha Over Br.	Method-B	In-Cable Method	Footway	19.4	1983
Kanari Br.	Method-A	In-Cable Method	Footway	23.1	1986
Toge Br.	Method-A	Counter-weight	Roadway	30.2	1986
No.5 Kujo Bv.	Method-A	Counter-weight	Railway	36.5	1987
Shirinashi Br.	Method-A	Counter-weight	Roadway	37.5	1989
Noichiwaki Br.	Method-A	Counter-weight	Roadway	47.8	1990

For all the bridges cracking of concrete in the splice zone has seldom observed yet. These new fabrication methods have some merits not only economical advantage but also the reduce of working period in the field and the improvement of fabrication accuracy of the beam. In the poster, more datailed fabrication procedures and the constructed bridge examples are presented.