

APPENDIX B

Forms:

- **Form 1 – Bridge Data Part 1**
- **Form 1 – Bridge Data Part 2**
- **Form 2 – Can Bridge be Excluded from Further screening?**
- **Form 3 – Record Relating to Settlement Slabs and Interspan Connections**
- **Form 4 – Seismic Attributes Grading System Grading Sheet**
- **Form 5 – Risk Register**
- **Sample of Form for Recording Information Collected During a Site Visit**

NOTE: Electronic versions of these forms are available on diskette in word processing format (Forms 1, 2, 3, 5 and the site visit record) and spreadsheet format (Form 4)

**SEISMIC SCREENING OF BRIDGES: FORM 1 OF 5
BRIDGE DATA (PART 1)**

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

Source of information (state identification numbers of files/drawings/site investigation reports)

Year designed

Number of spans

Span lengths between pier centrelines (metres)

Total length of superstructure (metres) (see A.1.3 (iv) for definition)

Are all superstructure elements continuous or interconnected? (see 3.3.2) (Yes/No)

How many *in-span* movement joints in deck (i.e. other than at piers or abutments)

For span(s) tightly inter-linked to adjacent span(s) and/or abutment(s) :
is end overlap at any support less than 200mm? (Yes/No/N.A.)

For span(s) with an end secured only by holding down bolts:
is end overlap less than 300mm? (Yes/No/N.A.)

For span(s) non-tightly interlinked to adjacent span(s) and/or abutment(s):
is end overlap at any support less than 400mm? (Yes/No/N.A.)

Overall width of structural deck slab including integral kerbs (metres)

Skew angle (degrees) at each abutment

Maximum pier height (top of foundation to soffit of superstructure) (metres)

Pier type(s) present - slab on spread footing? (Yes/No/N.A.)

- multi column, or slab on piles? (Yes/No/N.A.)

- single column? (Yes/No/N.A.)

Abutment type (A.1.3.(vii)) - monolithic/tightly connected? (Yes/No)

Soil condition (A.1.1.(iii)) (Flexible/Intermediate/Rock or Very Stiff/Don't know)

Are foundations subject to liquefaction effects? (A.1.1 (iv))
(High risk/Medium risk/Low risk/Don't know)

Do drawings show approach settlement/relieving slabs? (Yes/No)

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**SEISMIC SCREENING OF BRIDGES: FORM 1 OF 5
BRIDGE DATA (PART 2)**

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

Annual average daily traffic (AADT) count using bridge (v.p.d.) (see A.1.2(i) for definition)

Estimated percentage of AADT due to local traffic

Annual average daily traffic (AADT) count under bridge (see A.1.2(iii)) (v.p.d.)

Detour length (d_1) (km)

Normal route length between detour connection points (d_0) (km)

Extra distance travelled (EDT) ($d_1 - d_0$) (km)

If local traffic is significantly more affected by detour than non-local traffic (see A.1.2(ii)) :

Extra distance travelled by non-local traffic (km)

Extra distance travelled by local traffic (km)

Assessed journey speed of traffic over normal route between detour connection points (v_0) (km/hr)

Assessed journey speed of traffic on detour, with diverted traffic (v_1) (km/hr)

Nature and description of identified likely bottlenecks (e.g. one lane bridge) on detour
.....

Route type on bridge (note State Highway number if applicable; state if motorway)

Facility crossed: residential, operational (large gatherings),
(See A.1.2(iv)) commercial or industrial? (Yes/No)

parking/storage? (Yes/No)

other? (Yes/No)

railway? (Yes/No)

Does bridge carry: water, sewage, or gas in pipes of 100 mm diameter or more? (Yes/No)

Remaining service life (>50yrs; 25-50 yrs; <25yrs)

Seismic zone factor for site (Z) (Appendix D)

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SEISMIC SCREENING OF BRIDGES: FORM 2 OF 5
CAN BRIDGE BE EXCLUDED FROM FURTHER SCREENING?

(Refer to Section 3.3 for definition of terminology)

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

Note: A "yes" conclusion from any one of the three bullet points means the bridge can be excluded.

