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Proposed load distribution test on Bytown prestressed concrete bridges

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NATIONAL RESEARCH COUNCIL OF CANADA

DIVISION OF BUILDING RESEARCH

No.

186

TECHNICAL NOTE

NOT FOR PUBLICATION

FOR INTERNAL USE

PREPARED BY

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PREPARED FOR

DATE

30th September, 1954

SUBJECT : Proposed Load Distribution Test on
Bytown Prestressed Concrete Bridges

A loading test is proposed on one of the spans of the new Bytown Bridges with the objective of determining experimentally the load distributing effect obtained from the transverse prestressing of the bridge. Permission for the test has kindly been obtained by Mr. J. H. Irvine, Consultant Bridge Engineer, from the Board of Control of the City of Ottawa. Support for the test has also been received from Col. Thompson of the Federal Public Works Department. The test will be carried out by the Division of Building Research of the National Research Council and the Structural Research Department of the Ontario Hydro, who originally suggested this study. An analysis of the results and a preliminary report will be made by the staff of the Structural Research Department of the Ontario Hydro. Eventually a report will be prepared jointly by the two organizations for publication in a technical periodical after approval.

The bridge deck to be tested (north bridge) has a span of 89' and consists of 18 beams, which, placed side by side, form a bridge deck 65 feet wide, as shown in Figure 1. The test will be a relatively simple one and will involve essentially the application of a known load to one beam at a time in each of the three locations shown in Figure 1. Preferably, the test will be done directly on the beams, i.e., before any filler concrete or pavement has been placed on the bridge deck.

After transverse prestressing, the expected minimum deflections under a load equivalent to C.S.A. design live load will only be a fraction of the deflection of the individual beam. Therefore, in order to obtain more indicative deflections, it seems desirable to increase the test load, if this is mutually agreeable. In this respect, the load should be considered in the light of expected deflections, rather than in terms of a multiple of the design live load for the individual beam. An individual 75'-6" beam from the south bridge deflected 1.64 inches before cracking under a test load. During the test it is proposed to limit the

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L. J. Mason

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The bridge deck to be tested (north bridge) has a span of 80' and consists of 18 beams, which, placed side by side, form a bridge deck 6' test wide, as shown in Figure 1. The test will be a relatively simple one and will involve essentially the application of a known load to one beam at a time in each of the three locations shown in Figure 1. Preferably, the test will be done directly on the beams, i.e., before any filler concrete on pavement has been placed on the bridge deck.

After transverse prestressing, the expected minimum deflections under a load equivalent to 0.8 A design live load will only be a fraction of the deflection of the individual beam. Therefore, in order to obtain more indicative deflections, it seems desirable to increase the test load, so that it is actually greater. In this respect, the load should be considered in the light of expected deflections, rather than in terms of a multiple of the design live load for the individual beam. An individual 75'-6" beam from the south bridge deflected 1.0 inches before cracking under a test load. During the test it is proposed to limit the

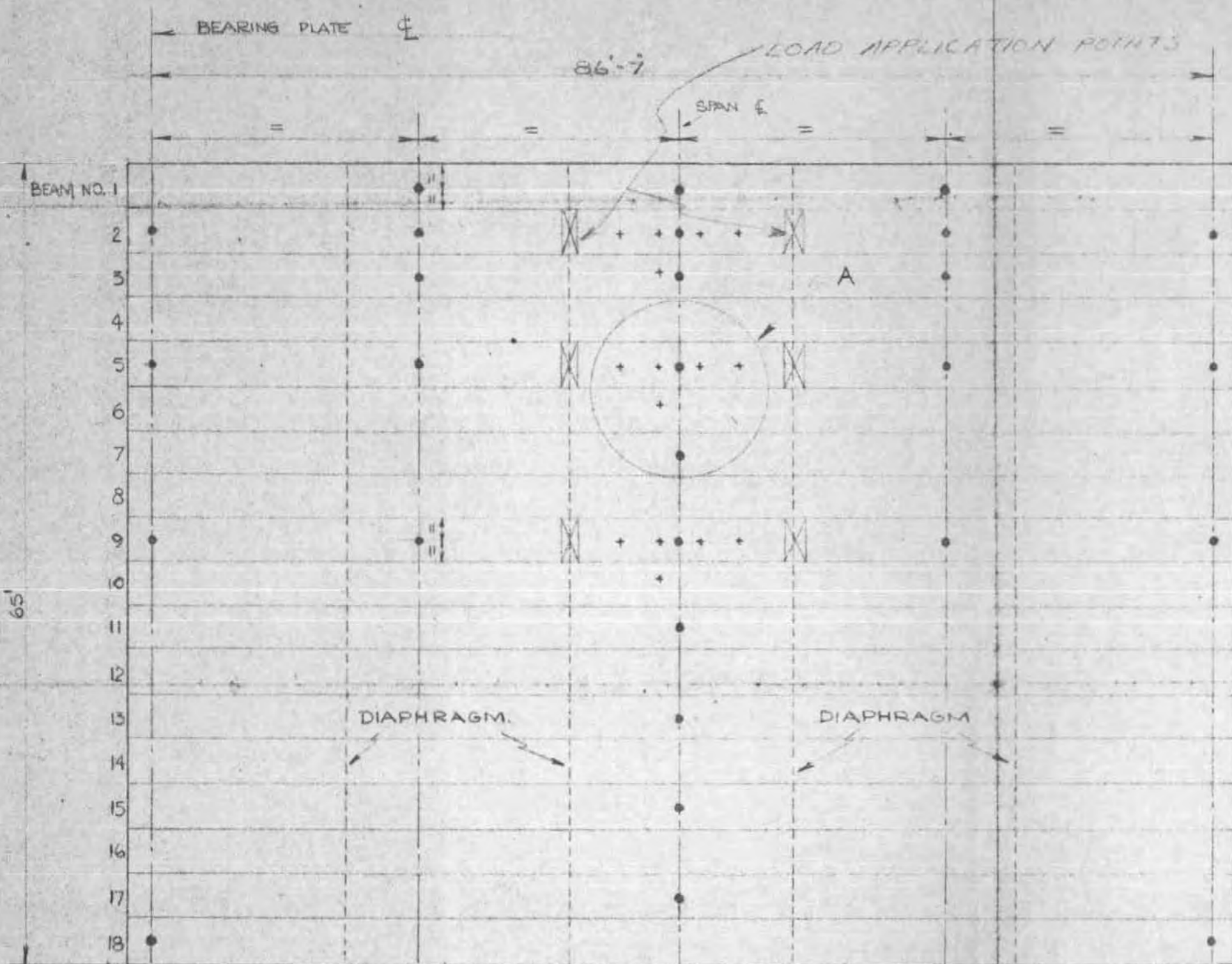
load to one producing a deflection of not more than $1/2$ " or a load equivalent to twice C.S.A. design live load, whichever is the smaller. This is believed to give a sufficient guarantee against cracking.

