



**MANUAL FOR SEISMIC
SCREENING OF BRIDGES
Revision 2**

SM110

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Document Status

This document has the status of a mandatory guideline as defined in Transit New Zealand's (1993) *Standards, Criteria and Guidelines Manual*.

The objectives of the manual are to set out Transit New Zealand's State Highway Management Division's policies and procedures for the quality management of projects.

The content is based on Transit New Zealand's current practices and those developed in the past from experience in managing the State Highways.

While all care has been taken in compiling this document, the Authority accepts no responsibility for failure in any way related to the application of this guide or any reference documents noted in it.

Amendment 4 – October 2000

This amendment comprises:

- *Appendix D*: Modified maps to specify the revised values of the Zone Factor Z in the south of the South Island. Page D3 added.

Sheet for insertion in the Transit New Zealand "Manual for Seismic Screening of Bridges, Revision 2", after the "Record of Amendments" sheet.

Amendment 3 – December 1999

This amendment comprises:

- *Clause A.1.1 (i)*: Modifications that relate to the increase in Z values above 1.2, specified in Appendix D
- *Page C3*: Modifications to take account of the issue of the spreadsheet “risk&rankp (Amdt 2, Supplement 1, Oct 99).xls”, which provides a facility for calculating and entering the value of the Economic Ranking Indicator (ERI) into the spreadsheet.
- *Appendix D*: Modified maps to specify the revised values of the Zone Factor Z. Pages D1 and D2 replace the single map “Figure 5.3: Zone Factor, Z”.

Sheet for insertion in the Transit New Zealand “Manual for Seismic Screening of Bridges, Revision 2”, after the “Record of Amendments” sheet.

Amendment 2 – August 1999

This amendment comprises:

- *Page 7:* Minor modifications to recognise the increase in Z values above 1.2
- *Page 18:* A revised version of Figure 4, which shows the revised relationship between likely damage and MMI values. The range of Z values has also been increased to cater for increases in the perceived seismic hazard in some areas, and the delineation of boundaries between the grades of likelihood has been altered.
- *Page 19:* Consequential changes resulting from the revision of Figure 4.
- *Page 23:* Table 5 has been extended to cater for the increased range of Z values.
- *Page 28:* Typographical correction to the column headings in columns J, K and L.
- *Appendix B:* Form 2 - The first bullet point has been modified to take account of the increase in the perceived seismic hazard in some areas. The wording of the ninth condition of the third bullet point has been modified to clarify its intention.
- *Appendix D:* This map will be revised as soon as revised curves are obtained from IGNS. In particular the screening of Region 10 should not proceed using the curves currently shown in Appendix D, and the screening of Regions 11 and 12 should be based on the revised curves derived from the report CRC U99/18.

Sheet for insertion in the Transit New Zealand “Manual for Seismic Screening of Bridges, Revision 2”, after the “Record of Amendments” sheet.

Preface

The effective operation of bridges is a key feature in the safe and efficient functioning of the state highway network.

As road agencies in Japan and the United States in particular have found in recent years, it is vital to have confidence in the integrity of bridging systems in the event of major natural disasters such as earthquakes. Agencies like Transit New Zealand (Transit) have a responsibility to ensure that structures do not represent an excessive risk to the public and can be returned to service as quickly as possible after emergencies. This fact is no less so in New Zealand where the risks and probability of earthquakes are comparable to those countries.

Transit has initiated a review of the earthquake resistance of all its bridges and large culverts to identify those that may not perform satisfactorily during earthquakes. Two major structures, the Thorndon Overbridge in Wellington and the Auckland Harbour Bridge have already been assessed and the work on the first of these is almost complete. It is now proposed to review the rest of the structures on the network in a systematic way, screening out the less important ones so that close attention will be given to those at greatest risk.

This Seismic Screening Manual has been developed specifically for that review of bridges on the state highway network. It was developed for Transit New Zealand by Opus International Consultants in collaboration with Apex Project Management, Phillips and Wood and Beca Carter Hollings and Ferner. It sets out a process for screening the bridge stock and producing a priority list of those structures justifying detailed assessment. Those processes will lead ultimately to design and retrofitting of structures following normal funding processes.

A good deal of work has been put into the development of this manual. Application of the processes outlined in it will provide the essential consistency needed for the screening of our bridges. As we move through into the retrofitting work it will give us confidence that the network of state highway bridges will in the future be able to cope with the magnitude of earthquakes we can expect in New Zealand.



R J Dunlop
General Manager

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