Table IEP-1 Initial Evaluation Procedure Step 1

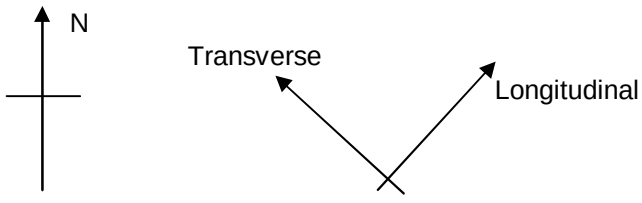
As per NZSEE document "Assessment and Improvement of the Structural Performance of Buildings in Earthquake" (incl Corrigendum No.1)

Building Name:	**Trentham Racecourse**	**Ref.:**	**15224**
Location:	**10 Racecourse Road**	**By:**	**LIS**
	Members Stand	**Date:**	**28 June 2011**

Step 1- General Information

1.1 Photos

1.2 Sketch Plan



1.3 List of relevant features

Constructed pre 1965, assumed built between 1935-1965
Multi storey concrete building
Appears to be predominately a concrete frame building
Iregular structure
Concrete ramps at the rear and several additions to origibal construction.
Importance Level 3 building as more than 300 people can congregate in one area

1.4 note information sources

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

Table IEP-2 Initial Evaluation Procedure Step 2

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

Building Name:	**Trentham Racecourse**	**Ref.:**	**15224**
Location:	**10 Racecourse Road**	**By:**	**LIS**
Direction Considered:	**Longitudinal & Transverse**	**Date:**	**28 June 2011**

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

2.1 Determine nominal (%NBS) = $(\%NBS)_{nom}$

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* **<0.4**

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**

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**

2.77 (%NBS)nom if revised by notes 1, 2 or 3

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) — **0.42**

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)) — **2.38** **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 1992 = k_μ — **1.57**

For 1992 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 Direction Baseline $(\%NBS)_b$ — **12**

(equals $(\%NBS)_{nom}$ x A x B x C x D x E)

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) 0.42

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)) 2.38 **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 1992 = k_μ 1.57
For 1992 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)$_b$ 12
(equals (%NBS)$_{nom}$ x A x B x C x D x E)

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.						

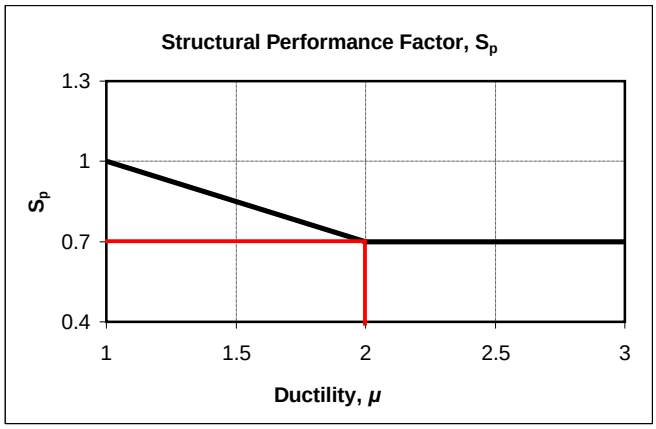
Where R is the return period factor appropriate to the current use of the building, as shown in Table 3.5 of NZS 1170.0:2002

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

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:	**Trentham Racecourse**	**Ref.:**	**15224**
Location:	**10 Racecourse Road**	**By:**	**LIS**
Direction Considered:	**Longitudinal Direction**	**Date:**	**28 June 2011**

Step 3- Assessment of Performance Achievement Ration (PAR)

(Refer Appendix B- Section B3.2)

Critical Structural Weakness — **For Factors A to C**

Severe	0.4	max
Significant	0.7	
Insignificant	1	

3.1 Plan Irregularity

Effect on Structural Performance Significant — **0.7** **Factor A**

Comment: Due to canopy mass/centre of rigidity offset > 0.3 width

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 and D2 and set D = the lower of the two or = 1.0 if no potential for pounding)

a) Factor D1 - Pounding Effect

Note: Values given assume the building has a frame structure. For stiff buildings (e.g. 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 **1.0**

Table for selection of Factor D1	**Severe**	**Significant**	**Insignificant**
Separation	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1.0
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2- Height Difference Effect

Factor D2 **1.0**

Table for selection of Factor D2	**Severe**	**Significant**	**Insignificant**
Separation	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

1.0 **Factor F**

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

Rationale for choice of Factor F.

No reason to use an enhanced factor.

3.7 Performance Achievement Ratio (PAR) **0.7**

(equals A x B x C x D x E x F)

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:	**Trentham Racecourse**	**Ref.:**	**15224**
Location:	**10 Racecourse Road**	**By:**	**LIS**
Direction Considered:	**Transverse Direction**	**Date:**	**28 June 2011**

Step 3- Assessment of Performance Achievement Ration (PAR)

(Refer Appendix B- Section B3.2)

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

3.1 Plan Irregularity

Effect on Structural Performance — Insignificant — **1.0** — **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 and D2 and set D = the lower of the two or = 1.0 if no potential for pounding)

a) Factor D1 - Pounding Effect

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

Factor D1 **1.0**

Table for selection of Factor D1	**Severe**	**Significant**	**Insignificant**
Separation	0<Sep<0.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	0.7	0.8	1.0
Alignment of Floors not within 20% of Storey Height	0.4	0.7	0.8

b) Factor D2- Height Difference Effect

Factor D2 **1.0**

Table for selection of Factor D2	**Severe**	**Significant**	**Insignificant**
Separation	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

1.0 **Factor F**

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

Rationale for choice of Factor F.

No reason to use an enhanced factor.

3.7 Performance Achievement Ratio (PAR)

(equals A x B x C x D x E x F) **1**

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:	**Trentham Racecourse**	**Ref.:**	**15224**
Location:	**10 Racecourse Road**	**By:**	**LIS**
		Date:	**28 June 2011**

		Longitudinal	Transverse
Step 4-	**Structural Performance Score**		
4.1	**Assessed Baseline $(\%NBS)_b$**	**11.8**	**11.8**
4.2	**Performance Achievement Ratio (PAR)**	**0.70**	**1.00**
4.3	**PAR x Baseline $(\%NBS)_b$**	**8.3**	**11.8**
4.4	**Percentage New Building Standard (%NBS)**		**8**
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: **Lily Simpson**

Reviewed by…… ……

Name: **Ignatius Black**

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