

(Refer Table IEP - 2 for Step 2; Table IEP - 3 for Steps 3; Table IEP - 4 for Steps 4, 5 and 6)

Building Name:	Taupo Airport - Timber Office	Ref: 130752
Location:	Taupo, New Zealand	By: LH Date: 30/08/2013

**Step 1 - General Information**

1.1 Photos (attach sufficient to describe building)



1.2 Sketch of building plan



1.3 List relevant features

The small office building located north of the main Terminal building at Taupo Airport is single level and constructed from lightweight materials, predominatly timber. The building has a timber floor and foundations presumably consist of piles.

A search of TDC archives did not reveal any documentation relating to the building. The age of the building was conservatively estimated as pre 1935.

The building is well maintained and in tidy condition.

1.4 Note information sources

- Visual Inspection of Exterior
- Visual Inspection of Interior
- Drawings (note type)
- Specifications
- Geotechnical Reports
- Other (list)

tick as appropriate

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>

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Step 2 - Determination of (%NBS)<sub>b</sub>

2.1 Determine nominal (%NBS) = (%NBS)<sub>nom</sub>

a) Date of Design and Seismic Zone

Note: Only periods between 1965-1992 require seismic zone to be chosen

- Pre 1935 see notes 1, 3
- 1935-1965
- 1965-1976
- 1976-1992 see note 2
- 1992-2004

Seismic Zone:

N/A

b) Soil Type

From NZS1170.5:2004, Cl3.1.3

- NZS1170.5:2004
- A or B Rock
  - C Shallow Soil
  - D Soft Soil
  - E Very Soft Soil

From NZS4203:1992, Cl 4.6.2.2  
(for 1992-2004 only, and only if known)

- NZS4203:1992
- Rigid
  - Intermediate

c) Estimate Period, T

can use following:

- $T = 0.09h_n^{0.75}$  for moment resisting concrete frame
- $T = 0.14h_n^{0.75}$  for moment resisting steel frame
- $T = 0.08h_n^{0.75}$  for eccentrically braced frame
- $T = 0.06h_n^{0.75}$  for all other frame structures
- $T = 0.09h_n^{0.75}/A_c^{0.5}$  for concrete shear walls
- $T \leq 0.4\text{sec}$  for masonry shear walls

period, T 

0.170	0.170
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 seconds

	0.170	0.170
Longitudinal		
<input type="radio"/> MRCF		<input type="radio"/> MRCF
<input type="radio"/> MRSF		<input type="radio"/> MRSF
<input type="radio"/> EBF		<input type="radio"/> EBF
<input checked="" type="radio"/> Other		<input checked="" type="radio"/> Other
<input type="radio"/> CSW		<input type="radio"/> CSW
<input type="radio"/> MSW		<input type="radio"/> MSW
Transverse		
<input type="radio"/> MRCF		<input type="radio"/> MRCF
<input type="radio"/> MRSF		<input type="radio"/> MRSF
<input type="radio"/> EBF		<input type="radio"/> EBF
<input checked="" type="radio"/> Other		<input checked="" type="radio"/> Other
<input type="radio"/> CSW		<input type="radio"/> CSW
<input type="radio"/> MSW		<input type="radio"/> MSW
$h_n =$	4	4
$A_c =$	0.0	0

Where  $h_n$  = height from base of structure to uppermost seismic weight

or mass,  $A_c = \sum A_i (0.2 + L_{wi}/h_n)^2$

$A_i$  = cross-sectional shear area of shear wall I in the first storey of building (m<sup>2</sup>)

$L_w$  = length of shear wall I in the first storey in the direction parallel to the applied forces (m) with the restriction that  $L_w / h_n$  shall not exceed 0.9

d) (%NBS)<sub>nom</sub> determined from Figure 3.3

Longitudinal	3.0	(%NBS) <sub>nom</sub>
Transverse	3.0	(%NBS) <sub>nom</sub>

Add specific value from figure 3.3

**Note 1:** For buildings designed prior to 1965 and known to be designed as a public building in accordance with the code, multiply (%NBS)<sub>nom</sub> by 1.25

For buildings designed 1965-1976 and known to be designed as public buildings in accordance with the code of the time, multiply (%NBS)<sub>nom</sub> by 1.33-Zone A, or by 1.2 - Zone B

1.25

**Note 2:** For reinforced concrete buildings designed between 1976-84 multiply (%NBS)<sub>nom</sub> by 1.2

1

**Note 3:** For buildings designed prior to 1935 multiply (%NBS)<sub>nom</sub> by 0.8 except for Wellington when the factor may be taken as 1

