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MONOLITHIC INTERMEDIATE STRUCTURES OF TRUSSES AND THEIR CONSTRUCTIVE FORMATS AND PRINCIPLES OF STRUCTURAL STRUCTURES

Barotov Ashurali Ixtiyor o'g'li
(Tashkent State Transport University)

Abstract : *this in the article monolithic intermediate devices for overpasses and their structural forms and reinforcement principles about information given and analysis results cited .*

Abstract: *this article provides information about the monolithic intermediate devices of overpasses and their structural forms and principles of reinforcement, as well as the results of the analysis.*

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Plate spacers can have a fixed or variable height in both the longitudinal and transverse directions.

Intermediate devices with a fixed height plate rest across their entire width on the frame support beams, a retaining wall, or at some points on columnar supports.

The span of monolithic piers with a fixed height and a solid cross-section is determined at approximately 10-15 m for a continuous scheme, and 12-25 m for a continuous scheme . In continuous structures, the height is determined as follows:

$$h = \left(1/15 - 1/20\right)L; \quad (1.1)$$

$$h = \left(1/20 - 1/30\right)L. \quad (1.2)$$

In continuous systems, the entire width of the intermediate device should not exceed 15-20 meters to avoid excessive transverse temperature deformations that worsen the operating conditions of the supporting parts. Longitudinal ribs are created in intermediate devices of greater length (Fig. 1) .

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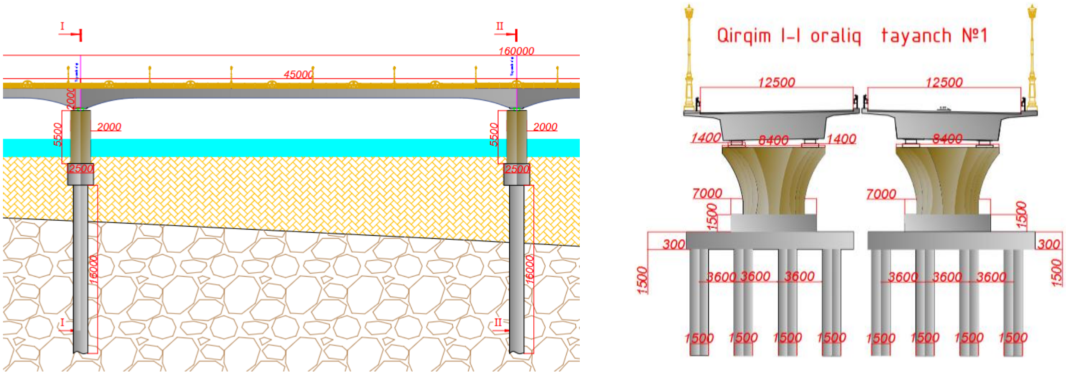

Figure 1. Plate-rib intermediate device with variable height in direction and cross section

In cases where the slab is supported at points in the transverse direction, the distance between the supports is assumed to be 8-12 m, and the cantilever overhang is calculated as follows:

$$S=(4-8)h; \qquad (1.3)$$

$$b=(8-12)\,h\,. \quad (1.4)$$

The following ratio is observed:

$$b/L = 0{,}5 - 0{,}25\,. \quad (1.5)$$

If most of the supports of slab trestles are of single-pillar or single-column construction, they must be very firmly attached to intermediate devices.

Often, the cross-section of plate-type intermediate structures supported by retaining walls or single-column supports is variable.

The relative thickness of the beams is determined as in the case of point support, the relative height of the thickest part of the intermediate devices is taken as follows:

$$h/L = 1/14 - 1/25\,. \quad (1.6)$$

If the entire width of the intermediate device is much smaller than its span, i.e.

$$B/L < 0.3\text{-}0.5, \quad (1.7)$$

then the work of such a load-bearing structure between the intermediate device is almost equal to the work of the beam, and the forces transverse to the intermediate device are small.

