Acronem Consulting Australia Pty Ltd

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Kewarm Pty Ltd
Attn: Kevin Song
F2/272-284 Frankston Dandenong Road,
Dandenong South, VIC 3175

WPG NON-LOADBEARING WALL SYSTEMS, &
WPG SUSPENDED CEILING SYSTEMS,
- EARTHQUAKE ACTIONS IN AUSTRALIA

Dear Kevin:

With regard to the seismic performance of:

- WPG Non-Loadbearing Wall Systems described in Acronem Report ACA-200504 200624 of June 24th 2020, and
- WPG Suspended Ceiling System described in Acronem Report ACA-210114 210115 of January 15th 2021.

All buildings differ by location, sub-soil class, height, design type and importance level. Their resistance to seismic actions must be individually determined by a *Professional Engineer* on a project-by-project basis with reference to the requirements of the NCC 2019 and AS 1170.4.

In the NCC 2019 a building or structure is assigned an Importance Level in accordance with Table B1.2a depending on the Building Type. Table B1.2b provides the Annual Probability of Exceedance to determine structural design actions for earthquakes in Australia in accordance with AS 1170.4.

Table B1.2a Importance Levels of buildings and structures

Importance Level	Building Types
1	Buildings or structures presenting a low degree of hazard to life and *other property* in the case of failure.
2	Buildings or structures not included in Importance Levels 1, 3 and 4.
3	Buildings or structures that are designed to contain a large number of people.
4	Buildings or structures that are essential to post-disaster recovery or associated with hazardous facilities.

Table B1.2b Design events for safety

Importance Level	Annual probability of exceedance for non-cyclonic wind	Annual probability of exceedance for cyclonic wind	Annual probability of exceedance for snow	Annual probability of exceedance for earthquake
1	1:100	1:200	1:100	1:250
2	1:500	1:500	1:150	1:500
3	1:1000	1:1000	1:200	1:1000
4	1:2000	1:2000	1:250	1:1500

Acronem Consulting Australia Pty Ltd ACN:148 929 944
Web: www.acronem.com.au Phone: 0437 407 176
Email: cameron@acronem.com.au

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The seismic design of non-loadbearing walls to the design procedure of AS 1170.4 uses project-specific values for building *Importance Level*, *Annual Probability of Exceedance*, *Building Class*, *Sub-Soil Class* and other inputs, for determining the earthquake actions. The seismic design of suspended ceilings is performed in accordance with AS/NZS 2785 which similarly references AS 1170.4.

For buildings found by a *Professional Engineer* to satisfy the necessary criteria, earthquake actions the out-of-plane actions required to be resisted by non-loadbearing walls, and the vertical and horizontal actions required to be resisted by suspended ceilings may both be determined in accordance with *AS 1170.4 Section 8.3 Simple Method*.

As an example:

A WPG non-loadbearing wall with;

- wind strength resistance of 0.375 kPa; and
- is 3000mm high; and
- has 1x13mm layer of plasterboard on each side; and
- is located in a 12m high building; and
- in an Australian capital city; and
- with an annual probability of exceedance of 1/500; and
- is 12m above the base of the building base;

the *AS 1170.4 Section 8.3* horizontal out-of-plane earthquake force acting at the centre of mass of the WPG non-loadbearing wall is approximately one-seventh (1/7) of the wind load capacity of the wall.

As above, while the strength of the WPG non-loadbearing wall described in the example above was 7-times greater than the out-of-plane earthquake action determined in accordance with the NCC 2019 & AS 1170.4, the resistance of a non-loadbearing wall to seismic actions must be individually verified by a *Professional Engineer* on a *project-by-project* basis with reference to the requirements of NCC 2019 and AS 1170.4.

Similarly, resistance to the ULS horizontal and vertical earthquake actions in suspended ceiling installations shall be independently verified on a project-by-project basis.

As an example:

For the vertical permanent, imposed and wind actions described in Report ACA-210114 210115 the limiting combinations of actions determined in accordance with AS/NZS 1170.0 were typically SLS deflection criteria. The ULS strength combination of $1.2G+W_u+\psi_c Q$ limited in some cases where W_u=-0.45kPa & ψ_c=0. For the cases examined, while this ULS strength combination produced greater design vertical actions than those arising from the earthquake design actions per G+Eu, resistance to horizontal earthquake actions requires assessment for each installation.

Yours faithfully,

CAMERON CHICK BE(HONS), PH.D, GC.COM.(MKTG), M.AIRAH, RPEQ
DIRECTOR - ACRONEM CONSULTING AUSTRALIA PTY LTD
RBP (Vic) EC 39441

Acronem Consulting Australia Pty Ltd ACN:148 929 944
Web: www.acronem.com.au Phone: +61 437 407 176
Email: cameron@acronem.com.au