1	Longitudinal	3.75	(%NBS) <sub>nom</sub>
	Transverse	3.75	(%NBS) <sub>nom</sub>

**2.2 Near Fault Scaling Factor, Factor A**  
If  $T \leq 1.5$  sec, Factor A=1

- a) Near fault factor,  $N(T,D)$   
(from NZS1170.5:2004, Cl 3.1.6)      Longitudinal: 

1
---

  
Transverse: 

1
---
- b) Near fault Scaling Factor =  $1/N(T,D)$       Longitudinal: 

1
---

  
Transverse: 

1
---

**Factor A**

**2.3 Hazard Scaling Factor, Factor B**

- a) Hazard Factor,  $Z$  for site      Site Area:        $Z = 0.28$   
(from NZS1170.5:2004, Table 3.3)       $Z_{1992} = 0.9$  Refer to Figure 3.5(b) (NZS 4203: 1992)
- b) Hazard Scaling Factor =  $1/Z$   
For pre 1992 =  $Z_{1992}/Z$
- (where  $Z_{1992}$  is the NZS4203:1992 Zone Factor from accompanying figure 3.5(b))      **Factor B**

3.57
------

**2.4 Return Period Scaling Factor, Factor C**

- a) Building Importance Level      Choose Importance Level  
(from NZS1170.0:2004, Table 3.1 and 3.2)       1     2     3     4
- b) Return Period Scaling factor from accompanying Table 3.1      **Factor C**

1
---

**2.5 Ductility Scaling Factor, Factor D**

- a) Assessed Ductility of Existing Structure,  $\mu$   
(shall be less than maximum given in accompanying Table 3.2)       $\mu = 2$  Longitudinal Direction  
 $\mu = 2$  Transverse Direction
- b) Ductility Scaling factor = 

Longitudinal	Transverse
$k_{\mu}$	$k_{\mu}$
1.12	1.12
1	1

  
For pre 1976 =  
For 1976 onwards =  
(where  $k_{\mu}$  is NZS1170.5:2004 Ductility Factor, from accompanying Table 3.3)      **Factor D**  
Longitudinal: 

1.57
------

  
Transverse: 

1.57
------

**2.6 Structural Performance Factor, Factor E**

- a) Structural Performance Factor,  $S_p$   
(from accompanying Figure 3.4)      

0.7
0.7

 Longitudinal Direction  
Transverse Direction
- b) Structural Performance Scaling Factor =  $1/S_p$       **Factor E**  
Longitudinal: 

1.43
------

  
Transverse: 

1.43
------

**2.7 Baseline %NBS for Building, (%NBS)<sub>b</sub>**

- (equals (%NBS)<sub>nom</sub> x AxBxCxDxE)      Longitudinal: 

30
----

  
Transverse: 

30
----

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Steps 3; Table IEP - 4 for Steps 4, 5 and 6))

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a) Longitudinal Direction

Step 3 - Assessment of Performance Achievement Ratio (PAR)

(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Building Score	Effect on Structural Performance (Choose a value - Do not interpolate)
<b>3.1 Plan Irregularity</b> <i>Effect on Structural Performance</i>	Factor A <input type="text" value="1"/>	Plan Irregularity _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment _____
<b>3.2 Vertical Irregularity</b> <i>Effect on Structural Performance</i>	Factor B <input type="text" value="1"/>	Vertical Irregularity _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment _____
<b>3.3 Short Columns</b> <i>Effect on Structural Performance</i>	Factor C <input type="text" value="1"/>	Short Columns _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment _____

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  
Select appropriate value from Table

**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.

	Severe	Significant	Insignificant
<b>Factor D1=</b> <input type="text" value="1"/>			
<i>Table for Selection of Factor D1</i>			
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	<input type="radio"/> 0.7	<input type="radio"/> 0.8	<input checked="" type="radio"/> 1
Alignment of Floors not within 20% of Storey Height	<input type="radio"/> 0.4	<input type="radio"/> 0.7	<input type="radio"/> 0.8

b) Factor D2: - Height Difference Effect  
Select appropriate value from Table

	Severe	Significant	Insignificant
<b>Factor D2=</b> <input type="text" value="1"/>			
<i>Table for Selection of Factor D2</i>			
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	<input type="radio"/> 0.4	<input type="radio"/> 0.7	<input type="radio"/> 1
Height Difference 2 to 4 Storeys	<input type="radio"/> 0.7	<input type="radio"/> 0.9	<input type="radio"/> 1
Height Difference < 2 Storeys	<input type="radio"/> 1	<input type="radio"/> 1	<input checked="" type="radio"/> 1

Factor D  (Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)

3.5 Site Characteristics - (Stability, landslide threat, liquefaction etc)  
Effect on Structural Performance

Factor E  Severe Significant Insignificant  
 0.5 max     0.7     1

3.6 Other Factors

Factor F  for ≤ 3 storeys - maximum value 2.5, otherwise - maximum value 1.5. No minimum

Record rationale for choice of Factor F:  
Timber structure, single level.