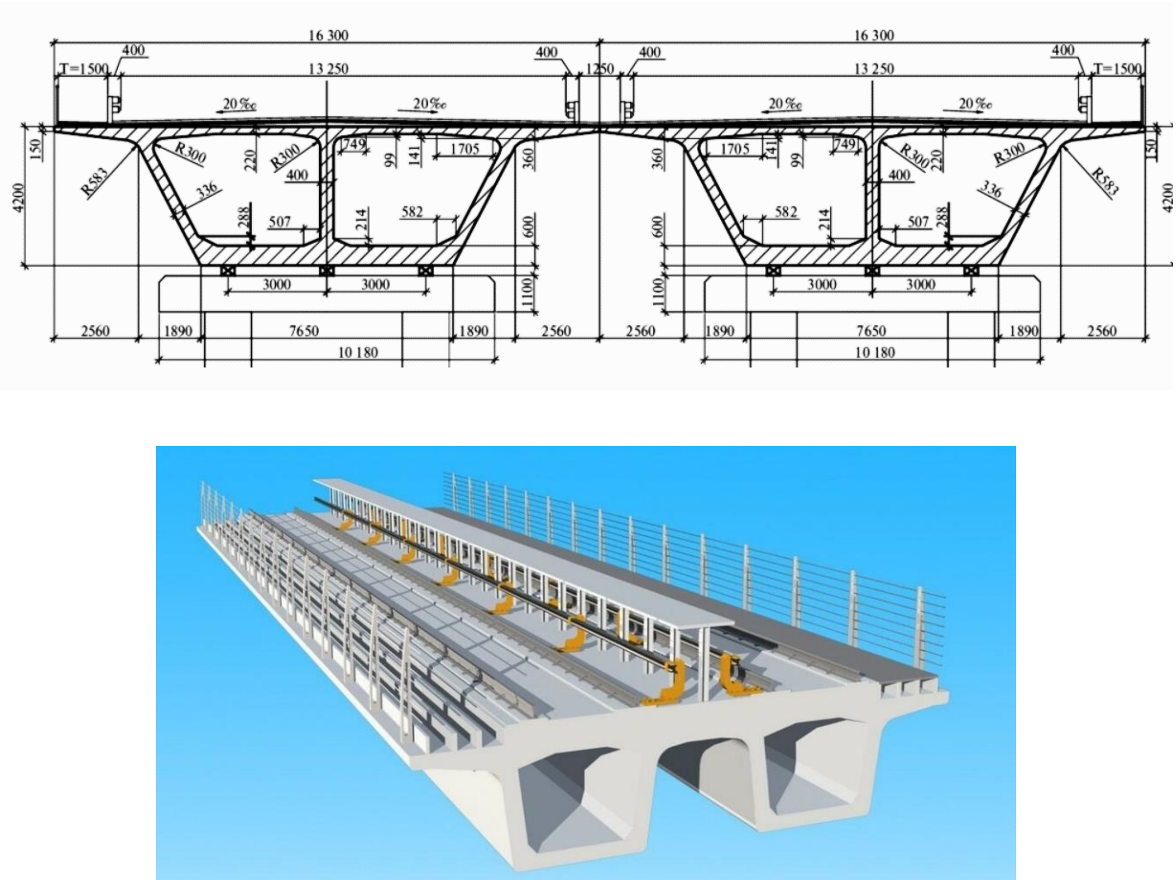

Figure 2. Monolithic intermediate devices with a box-shaped cross-section

In order to reduce weight, various shapes of cavities (round, oval or rectangular) are created in monolithic intermediate devices. In terms of their working characteristics, such structures are close to multi-contour box intermediate devices (Figure 2).

Conditionally, if $B/\ L > 8\text{-}10$ and the total area of the gaps is less than half of the gross area of the cross section, the intermediate device can be considered as a plate intermediate device.

In installations with a spacing of 30-40 m, it is undesirable to leave the height of the structure the same along the direction of movement. This is The height of the structures used in the spans is smoothly variable. The supports are usually constructed with a single column .

this type are called “mushroom-shaped”. When attaching large diameter columns

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(3-4 m) to the intermediate device, its height should be reduced to a minimum in the middle of the intermediate device.

$$h = \leq (1/30 - 1/50)L \quad (1.8)$$

The height of such an intermediate device in the support sections is equal to:

$$H=(2\text{-}5)h \quad (1.9)$$

of such structures is the complexity of concreting a slab with a variable height in each direction. Most often, they are built using standard formwork with the method of concreting along intermediate devices. In mushroom-shaped overpasses of great length and with very strong supports, quite large stresses can occur due to expansion or contraction under the influence of temperature, therefore it is recommended to create deformation joints at distances of no more than 50-60 m.

