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Table IEP-1 Initial Evalulation Procedure Step 1

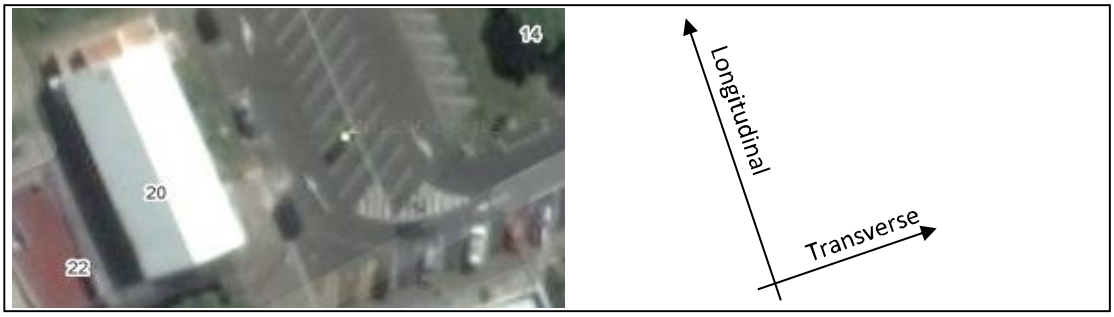
As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name:	**Porirua Little Theatre**	**Ref.:**	**17343**
Location:	**Whitehouse Road, Titahi Bay**	**By:**	**RRM**
		Date:	**24 May 2013**

Step 1- General Information

1.1 Photos

1.2 Sketch Plan



1.3 List of relevant features

The structure is a light timber framed commercial shed type building, we understand it was built during the 1940s for use by United States servicemen. The building has a gable roof framed in bolted timber trusses at 3 metre centres, on timber stud wall framing, on a timber framed floor structure with concrete foundation walls around the perimeter. Some portal frame action is developed in the the trusses to provide lateral bracing of the building, by means of timber knee struts connecting the first web-to-bottom-chord joint of each truss to a point part-way up the supporting wall studs of each truss. There are some small rooms at each end of the building ,but the majority of the interior is a large auditorium and stage with no internal walls. The overall plan dimensions of the building are 30m x 12m and the stud height of the side walls is 3.4 metres. The roofing is corrugated iron and the wall cladding is timber weatherboards.

1.4 Note information sources

Visual Inspection of Exterior	☑
Visual Inspection of Interior	☑
Drawings	☐
Specifications	☐
Geotechnical Reports	☐
Other	☐

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NOTE: THIS ASSESSMENT IS BASED ON BUILDING IN GOOD CONDITION.
The building has significant water damage and rotten timber in main structure, this is not taken into account in this assessment.

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Table IEP-2 Initial Evalulation Procedure Step 2

As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name:	**Porirua Little Theatre**	**Ref.:**	**17343**
Location:	**Whitehouse Road, Titahi Bay**	**By:**	**RRM**
Direction Considered:	**Longitudinal and Transverse**		
		Date:	**24 May 2013**

Step 1- Determine of $(\%NBS)_b$-

2.1 Determine generic(%NBS)=(%NBS)gen

a) Code

Pre- 1935			
1935-1965	**&**		**YES**
1965-1976	**Seismic Zone:**	**A**	
		B	
		C	
1976-1992	**Seismic Zone:**	**A**	
		B	
		C	
1992-2004			

b) Soil Type

from NZS1170.5:2004, Cl3.1.3	**A or B Rock**	
	C Shallow Soil	
	D Soft Soil	**Yes**
	E Very Soft Soil	
from NZS4203:1992, Cl 4.6.2.2, Cl3.1.3	**a) Rigid**	
	b) Intermediate	

c) Estimated Period, *T* **<0.4s**

d) $\%(NBS)_{nom}$ determined from Figure 3.3 **2.77**

Note 1:	For buildings designed prior to 1965 and known to be designed as public buildings in accordance with the code of the time, multiply $(\%NBS)_{nom}$ by 1.25. For buildings designed 1965-1976 and known to be designed as public buildings in acocordance with the code of the time, multiply $(\%NBS)_{nom}$ by- 1.33- Zone A, 1.2- Zone B.	**1.25**		Site originally hosted a hospital, and then a school, both building types would be required to be built as public buildings
Note 2:	For reinforced concrete buildings designed between 1976-84 multiply (%NBS)nom by 1.2	**1**		
Note 3:	For URM Buidlings designed prior to 1935 multiply $(\%NBS)_{nom}$ by 0.8 except for Wellington where the factor may be taken as 1.	**1**	**3.4625**	(%NBS)nom if revised by notes 1, 2 or 3