- Was bridge designed after 1972 *and* is it in an area with a Zone Factor (Z) of less than 1.8?
If so, exclude from the ranking procedure (Yes/No)

 - Is bridge a single span with either monolithic abutments (see A.1.3 (vii)) or with a superstructure overlap rating of 0 when rated in accordance with Section A.1.3 (iii) of the seismic attributes grading system (see Appendix A)?
If so, exclude from the ranking procedure (Yes/No)

 - Is bridge of multi spans with "yes" as an answer to *all* the following questions:
 - is bridge of three spans or fewer?
 - are spans structurally continuous or connected with tight linkage bolts?
 - is overall bridge length-to-deck width ratio 8 or less?
 - is the skew angle less than 15 degrees?
 - is the span arrangement reasonably balanced, with no span exceeding 30 metres?
 - are all the piers of multi-column or slab form?
 - are all the piers less than 7 metres high from the top of the foundation to the soffit of the superstructure?
 - does the bridge superstructure have monolithic abutments (see A.1.3 (vii)) or a superstructure overlap rating of 0 when rated in accordance with Section A.1.3 (iii) of the seismic attributes grading system (see Appendix A)?
 - are the foundations and abutments founded with little overall likelihood of failure in the event of soil liquefaction or instability?
 - is the bridge without unusual structural features (e.g. hinged pier bases or inclined piers) that may justify inclusion in the ranking procedures?
- If so, exclude from the ranking procedure* (Yes/No)

CONCLUSION: Can the bridge be excluded from the ranking procedure? (Yes/No)

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SEISMIC SCREENING OF BRIDGES: FORM 3 OF 5

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

- DO THE BRIDGE ABUTMENTS INCLUDE APPROACH SETTLEMENT SLABS?

If YES:

Confirm here

If NO:

Confirm here

Further consideration is required to decide whether approach settlement slabs should be installed as retrofit.

- DOES THE BRIDGE LACK CONNECTIONS BETWEEN SUPERSTRUCTURE ELEMENTS?
(See Section 3.3.2 for definition)

If YES:

What is the annual average daily traffic count using the bridge?

How many heavy vehicles use the bridge? (Figure 3, Appendix E)

What is the seismic Zone Factor (Z) applicable to the bridge site?

If NO:

Confirm here

Prepared by: Date

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SEISMIC SCREENING OF BRIDGES: FORM 4 OF 5
SEISMIC ATTRIBUTES GRADING SYSTEM
GRADING SHEET

(Refer to Appendix A for derivation of Rating values)

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

	Rating		Weighting		Weighted Rating
Hazard Index					
<i>Peak Ground Acceleration</i> Rating	x	0.40	=	.....
<i>Remaining Service Life</i> Rating	x	0.30	=	.....
<i>Soil Condition</i> Rating	x	0.15	=	.....
<i>Risk of Liquefaction</i> Rating	x	0.15	=	.....
Total = Hazard Index					.....

Importance Index					
<i>AADT on Bridge</i> Rating (.....) x <i>Detour Effect</i> Rating (.....)	.....	x	0.50	=	.....
<i>AADT under Bridge</i> Rating	.....	x	0.10	=	.....
<i>Facility Crossed</i> Rating	.....	x	0.15	=	.....
<i>Strategic Importance</i> Rating	.....	x	0.15	=	.....
<i>Critical Utility</i> Rating	.....	x	0.10	=	.....
Total = Importance Index					.....

Vulnerability Index					
<i>Year Designed</i> Rating	.....	x	0.25	=	.....
<i>Superstructure Hinges</i> Rating	.....	x	0.08	=	.....
<i>Superstructure Overlap</i> Rating	.....	x	0.10	=	.....
<i>Superstructure Length</i> Rating	.....	x	0.12	=	.....
<i>Pier Type</i> Rating	.....	x	0.15	=	.....
<i>Skew</i> Rating	.....	x	0.05	=	.....
<i>Abutment Type</i> Rating	.....	x	0.10	=	.....
<i>Other Feature</i> Rating	.....	x	0.15	=	.....
Total = Vulnerability Index					.....

Seismic Attributes Grade = Hazard Index x Importance Index x Vulnerability Index

=

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SEISMIC SCREENING OF BRIDGES - FORM 5 OF 5 RISK REGISTER

BRIDGE AUTHORITY/REGION Transit New Zealand Region 9
 HIGHWAY SH1 ROUTE POSITION 915/6.71
 BRIDGE NAME Otaki River Bridge