Reinforcement of monolithic intermediate structures of overpasses

The intermediate devices of monolithic overpasses are reinforced with prestressed or prestressed reinforcement, which can also be used together. The number of reinforcements and the distance between the elements are determined by calculation and in accordance with the requirements of current standards .

Longitudinal and transverse structural reinforcement are installed on continuous intermediate structures supported along the entire width. Near the supports, the ends of the reinforcement are bent back and some are bent upward. Near the middle of the intermediate structure, the lower and upper transverse reinforcements are installed closer together, and in addition to supporting the longitudinal rods, they also take on transverse and negative bending moments.

In continuous intermediate structures, reinforcement is also bent backward near the intermediate supports, and if necessary, additional reinforcement is installed that works with a negative bending moment.

In the cross section of a solid or hollow slab, closed clamps can be installed, distributing the working rods evenly across the width of the slab.

In cases where the intermediate structure is supported at several points on the supports, the transverse reinforcement near the supports will take much larger negative and positive moments and should be placed closer together than in the intermediate structure. The bent ends of the transverse reinforcement are placed closer to the support points. (Figure 3).

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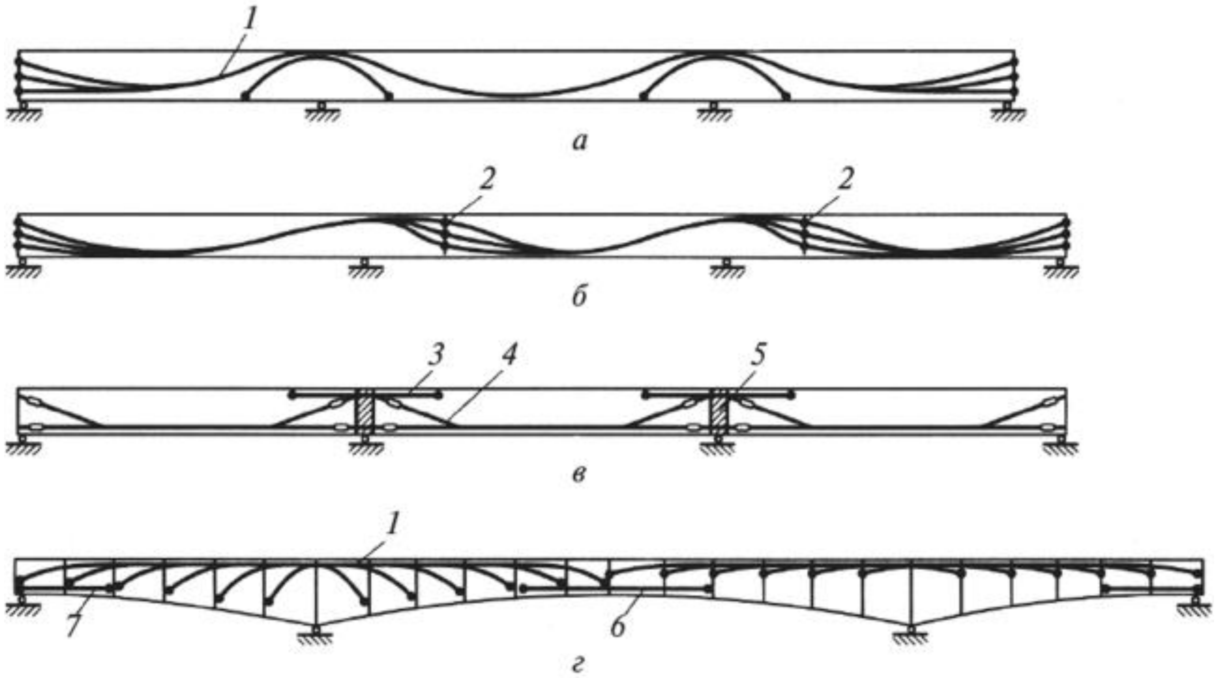

Figure 3. Variants of reinforcement schemes with prestressed reinforcement (a - g): 1 - prestressed reinforcement bundles; 2 - concreting seam; 3 - prestressed reinforcement bundles for connecting prefabricated beams to a continuous intermediate structure; 4 - prestressed reinforcement before concreting; 5 - monolithic seam connection of prefabricated beams; 6,7 - lower prestressed reinforcement for receiving positive bending moments

Reinforcement of inclined and curved slab spans is more complicated. The longitudinal working and transverse structural sub-reinforcement of the inclined, continuous structure is placed parallel to the horizontally located edges of the span. The number of longitudinal rods increases near the middle of the span.