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Longitudinal Direction

2.2 NZS4203:1992 Zone Factor For Site
if T £ 1.5sec, Factor A=1

a) Near Fault Factor, N(T,D) 1.00
(from NZS1170.5:2004, Cl 3.1.6)

b) Near Fault Scaling Factor = **1/N(T,D)** 1.00 **Factor A**

2.3 Hazard Fault Scaling Factor, Factor B

a) Hazard Factor, *Z, for site*
(from NZS1170.5:2004, table 3.3) 0.4

b) Hazard Scaling Factor
For pre 1992 = 1/Z
For 1992 onwards = Z_{1992}/Z
(Where Z1992 is the Zone actor from NZS4203:1992, figure 4.5(b) 2.50 **Factor B**

2.4 Risk Period Scaling Factor, Factor C

a) Building Importance Level 3
(from NZS1170.0:2004, table 3.1 and 3.2)

b) Return Period Scaling Factor from accompanying Table 3.1 0.8 **Factor C**
(from NZS4203:1992, Table 4.6.4)

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ 2
(shall be less than maximum given in accompanying Table 3.2)

b) Ductility Scaling Factor
For pre 1976 = k_μ 1.57
For 1976 onwards = 1
(Where k_μ is NZS1170.5:2004 Ductility Factor, from accompanying Table 4.3)) 1.57 **Factor D**

2.6 Structural Performance Scaling Factor, Factor E

a) Structural Performance Factor, Sp 0.7
from accompanying Figure 3.4

b) Structural Performance Scaling Factor = $1/S_p$ 1.43 **Factor E**

2.7 Longitudinal Baseline (% NBS)$_b$ 16
(equals (%NBS)$_{nom}$ x A x B x C x D x E)

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Transverse Direction

2.2 NZS4203:1992 Zone Factor For Site
if T £ 1.5sec, Factor A=1

a) Near Fault Factor, N(T,D) — **1.00**
(from NZS1170.5:2004, Cl 3.1.6)

b) Near Fault Scaling Factor = **1/N(T,D)** — **1.00** **Factor A**

2.3 Hazard Fault Scaling Factor, Factor B

a) Hazard Factor, *Z, for site*
(from NZS1170.5:2004, table 3.3) — **0.4**

b) Hazard Scaling Factor
For pre 1992 = 1/Z
For 1992 onwards = Z_{1992}/Z
(Where Z1992 is the Zone actor from NZS4203:1992, figure 4.5(b)) — **2.50** **Factor B**

2.4 Risk Period Scaling Factor, Factor C

a) Building Importance Level — **3**
(from NZS1170.0:2004, table 3.1 and 3.2)

b) Return Period Scaling Factor from accompanying Table 3.1 — **0.8** **Factor C**
(from NZS4203:1992, Table 4.6.4)

2.5 Ductility Scaling Factor, D

a) Assessed Ductility of Existing Structure, μ — **2**
(shall be less than maximum given in accompanying Table 3.2)

b) Ductility Scaling Factor
For pre 1976 = k_μ — **1.57**
For 1976 onwards = 1
(Where k_μ is NZS1170.5:2004 Ductility Factor, from accompanying Table 4.3)) — **1.57** **Factor D**

2.6 Structural Performance Scaling Factor, Factor E

a) Structural Performance Factor, Sp — **0.7**
from accompanying Figure 3.4

b) Structural Performance Scaling Factor = $1/S_p$ — **1.43** **Factor E**

2.7 Transverse Direction Baseline (% NBS)$_b$ — **16**
(equals (%NBS)$_{nom}$ x A x B x C x D x E)

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Table IEP-3 Initial Evaluation Procedure Step 3

As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name: Porirua Little Theatre **Ref.:** 17343
Location: Whitehouse Road, Titahi Bay **By:** RRM
Direction Considered: Longitudinal Direction
Date: 24 May 2013

Step 3- Assessment of Performance Achievement Ration (PAR)

Refer Appendix B- Section B3.2)

	For Factors A to D2	Severe	0.4	max
Critical Structural Weakness		Significant	0.7	
		Insignificant	1	

3.1 Plan Irregularity
Effect on Structural Performance — Significant — 0.7 — **Factor A**

3.2 Vertical Irregularity
Effect on Structural Performance — Insignificant — 1.0 — **Factor B**

3.3 Short Columns
Effect on Structural Performance — Insignificant — 1.0 — **Factor C**

3.4 Pounding Potential
(Estimate D1: - Pounding Effect

Note: Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1- Pounding Effect 1.0

Table for selection of Factor D1	Severe	Significant	Insignificant
Seperation	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

Factor D2- Height Difference Effect 1.0

Table for selection of Factor D2	Severe	Significant	Insignificant
	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1.0
Height Difference 2 to 4 Storeys	0.7	0.9	1.0
Height Difference < 2 Storeys	1.0	1.0	1.0

1.0 — **Factor D**
Lesser of D1 and D2

3.5 Site Characteristics- (Stability, landslide threat, liquefaction etc)

Insignificant — 1.0 — **Factor E**

For Factor E	Severe=	0.5
	Significant=	0.7
	Insignificant=	1

3.6 Other Factors

1.5 — **Factor F**

For≤3 Storeys- Max value 2.5, otherwise Max value 1.5. No min.

