



SITUATION SKETCH of Bluestone River bridge at time the center span failed during erection.

Probe cause of W. Va. bridge failure

By J. R. Carr

Hinton, W. Va.—Nobody knows or will hazard a guess as to why the Bluestone River bridge failed during erection (ENR, April 7, p. 15), but here's what happened:

Failure occurred when ten panels of the 278-ft. center span of the five span bridge had been cantilevered 231 ft. 8 in. from pier 3 toward pier 2. The riverward end of the extension dropped into the stream leaving the shoreward end hanging precariously, supported by twisted truss members in the first and second panels adjacent to pier 3.

When the sudden failure occurred (five steel erectors were killed and four others injured) the downstream top chord snapped in two at the second panel point from pier 3. The upstream top chord bent, but did not break. This caused the end of the cantilever to drift about 15 ft. upstream as it fell. Workmen reported they heard only a single, sharp popping sound, but it could not be determined if this occurred before or after the actual failure.

The failure came despite attempts to take care of erection stresses by increasing the section of certain main truss members. For example, the ruptured top chord had been increased from a design section of two 13-in. channels at 31.8 lb., and one 22 by ½-in. cover plate, to two 13 in. ship channels at 50 lb. and one 22 by ½-in. cover plate.

At the time of the accident, there were no unusual superimposed loads on the cantilevered trusses, and there was no appreciable wind reported. A conventional guy derrick, weighing approximately seven tons and supported on the roadway stringers at the center of the ninth panel from pier 3 was placing a lightweight three-panel steel erection truss (weighing about five tons) to close the gap between pier 2 and the end of the cantilevered portion.

Erection truss in motion

The derrick had picked up the erection truss and was booming out when the accident occurred. The truss was to be suspended beneath the bottom chord, with one end supported on pier 2 and the other pinned to the last panel point of the main truss. It would have transmitted part of the load of the last three panels, to reduce the cantilever erection stresses.

The second erection truss—for the upstream side—was not on the span at the time of failure.

Located two miles upstream from Bluestone Dam, near this village, Bluestone Bridge is to be a 1,158-ft. riveted five-span cantilever highway bridge as shown in the accompanying sketch. All panel lengths are 23 ft. 2 in. Spans 2 and 4 are anchor spans for spans 1, 3 and 5. They are continuous over, and extend 3 panels beyond their supporting piers to form cantilever arms for supporting a 6-panel suspended span at the ends of

spans 1 and 5 and in the center of span 3.

Span 5 was erected first, on timber and steel bents. It served as an anchor span for span 4 which was erected by cantilevering out from pier 4 to pier 3. Span 4, in turn, was the anchor span for span 3 during its erection. Steel was delivered to the guy derrick by a push car whose track was carried by the two middle roadway stringers; the two outside lines of stringers were not to be erected until it had landed on pier 2.

There was only one hydraulic erection jack in span 3. Located in the fourth top chord panel of the downstream truss, its only purpose was to level the fourth floorbeam when steel erection had reached that point. Two shortened, top chord erection members in span 3 were used to insure keeping the cantilevered trusses high enough to land on pier 2. One of these contained the hydraulic jack. It suffered no visible damage when the span failed.

Removal problem

No decision has been reached regarding removal of the wrecked span. Obviously, the trusses cannot be cut free at their upper ends and permitted to fall against pier 3. Several truss members appear to be undamaged and salvageable, but final decision may be to remove it all as scrap. Bluestone River bridge is being built for the West Virginia State Road Commission, to carry state route 20 over water impounded by Bluestone Dam. The Virginia Bridge Co., holds the contract for erection of the superstructure.