A large water tank on a platform will be used for applying load. Baffles will be installed in the tank to prevent surging of the water due to any sudden movement. Screw jacks will be used at the corners of the platform to lift it and then lower it on wooden blocks placed at the two desired load application points. The load application points will be over the two centre diaphragms. The load will be applied over the width of one beam (3'-6"). Filling of the tanks will be done from a fire hydrant and emptying by using pumps.

The deflections of the bridge during the test will be measured at the spots shown in Figure 1. In view of the small deflections expected, a high degree of accuracy is required for their measurement. In view of the simplicity of using optical levels and the fact that with a Wild N3 precise level a good accuracy can be obtained (approximately $5/1000$ " in terms of deflection), it was agreed to use this method. Two Wild N3 levels are available for the test. Special pins supplied by Ontario Hydro will be installed in the bridge deck by the Building Research staff. A water tube level supplied by the Hydro will be used to measure inaccessible points, such as under the platform.

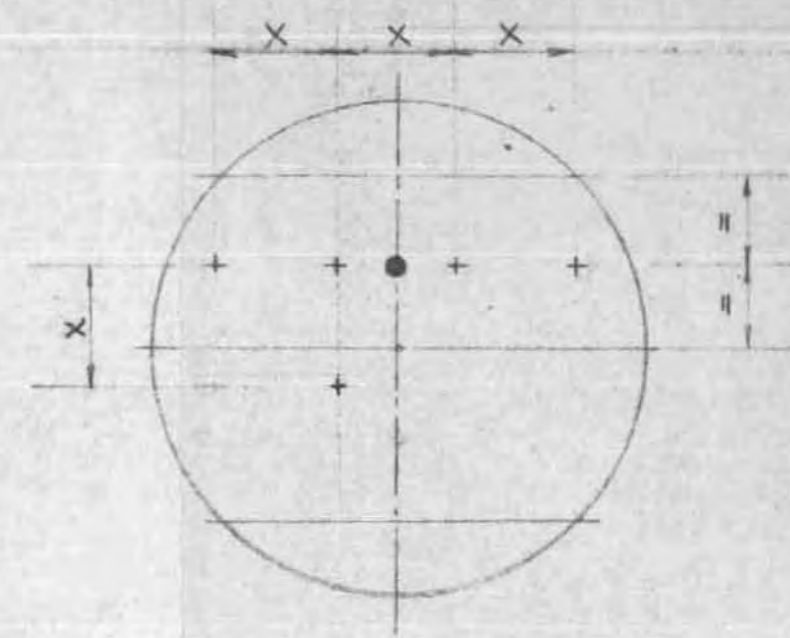
Strain measurements will be taken during the test at positions shown in Figure 1. A 30"Whittemore gauge will be used for strain measurement. To compensate for any dimensional changes in the bridge due to temperature and humidity variations, all deflection and strain gauge points will be read of a week-end, one week prior to the proposed load test.

The test will be done with the least possible inconvenience to the contractor and is therefore planned for a week-end. The tentative date for the test is the week-end of the 9th - 10th of October. In case of rain or other delays the following week-end would be used.



PLAN

- DEFLECTION PINS
- + WHITTEMORE PINS



DETAIL of A

NOTES

- ① DEFLECTION PINS TO PROJECT $\frac{3}{8}$ INCH ABOVE FLANGE
- ② WHITTEMORE PINS TO BE SET FLUSH WITH FLANGE - DISTANCE X OBTAINED USING JIG.
- LOAD APPLICATION POINTS

THE HYDRO-ELECTRIC POWER COMMISSION
OF ONTARIO
RESEARCH DIVISION

SUSSEX STREET BRIDGE
SHOWING LOCATION OF
MEASUREMENT STATIONS

DRAWN P.J.D.	TRACED	CHECKED	APPROVED
DATE	SCALE		
Sept. 10, 1954			

NO.	DATE	REVISIONS	BY	CHK'D	APP'D