Rational for choice of Factor F.

Lightweight timber structure with long exterior walls to both sides in this direction. Few internal walls. Limited ceiling diaphragm action.

3.7 Performance Achievement Ration (PAR) 1.05
(equals A x B x C x D x E x F)

NOTE: THIS ASSESSMENT IS BASED ON BUILDING IN GOOD CONDITION.
The building has significant water damage and rotten timber in main structure, this is not taken into account in this assessment.

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Table IEP-3 Initial Evaluation Procedure Step 3

As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name: Porirua Little Theatre **Ref.:** 17343
Location: Whitehouse Road, Titahi Bay **By:** RRM
Direction Considered: TRANSVERSE DIRECTION
Date: 24 May 2013

Step 3- Assessment of Performance Achievement Ration (PAR)

Refer Appendix B- Section B3.2)

Critical Structural Weakness	**For Factors A to D2**	**Severe**	0.4 max
		Significant	0.7
		Insignificant	1

3.1 Plan Irregularity
Effect on Structural Performance — Significant — **0.7** — **Factor A**

3.2 Vertical Irregularity
Effect on Structural Performance — Insignificant — **1.0** — **Factor B**

3.3 Short Columns
Effect on Structural Performance — Insignificant — **1.0** — **Factor C**

3.4 Pounding Potential
(Estimate D1: - Pounding Effect

Note: Values given assume the building has a frame structure. For stiff buildings (eg with shear walls), the effect of pounding may be reduced by taking the co-efficient to the right of the value applicable to frame buildings.

Factor D1- Pounding Effect **1.0**

Table for selection of Factor D1	**Severe**	**Significant**	**Insignificant**
Seperation	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

Factor D2- Height Difference Effect **1.0**

Table for selection of Factor D2	**Severe**	**Significant**	**Insignificant**
	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	0.4	0.7	1.0
Height Difference 2 to 4 Storeys	0.7	0.9	1.0
Height Difference < 2 Storeys	1.0	1.0	1.0

1.0 **Factor D**
Lesser of D1 and D2

3.5 Site Characteristics- (Stability, landslide threat, liquefaction etc)

Insignificant — **1.0** — **Factor E**

For Factor E	**Severe=**	0.5
	Significant=	0.7
	Insignificant=	1

3.6 Other Factors

1.5 **Factor F**

For≤3 Storeys- Max value 2.5, otherwise Max value 1.5. No min.

Rational for choice of Factor F.

Light weight, single story, transverse walls clearly grouped at ends, with no transverse walls through middle (majority) of building. Limited ceiling diaphragm action.

3.7 Performance Achievement Ration (PAR)
(equals A x B x C x D x E x F) **1.05**

NOTE: THIS ASSESSMENT IS BASED ON BUILDING IN GOOD CONDITION.
The building has significant water damage and rotten timber in main structure, this is not taken into account in this assessment.

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Table IEP- Initial Evaluation Procedure Step 4, 5 and 6

As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name: Porirua Little Theatre **Ref.:** 17343
Location: Whitehouse Road, Titahi Bay **By:** RRM

Date: 24 May 2013

		Longitudinal	Transverse
Step 4-	Structural Performance Score		
4.1	Assessed Baseline $(\%NBS)_b$	15.5	15.5
4.2	Performance Achievement Ratio (PAR)	1.05	1.05
4.3	PAR x Baseline $(\%NBS)_b$	16.3	16.3
4.4	Percentage New Building Standard (%NBS)		16
Step 5-	Potentially Earthquake Prone	%NBS<34	Yes
Step 6-	Potentially Earthquake Risk	%NBS<67	Yes
Step 7	Grading for Seismic Risk		
		Seismic Grade	E

Relationship between Grade and SPS:

Grade:	A+	A	B	C	D	E
%NBS:	>100	100 to 80	80 to 67	67 to 33	33 to 20	<20

Evaluation by..... 

Name: Richard Mayes

CPEng. No:

Reviewed by..... 

Name: Scott Miller

CPEng. No: 166810

NOTE: THIS ASSESSMENT IS BASED ON BUILDING IN GOOD CONDITION.

The building has significant water damage and rotten timber in main structure, this is not taken into account in this assessment.