2.7 Performance Achievement Ratio (PAR) (equals Ax Bx Cx Dx Ex F) PAR

(Refer Table IEP - 1 for Step 1; Table IEP - 3 for Steps 3; Table IEP - 4 for Steps 4, 5 and 6)

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(Choose worse case if clear at start. Complete IEP-2 and IEP-3 for each if in doubt)

b) Transverse Direction

Step 3 - Assessment of Performance Achievement Ratio (PAR)

(Refer Appendix B - Section B3.2)

Critical Structural Weakness	Building Score	Effect on Structural Performance (Choose a value - Do not interpolate)
<b>3.1 Plan Irregularity</b> Effect on Structural Performance	Factor A <input type="text" value="1"/>	Plan Irregularity _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment: _____
<b>3.2 Vertical Irregularity</b> Effect on Structural Performance	Factor B <input type="text" value="1"/>	Vertical Irregularity _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment: _____
<b>3.3 Short Columns</b> Effect on Structural Performance	Factor C <input type="text" value="1"/>	Short Columns _____ <input type="radio"/> Severe <input type="radio"/> Significant <input checked="" type="radio"/> Insignificant Comment: _____

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

Select appropriate value from Table

**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.

Table for Selection of Factor D1	Severe	Significant	Insignificant
Separation	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Alignment of Floors within 20% of Storey Height	<input type="radio"/> 0.7	<input type="radio"/> 0.8	<input checked="" type="radio"/> 1
Alignment of Floors not within 20% of Storey Height	<input type="radio"/> 0.4	<input type="radio"/> 0.7	<input type="radio"/> 0.8

Factor D1=

b) Factor D2: - Height Difference Effect

Select appropriate value from Table

Table for Selection of Factor D2	Severe	Significant	Insignificant
	0<Sep<.005H	.005<Sep<.01H	Sep>.01H
Height Difference > 4 Storeys	<input type="radio"/> 0.4	<input type="radio"/> 0.7	<input type="radio"/> 1
Height Difference 2 to 4 Storeys	<input type="radio"/> 0.7	<input type="radio"/> 0.9	<input type="radio"/> 1
Height Difference < 2 Storeys	<input type="radio"/> 1	<input type="radio"/> 1	<input checked="" type="radio"/> 1

Factor D2=

Factor D

(Set D = lesser of D1 and D2 or.. set D = 1.0 if no prospect of pounding)

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

Effect on Structural Performance

Factor E <input type="text" value="1"/>	Severe	Significant	Insignificant
	<input type="radio"/> 0.5 max	<input type="radio"/> 0.7	<input checked="" type="radio"/> 1

3.6 Other Factors

Factor F  for ≤ 3 storeys - maximum value 2.5, otherwise - maximum value 1.5. No minimum

Record rationale for choice of Factor F:

Timber structure, single level.

2.7 Performance Achievement Ratio (PAR)

(equals AxBxCxDxExF)

PAR

(Refer Table IEP - 1 for Step 1; Table IEP - 2 for Step 2; Table IEP - 3 for step 3)

Building Name:	Taupo Airport - Timber Office	Ref:	130752
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		Date:	30/08/2013

Step 4 - Percentage of New Building Standard (%NBS)

	Longitudinal	Transverse
4.1 Assessed Baseline ( %NBS) <sub>b</sub> (from Table IEP - 1)	30	30
4.2 Performance Achievement Ratio (PAR) (from Table IEP - 2)	2.50	2.50
4.3 PAR x Baseline (%NBS) <sub>b</sub>	75	75
4.4 Percentage New Building Standard (%NBS) ( Use lower of two values from Step 3.3)		75

Step 5 - Potentially earthquake Prone?

(Mark as appropriate)

%NBS ≤ 33

NO

Step 6 - Potentially Earthquake Risk?

%NBS < 67

NO

Step 7 - Provisional Grading for Seismic Risk based on IEP

Seismic Grade

B

Evaluation Confirmed by...

Signature



Name

Ian C. Smith

CPEng. No

27179

Relationship between Grade and SPS:

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