

Evaluation of Concrete Turnout Ties and Bridge Ties

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ABSTRACT

Canadian National Railways now have roughly 2-1/2 million concrete ties installed in track, and are currently evaluating the merits of concrete turnout ties and concrete bridge ties. Field measurements have clearly demonstrated that impact loading from wheel tread defects presents the greatest obstacle to more economical concrete tie design. The concrete tie being a designed element, is eminently suited for performance evaluation through strain gauge measurements. Similar measurements have not been taken on wood ties, and they have simply been replaced when they split, rotted, became severely plate cut, or spike killed. It is believed that the loading which can cause distress in concrete ties has for years been also causing distress on wood tie track. It is suggested that A.A.R. Interchange Rule No. 41, Section A, Cause for Wheel Renewal, be amended by including wheel loading exception limits. It is also suggested that a train full of non-condemnable wheel tread defects be run on the FAST track to establish the costs associated with accelerated rates of track degradation.

INTRODUCTION

This report is divided into four sections:

1. Concrete turnout ties
2. Concrete bridge ties
3. North American Wheel/Rail Loading
4. General Conclusions

Before getting into details, I would like to give you a brief history of concrete track ties on Canadian National Railways. The first records we have found date back to 1922, and during the 1920's a number of small test installations of concrete ties were made in the Lakehead area. Some of these ties failed rather quickly, while other small pockets of ties remained in track until 1941. In the fall of 1961, 1000 French type RS two-block concrete ties and 800 A.A.R. Type E or MR ties, also known as AREA Mark I, were installed on the Drummondville Subdivision in Quebec. From 1965 to 1967, a number of small test installations of British Rail Type F-23 and F-27 ties, Swedish Type 101 ties, French Type RS, and Canadian-made Types A, B, and C were installed at various locations. From these test installations, it became apparent that the British Rail Type F-23 concrete tie with Pandrol rail stenting system provided the most maintenance-free track structure, and in 1972, CN installed roughly 10,000 Costain U.K. Type F-23 ties modified slightly for Canadian conditions, on a 4-mile section of track west of Jasper, Alberta. In 1973, an order was placed for 300,000 CN60A concrete ties, and this was followed in 1975 by a separate order for 1.5 million concrete ties. In 1981, the CN60A tie design was refined into the CN60B. CN now has roughly 5 million concrete track ties installed in British Columbia and northern Ontario. Current standards state that concrete ties should be considered on inline track curves 2° and over, and on tangents up to one mile in length between such curves, where annual tonnage exceeds 20 MGT, and where a significant portion of traffic is carried in 100-ton cars.