ITEM/ACTION	VALUE	or	DESCRIPTION/NOTES
Risk event/Page number for this bridge	1	of	2
Seismic zone factor Z for this bridge	1.2		
Description of risk event and consequences <i>Refer 3.9.3.3</i>	Intermediate deck movement joints – linkage bolts stretch with exceedance of 150 mm support length at one or more joints.		
Peak Ground Acceleration (PGA) to cause this risk event – <i>Refer 3.9.3.4(b)</i> g	>0.4		
Likelihood (highlight one) <i>Refer 3.9.3.4(b) (and Table 4 for key)</i>	E D C B A		
Number of days D to reinstate the bridge to the existing traffic capacity <i>Refer 3.10.2</i>	180		Required only for a risk event with an unacceptable level of risk – <i>Refer 3.10.1</i>
Number of days D' the detour will be in use before the existing crossing is repaired or a temporary crossing is opened. <i>Refer 3.10.2</i>	14		
Journey speed of traffic v_2 over the normal route, with a temporary crossing or a reduced level of service (km/hr). <i>Refer 3.10.2</i>	60		Required only for a risk event with an unacceptable level of risk – <i>Refer 3.10.1</i>
D' x AADT x EDT <i>Refer Table 3</i>	16632000		
Consequence class) highlight one <i>Refer 3.9.3.4 (c)</i>) per table	Table 2	1 2 3 4 5	
	Table 3	1 2 3 4 5	
Level of risk category (highlight one) <i>Refer 3.9.3.4 (d)</i>	L M S H		
Assess treatment options? (highlight one) <i>Refer 3.9.3.5 (Risk L, M – No; S, H – Yes)</i>	No/Yes		
Risk treatment options) describe, and state <i>Refer 3.9.3.6</i>) ROC	Install seat extenders beneath beam soffits – relatively easy, with good access; ROC \$25,000		
Rank of risk event for further analysis <i>Refer 3.11.2</i>	1		
Reasons for risk event rank where appropriate – <i>Refer 3.11.2</i>			
Safety – possible loss of span support.			
General comments:			

Use additional sheets as required and note references to supporting information

Prepared by: Date
 (Bridge Specialist)

Verified by: Date

SEISMIC SCREENING OF BRIDGES - FORM 5 OF 5 RISK REGISTER

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

ITEM/ACTION	VALUE	or	DESCRIPTION/NOTES
Risk event/Page number for this bridge	of		
Seismic zone factor Z for this bridge			
Description of risk event and consequences <i>Refer 3.9.3.3</i>			
Peak Ground Acceleration (PGA) to cause this risk event – <i>Refer 3.9.3.4(b)</i>	g		
Likelihood (highlight one) <i>Refer 3.9.3.4(b) (and Table 4 for key)</i>	E D C B A		
Number of days D to reinstate the bridge to the existing traffic capacity <i>Refer 3.10.2</i>			Required only for a risk event with an unacceptable level of risk – <i>Refer 3.10.1</i>
Number of days D' the detour will be in use before the existing crossing is repaired or a temporary crossing is opened. <i>Refer 3.10.2</i>			
Journey speed of traffic v_2 over the normal route, with a temporary crossing or a reduced level of service (km/hr). <i>Refer 3.10.2</i>			Required only for a risk event with an unacceptable level of risk – <i>Refer 3.10.1</i>
D' x AADT x EDT <i>Refer Table 3</i>			
Consequence class) highlight one <i>Refer 3.9.3.4 (c)</i>) per table	Table 2	1 2 3 4 5	
	Table 3	1 2 3 4 5	
Level of risk category (highlight one) <i>Refer 3.9.3.4 (d)</i>	L M S H		
Assess treatment options? (highlight one) <i>Refer 3.9.3.5 (Risk L, M – No; S, H – Yes)</i>	No/Yes		
Risk treatment options) describe, and state <i>Refer 3.9.3.6</i>) ROC			
Rank of risk event for further analysis <i>Refer 3.11.2</i>			
Reasons for risk event rank where appropriate – <i>Refer 3.11.2</i>			
General comments:			

Use additional sheets as required and note references to supporting information

Prepared by: Date

(Bridge Specialist)

Verified by: Date

**SEISMIC SCREENING OF BRIDGES
RECORD OF OBSERVATIONS MADE DURING SITE VISIT**

BRIDGE AUTHORITY/REGION

HIGHWAY ROUTE POSITION

BRIDGE NAME

• Date of site visit

• All known drawings that illustrate the bridge

• Do the drawings fully illustrate the bridge? (Yes/No)

If "No", what features, including services, are there that vary from the drawings?

- Feature:

Location:

Photographs taken (identifier, direction of view etc.):

Sketches made (attach):

• Are there any features of the structure that appear as possibly representing particular seismic vulnerabilities? (Yes/No)

If "Yes" what are the features?

- Feature:

Location:

Photographs taken (identifier, direction of view etc.):

Sketches made (attach):

- Feature:

Location:

Photographs taken (identifier, direction of view etc.):

Sketches made (attach):

- Feature:

Location:

Photographs taken (identifier, direction of view etc.):

Sketches made (attach):

SITE VISITED AND REPORT PREPARED BY:

DATE