Intermediate devices with variable height plates can be reinforced with top reinforcement located radially above the support column in both the longitudinal and transverse directions.

Figure 4 shows the reinforcement of plate-rib intermediate devices: a – with non-stressed reinforcement; *b* – in the form of box-shaped intermediate devices . When reinforcing a plate-rib intermediate device with non-stressed reinforcement, it consists of the upper grid of the plate *1* , the reinforcement frame of the rib wall *3* and the lower reinforcement of the plate in its console part *4* .

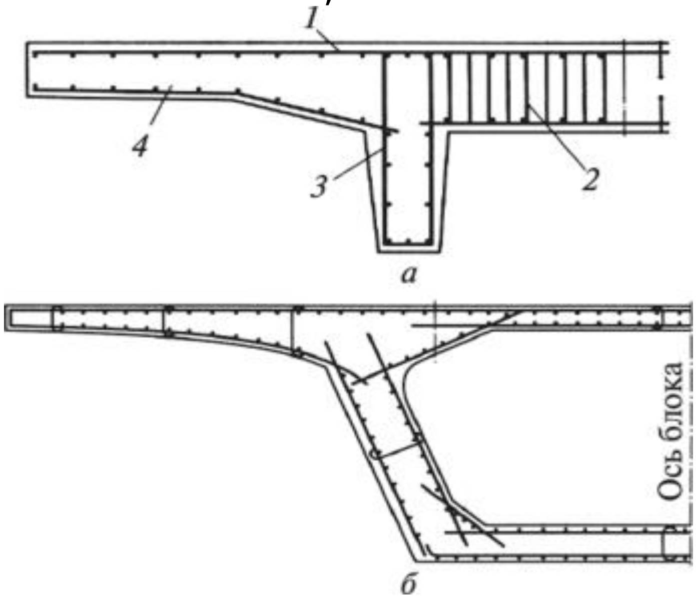

Figure 4. Scheme of reinforcement of plate-rib and box-shaped cross sections with non-stressed reinforcement: 1 - upper reinforcement grid of the carriageway slab; 2 - longitudinal reinforcement and transverse rib yokes; 3 - reinforcement frame of the longitudinal beam; 4 - reinforcement grid of the carriageway console

Prestressed reinforced plate spans are constructed in the same way. The longitudinal reinforcement elements are placed along the entire length of the span from the lower zone of the span above the supports to the upper zone. In long spans, part of the longitudinal reinforcement elements are cut off, and in spans they are bent towards the lower and upper edges.

In slope-spanning structures, transverse reinforcement can be placed in the support zone facing the slope, and in the remaining part perpendicular to the bridge axis.

In intermediate structures supported on single columns in the transverse direction, transverse reinforcement should be concentrated at the location of the greatest negative bending moments.

In curved intermediate structures, lower longitudinal reinforcement can be installed, which is placed along the entire length of the intermediate structures, but more densely along the horizontal plane towards the inner edge.

Prestressed elements can be connected using special joints called “couplers”. A bundle of 19 blades is connected to a domestically developed circular UACO-19 base plate. The UACO-19 base plate has conical holes in the middle for fastening three-piece blade bundles, and the blade bundles are mounted using anchors that are clamped along the contour from left to right. The last anchors have the same structure.

Conclusion

Overpasses monolithic intermediate devices modern bridge construction in the field high strength , reliability and far service the deadline provider important constructive solution is considered . Research shows that this of buildings constructive forms correct choice and optimal reinforcement principles application through downloads effective distribution , deformations prevent to take and construction expenses reduce possible . Monolith intermediate devices , especially complex ones geological and operational under the circumstances his/ her own high efficiency manifestation This in the article seeing issued constructive approaches and reinforcement methods on the pier construction further improvement and design processes scientific based on to strengthen service does .

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