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Table 3.1: Return period scaling factor

NZS1170.5:2004 Return Period Factor R				Return Period Scaling Factor, C			
Importance Level	Comment	Annual Probability of Exceedance	Return Period Factor R	Pre 1965	1965-76	1976-92	1992-04
1	Minor structures (failure not likely to endanger human life)	1/100	0.5	2	2	2	1.2
2	Normal structures and structures not failing into other levels	1/500	1	1	1	1	1
3	Major structures (affecting crowds)	1/1000	1.3	0.8	0.8	1.1	0.9
4	Post-disaster structures (post-disaster functions or dangerous activities)	1/2500	1.8	0.6	0.6	1	0.7
5	Exceptional structures are outside the scope of the IEP, special study required.						

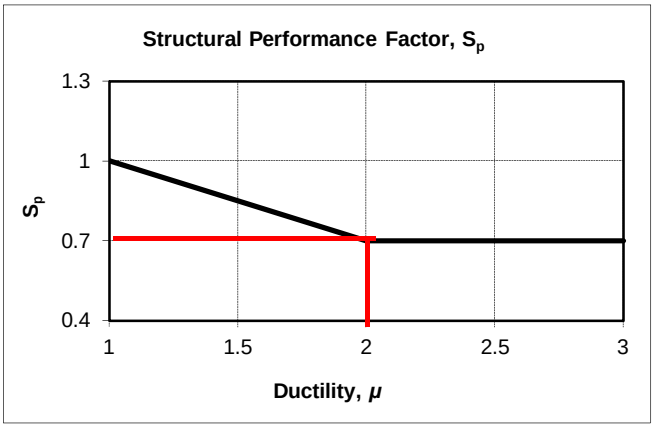
Where R is the return period factor appropriate to the current use of the building, as shown in Table 3.5 of NZS 1170.0:2002

Table 3.2: Ductility factors to be used for existing buildings

Structure Type	Maximum allowable ductility factor for IEP			
	Pre 1935	1935-1965	1965-1976	1976-2004
All buildings	2	2	2	6

Table 3.3: Ductility scaling factor

	Structural Ductility Scaling Factor, k_u							
	1.0 or less		1.25		1.5		2	
Soil Type	A,B,C & D	E	A,B,C & D	E	A,B,C & D	E	A,B,C & D	E
Period,T								
≤ 0.40s	1	1	1.14	1.25	1.29	1.50	1.57	1.70
0.50s	1	1	1.18	1.25	1.36	1.50	1.71	1.75
0.60s	1	1	1.21	1.25	1.43	1.50	1.86	1.80
0.70s	1	1	1.25	1.25	1.50	1.50	2.00	1.85
0.80s	1	1	1.25	1.25	1.50	1.50	2.00	1.90
≥ 1.00s	1	1	1.25	1.25	1.50	1.50	2.00	2.00



Where SP is the Structural Performance Factor form NZS1170.5:2004, Cl 4.4.2.

Figure 3.4: Structural performance factor, SP

Insignificant — The critical structural weakness is [illegible] no significant effect on the integrity of the structure or any other element of the building [illegible] design earthquake.

Significant — The critical structural weakness is evident in part or all of the building and [illegible] reduce the integrity of the structure or any other element of the building [illegible] partial structural collapse and possible threat to life would result in a design earthquake.

Severe — The critical structural weakness is evident in part or all of the building and clearly reduces the integrity of the structure or any other element of the building [illegible] severe structural collapse and probable threat to life would result in a design earthquake.

Table 3.4: Guide to severity of critical structural weaknesses

Critical structural weakness	Severe	Significant	Insignificant
Plan irregularity			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Vertical irregularity			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Short columns			
[illegible]	[illegible]	[illegible]	[illegible]
Pounding effect			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Height difference effect			
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Site characteristics	[illegible]	[illegible]	[illegible]

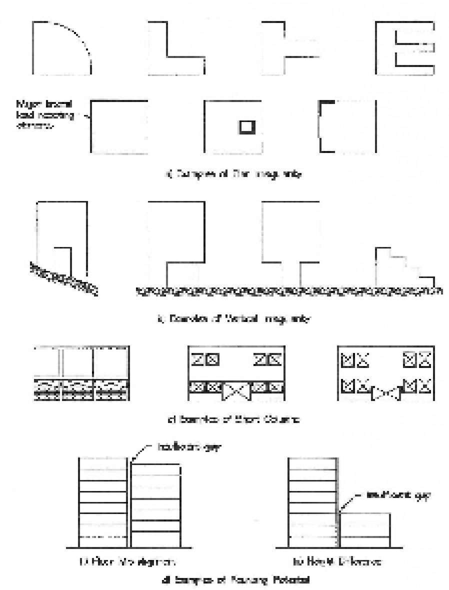


Figure 3.7: Examples of critical structural weaknesses

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