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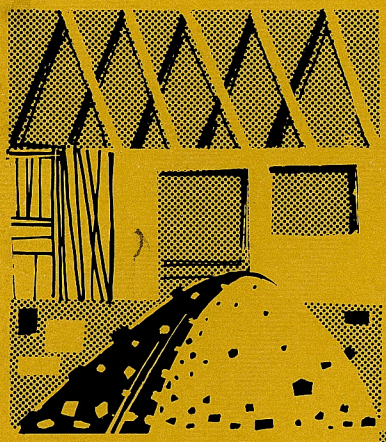

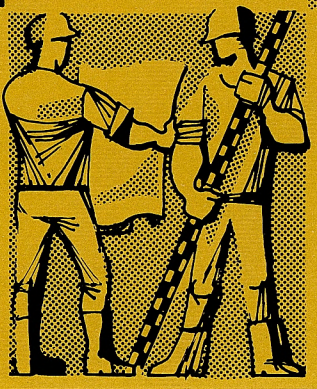

BRIDGE INSPECTION

March 1988

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BRIDGE INSPECTION

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Cette publication peut aussi être obtenue
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Inspection des ponts

BRIDGE INSPECTION

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BRIDGE INSPECTION

1.0 INTRODUCTION

This publication is intended as a guide, and outlines procedures for undertaking bridge inspections. It is intended for band personnel involved in the maintenance of reserve bridges.

The objectives of a bridge inspection are as follows:

a. to ensure the safety of bridge users;

b. to maximize the life of the bridge, ensuring protection of the investment;

c. to confirm regular maintenance activities are being undertaken;

d. to allow a phased renovation and replacement program to be instituted; and

e. to identify, at an early stage, problems which may necessitate a full inspection by a qualified bridge engineer.

The frequency and level of inspection or assessment depend on many factors including the type of construction, age, results of previous inspections, climate, degree of previous maintenance, and the type and amount of traffic.

A bridge inspection involves an examination of all the bridge components. A report is prepared which details their condition and proposes any minor repairs considered necessary. The report should contain photographs and diagrams.

An inspection should be performed every second year until the bridge is four years old, after which an annual inspection is required. Interim inspections should be carried out where the bridge has known deficiencies or is in questionable condition.

2.0 PRE-INSPECTION

Before visiting the site, review the available aerial photographs, layout and detail drawings, specifications and soils information. If these are not available, try to find out the age and history of the bridge. Inspections should be done during low water conditions to allow full access to the underside of the bridge.

Depending on the type of bridge inspected, the following equipment may be required:

- camera and film,
- 20 m tape,
- plumb bob,
- string line,
- hammer,
- scraper,
- knife or spike,
- shovel,
- broom, and
- field books and inspection forms.

3.0 INSPECTION PROCEDURE

On arrival at the site, review the general location, considering the general topography, alignment of road approaches, stream or river condition, nature of the road use and general orientation. Then review the bridge to gain an initial impression of its overall condition.

If an as-constructed general layout is unavailable, prepare a simple sketch layout of the bridge and its surroundings with the following points noted, where applicable:

- a northpoint;
- adjacent road junctions and curves;
- direction to the community;
- bends in the river;
- stream flow direction;
- position of shoals, debris and high water marks; and
- any significant deficiencies that have been observed.

This often helps later to orientate and define details from photographs.

Where possible photographs should be taken of the following:

a. a view upstream and downstream;

b. a view of each approach;

c. a general view of the surface and underside of the deck;

d. a view of each elevation;

e. a general and detailed view of the abutment face, wingwalls, piers, bearings, expansion joints, bridge and approach guiderail and rip rap; and

f. close-ups of problem areas and special features.

Progressively overlapping photographs can be taken to give a panoramic view when joined together. All close-up photographs of details should include an object to give the detail some scale, preferably a tape or ruler.

The bridge report form should be completed before leaving the site, and additional observations may be made on a separate sheet or on the back with the sketch layout. Appendix A shows the bridge report form and Appendix B a completed example.

