Office of the Superintending Engineer

Design's Circle, (R&B)
No6, Opposite Cricket Club of
India, Bombay - 1
Dated 22-3-61

To
All the Executive Engineers
Of Building and Communication Deptt.,

Sub:- Skew Bridges and C.D.Works-
Instructions for the-

Please find herewith important considerations regarding planning and design and construction of skew bridges and C.D. works for your general guidance. And use.

D.A. 1 Note
(5 copies)

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SKEW BRIDGES AND C.D. WORKS

(I) IMPORTANT CONSIDERATIONS DURING PLANNING

1) The Angle of skew should always be found out with reference to the direction of flow at higher floods and not with reference to the low water levels or post monsoon flow.

2) If the high flood expense is vast with small flood depth, and if the skew angle observed at low floods is upto 10 degree, there is every possibility of the high floods being square to the crossing.
   Under such circumstances, the skew angle should not be considered as a square crossing. The sections of piers and abutments, generally adopted in such designs are normally safe for skew flow upto 10 degree
3) When the flood expense is vast or there exists a spill channel to the main stream under maximum flood conditions, any attempt to the training of the main nalla to avoid the skew is futile. Such a training would not be affective and the trained course would soon be silted up under maximum flood.

   Training of the nalla should only be proposed when the trained course can be a well defined channel to contain the maximum floods within the banks. Intake of the trained course may be aligned tangentially to the curve of the natural nalla course and length of the trained course should be shorter than that of the natural one.

4) Maximum angle of skew for cross-drainage works may be limited to 45 degrees only. If a certain cross drainage work entails angle of skew more than 45 degrees either the nalla may be trained suitably or road alignment changed.
5) Maximum angle of skew for arch culverts any be limited to 20 degrees.
6) For skew culvert or bridge section of a patent parrallel to the road center line may be kept same as that required for square cross drainage work but the top width of the abutment may be increased if necessary, for workable width for masonry section of the pier at right angle to it's center line should be the same as that required for square structure and the length of pier may be such that no portion of deck is supported by cut and ease waters. Sections of wings and returns at right angle to their axis for skew C.D.works may be same as those for square case.

IMPORTANT CONSIDERATIONS DESIGN AND CONSTRUCTION

Solid slab Bridges :-

Measure the distance between the centers of bearings along the center line of the road way. Let this skew span be L feet.

Refer the standard tables for slabs for the design of solid slabs. Provide the thickness of slab, the amount of the main reinforcement and distribution reinforcement as required for a span in this table nearest to L foot span.

Provide the main reinforcement parallel to the center line of the road way.Measure the spacing of bars at right angles to this main reinforcement.

Keep the distribution reinforcement parallel to the supports. Measure the spacing of bars at right angles to this reinforcement.

T-beam and slab bridges:-
For angle of skew less than 20 degrees.
1.Measure the distance between the center of bearings along the center line of the roadway. Let this skew span be L feet.

2.Design the depth of beam the amount of main reinforcement and shear reinforcement, for this span of L feet. Provide the shear reinforcement at right angles to the direction of beam bars.

3.The thickness of the deck slab the amount of main reinforcement and distribution reinforcement , should be the same as for a square slab spacing between the main girders.

4.Place the main reinforcement in the deck parallel to the supports. Measure the requisite spacing of bars in the direction of skew span. If S is the spacing of main bars required for a square slab, the spacing at right angles to the main slab reinforcement will then be S cos θ , where θ is the skew angle.

5. Place the distribution steel in the deck slab, parallel to the roadway. Measure the spacing of the bars in the direction of flow. If S is the spacing of the distribution bars required for a square slab, the spacing at right angles to the distribution will be S x cos θ.

2. T- Beam and slab bridges.

(ii) For angle of skew between 20 degrees and 45 degrees

1. Measure the distance between the center of bearings along the center line of the roadway. Let this skew span be L feet.
2. Design the depth of beam, the amount of main reinforcement and shear reinforcement for this span of L feet, place the shear reinforcement at right angles to the main reinforcement in the beam.
3. The thickness of the deck slab, the amount of the main reinforcement and distribution reinforcement should be the same as for a square slab spanning between the main girders.
4. Keep the main reinforcement in the deck slab, perpendicular to the main beam. Measure the requisite spacing of the bars at right angles to this steel.
5. Keep the distribution reinforcement in the deck slab, parallel to the main beams. Measure the spacing of the bars to this steel.
6. At the acute angles near the ends where the main reinforcement in the deck slab is intercepted by the edges of the slab, it should be anchored in the special cross girders (in replacement of the ordinary end cross girder) to be provided at the end of the deck. This special and cross girder will have the same thickness and reinforcement as for the corresponding ordinary end cross girder but (1) It would be best monolith when end supporting has deck slab. (2) it will extend for the full length of the cantilever deck slab end. (3) it's reinforcement will rise upto below the topmost layer of the beam reinforcement. The slab reinforcement to be anchored into this cross girder will anchor into a length of 50 diameter plus the end hook.

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