



Load Tests of Dongping Bridge in Foshan, China

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Summary

Dongping Bridge in Foshan is a combinatorial bridge of steel box arch and continuous beam with vice-arch, the main span of which is 300 meters. In this paper, the major items of static load tests and layout of measurement point for the bridge are presented. Moreover, evaluate the bridge's static stress behavior by the result of compare the two kinds of loading cases tests.

Keywords: steel bridge; Beam-arch cooperation system; load test.

1. General instruction

Dongping Bridge crossing the Dongping River is located in the south of Chancheng District of Foshan City, Guangdong province. The total span of the Bridge is 578m with a main span of 300m and side combine span of 95.5m. The main bridge is a cooperative-system steel box tied-arch bridge cooperating with prestressed concrete continuous beam. The three parallel arch axis of the main arch rib is funicular curve which net rise span ratio is 1/4.55 and the coefficient of arch axis is 1.1. The overall width of this bridge is 48.6m including 12m sidewalk. The design loads are Truck-Load over 20 and trailer 100 and the design speed is 60Km/h.

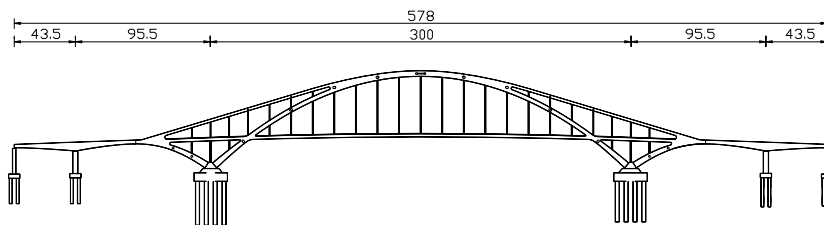


Fig. 1: Elevation drawing of Dongping bridge (unit:m)

2. Main Bridge Static Load Test

The contents of load tests were determined according to the relevant codes promulgated by ministry of communications and Structural characteristic of Dongping Bridge. The contents of load tests including (1) the maximum positive moment of $L/2$ cross section; (2) the maximum positive moment of $L/4$ cross section; (3) the maximum negative moment of arch foot section; (4) Arch beam of light is the biggest moment; (5) Arch-foot arch largest negative moment; (6) Edge-span

continuous beam cross-section bearing the greatest negative moment;(7) Suspenders largest Rally;(8) Is the largest cross-beams in the moment;(9) Column longest maximum pressure;(10) Deck maximum stress.

3. Dynamic Test

Evaluating whether the biggest dynamic strain, stress and deflection meet the requirements of design by measuring the dynamic characteristic of the bridge structure as a whole under the dynamic load, especially the dynamic frequency, flap, acceleration, flap type and so on which the bridge reflect when both the vehicles in all kinds of service condition, and the single heavy vehicles pass through the bridge at different speeds. Meanwhile structure can be analyzed by the structure dynamic model simulation calculation. The test condition including: Even speed of 10km/h, 20km/h, 30km/h, 40km/h, 50km/h; Break test; Impact test.

4. Analysis of the results and conclusions

(1)Analysis of test load : From Table 1, according to Dongping Bridge's structure and material characteristics, multiple test conditions were designed in order to examine the force behavior of the whole structure and local component. Experimental efficiency of various test conditions are ranged from 80% to 95%, and meet the relevant requirements.

(2)Deflection analysis : From Tab. 2, Tab.3 and other test results, the measured deformations are smaller than theoretical deformations under various test conditions of static load test and the residual deflection is little. So we can draw the conclusion that the arch ribs were always in elastic working state during test and showed good strength and stiffness.

(3)Stress Analysis : From Tab.3, Fig. 4 and other stress values gotten from field test, measured stress are slightly less than theoretical stress, besides a small number of measuring points with few stress variation. There are many extra influence of stress (such as temperature, concrete creep, etc.). In strain measurement, how to better avoid the other adverse effect on strain is one of test difficulties.

(4) The result of dynamic test show that Dongping Bridge has large integrated displacement response, so we must pay much attention to maintained the pavement of deck during the service period. Ensure the smoothness of floor to avoid extreme dynamic impacting. And emergency braking must be avoided when automobile is running at high speed.

In summary, loading test proved that under normal load effect the bridge was basically in plastic working state. the stressing state, loading capacity, the structural strength and rigidity of Dongping Bridge meet the requirements of design and related quality inspection and evaluation standards.

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