Observations of the various components or aspects of a bridge are often linked and should not be considered in isolation. For example, damage to the underside of the main beams might be from debris at the spring flood, which could be linked to the limited size of the bridge opening and river upstream. This in turn could be responsible for a high rate of scour of the river bed at the abutment and pier foundations. Consequently continuity of inspection procedures is of greater importance than the specific order in which components are checked.

4.0 METHOD OF CHECKING MATERIALS

The methods of checking various materials apply to all components. A visual inspection is required for all materials. Wood and concrete should be 'sounded' by striking it with a hammer to see if it sounds solid or hollow and defective. Rotten wood will have a dull sound. Wood should also be pried with a knife or spike to see if it is sound.

Special attention should be paid to splits in all timber members and connections between members. These tend to retain moisture and are particularly susceptible where the connections have been field treated or left untreated. A note should be made to indicate which timber has been treated with preservative, pressure treated, or is untreated. Pressure treatment can usually be identified by regular incisor marks over the surface that have allowed penetration of the preservative.

Any concrete that is crazed, cracked or has spalling (that is, the surface has broken away to form a depression in the concrete surface) should be noted accurately by means of photographs and dimensioned sketches. This will enable a comparison to be drawn in future inspections, and thus assess additional deterioration. If this deterioration is severe it will justify calling in a specialist to assess both a temporary weight restriction and the various alternative means of repair or restoration.

All structural steel should be examined for corrosion and cracking, especially at joints, welds, bolts and rivets; and details noted with sketches and photographs. Steel must be clean and well protected with paint.

5.0 APPROACHES

Bridge approaches should be checked for the following:

a. road width including shoulders, ditching and washouts;

b. safe horizontal and vertical alignment;

c. sight lines, including maintenance of the clear-cut area adjacent to the road;

d. warning signs for reduced sight lines and bridge width, load restrictions on the structure and speed limits;

e. guiderail installation, including posts, installation height and end details (flare or buried if applicable, or a breakaway cable terminal assembly); and

f. all bolts should be present and tight, and joint laps in the correct direction.

6.0 DECKS

There is a great variety of deck constructions. All decks should be kept clear of gravel and dirt to prevent moisture from being retained, which could cause the deck to deteriorate, particularly if it is made of wood. This problem is most serious with gravel approach roads, because the gravel migrates onto the deck and eventually forms a thick compacted layer. This blocks drainage holes, causing the deck to be continually moist, and increases the dead load on the bridge, possibly causing severe overloading.

Expansion joints are also prone to blockage by dirt and gravel and should be protected by a cover plate. Open expansion joints and drainage holes require regular clearing and should be checked from above and below the deck.

All dirt and debris should be removed from the deck to allow a full examination of its condition. At times it may be necessary to remove portions of asphalt surfacing where it appears cracked or damaged to check the condition of the deck underneath. Checking the condition of the deck material is discussed in 4.0.

An examination of the underside of the deck may also reveal leakage problems that will betray defects not necessarily evident on the deck surface. It may be necessary to gain access with a boat. If this is not immediately possible, assess the condition from the overall state of the structure. If the general condition is poor, a detailed inspection should be undertaken as soon as possible.

7.0 SUPERSTRUCTURE

The main beams should be checked for horizontal alignment and vertical deflection or uplift due to frost heave in the foundations.

Condition checks for materials are discussed in 4.0.

Particular attention should be paid to the condition of bearing surfaces to ensure they are clean and that the bearings operate correctly. Main beams must be checked at points of maximum stress -- at mid-span and at supports. They should also be examined for cracks and splits. Outer timber beams tend to weather and split, weakening the member and allowing decay. Damage can be caused by debris striking the stringers during high water conditions.

8.0 ABUTMENTS AND PIERS

All faces and sides should be vertical, or conform to the drawing. Any deterioration or damage must be noted by means of sketches or photographs to enable an assessment to be made of any future changes. Points of maximum stress under bearings must be checked for cracking. Particular note must be taken of the condition at the water line and down to river bed level, where deterioration can take place undetected. In addition, the condition of the river bed with regard to scour, and embankment protection, rip-rap etc., should be assessed. Any accumulation of debris should be noted and removed as soon as possible. Any damage from debris or ice should be noted and, if significant, repairs recommended. Drainage holes should be checked to confirm that they are clear and operating.

9.0 BRIDGE REPORT

The final report should include a completed form, photographs, sketches and copies of drawings, if possible. This will enable recommendations to be substantiated and can be used at the next inspection to show that further deterioration has occurred. It can also be used to confirm that any remedial work suggested has been undertaken. In extreme cases of deterioration it will verify the need for a bridge closure or weight restriction. Polaroid photographs are best as they provide an instant record. In these circumstances, directly inform the band council and the regional director of engineering and architecture in writing of the severity of the deterioration of the bridge, and suggest a course of action, with a time frame. For example, immediate closure to all traffic by blocking both approaches, and inspection by a qualified professional to produce estimates for alternative methods of repair and restoration.

10.0 REFERENCES

US Department of Transportation. Federal Highway Administration. 1979. Bridge Inspector's Training Manual 70. Obtainable from US Government Printing Office Washington, DC 20402.

American Association of State Highway and Transportation Officials. 1974. Manual for Maintenance Inspection of Bridges. Obtainable from 341 National Press Building Washington, DC 20004.

Transportation Research Board. 1985. Detecting Defects and Deterioration in Highway Structures. National Cooperative Highway Research Program 118. Obtainable from National Research Council, 2101 Constitution Ave., NW, Washington DC 20418.

Washington State University. 1975. The Timber Bridge Inspection Program in Washington State by Denis McGee. Obtainable from US Department of Transportation, Federal Highway Administration, Washington Division, Olympia, Washington, DC.

If any difficulties are encountered in obtaining copies of these publications, assistance can be provided from the Transportation Division of Technical Services and Contracts Branch at headquarters.

Appendix A

BRIDGE REPORT

REGION: DATE:

LOCATION: RESERVE:

CROSSING: RIVER:

OVERALL LENGTH: NO. OF SPANS:

SPAN LENGTHS:

CLEAR WIDTH:

DRAWINGS BY: DATED:

LOADING:

TYPE OF CONSTRUCTION:

DECK:

SUPERSTRUCTURE:

ABUTMENT:

PIERS:

GUIDERAIL - BRIDGE:

APPROACH:

WATER CLEARANCE: TERRAIN:

APPROACH ROAD WIDTH: SURFACE:

SIGNING:

OBSERVATIONS:

RECOMMENDATIONS:

Appendix B

EXAMPLE OF A COMPLETED BRIDGE REPORT

REGION: Anywhere DATE: 1st July 1986
LOCATION: Seagull RESERVE: North Bridge
CROSSING: Duck
OVERALL LENGTH: 30.2 m NO. OF SPANS: 4
SPAN LENGTHS: 7.55 m x 4
CLEAR WIDTH: 7.3 m
DRAWINGS BY: Consulting Engineering Ltd. DATED: 1981
LOADING: H15-44
TYPE OF CONSTRUCTION:

DECK:	Laminated Wood - Asphalt Surfacing
SUPERSTRUCTURE:	Wood Beam (200 mm x 380 mm)
ABUTMENT:	Timber Pile/Plank
PIERS:	Steel 'H' Piles/Timber Cross Beam
GUIDERAIL - BRIDGE:	Flex Beam 'W' - Wood Post
APPROACH:	None

WATER CLEARANCE: 2.2 m TERRAIN: Flat
APPROACH ROAD WIDTH: 7.3 m - 5.0 m SURFACE: Gravel
SIGNING: None

OBSERVATIONS:

There is gravel on the deck, and potholes on both approaches immediately before the deck. Minor cracks were observed in the surfacing.

Two lengths of Flex Beam have been detached from 4 posts at the NE corner.

The drawings were dated '81 and the steel substructure and underside of the deck looked modern. However, the main beams and cross beams appeared to have been used previously. Old bolts could be seen in the beams.

No approach rail.

RECOMMENDATIONS:

Secure Flex Beam to posts. Clean gravel off deck and inspect deck surface. Repair if necessary. Regrade to fill potholes and clear vegetation at edges of road. Erect approach barrier.

Within two years inspect the bridge fully with particular attention to the main beams and crossbeams; assess the load capacity and provide appropriate load limit signs.