
ROLE AND ACTIONS OF THE SEISMIC NSE IN THE EVENT OF AN EARTHQUAKE

from BUILDING SERVICES PERSPECTIVE

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FULL ABSTRACT

The structure of any building in New Zealand is governed by building Act and NZ Building Code B1 – Structure. We have our own *NZ Standard 1170 – Structural Design Actions* particularly part 5: 2004 which outlines the *Earthquake Actions – New Zealand*. The main reason to refer to these standards are to determine the *Ultimate limit State (E_u)* and *Serviceability Limit State (E_s)*.

When touching the non-seismic elements (NSE) of a structure system, it falls under *NZS 4219:2009 – Seismic Performance of Engineering Systems in Buildings*. This standard is for specific design of the NSE of the structure elements. However, it doesn't cover all types of Fire and Mechanical services. Such as but not limited to,

1. Fire Sprinkler System
2. Suspended Ceilings

These are just some of the examples and they have their own standards to comply with the NZBC B1 and of course the NSE of any structure in New Zealand.

As per NZS 4219:2009, there are 2 x pathways to achieve NSE for any type of building,

1. Specific Design Method
1. Such designs are drafted by experience structural engineers such as CPEng as most of them falls under either AS or VM of the NZBC B1. However, it may touch to other Building codes such as

NZBC G10- Piped Services and/or *NZBC G12 – Water Supplies*. These types of design could have generic approach on the NSE components from experience of the registered engineer.

2. Non-Specific Design Method

Such designs could be done by NSE specialists as well as by the building services engineers such as Mechanical Engineer or Fire Engineer. Most of the NSE designs out there are done by this way determining the different parameters of the building and finally calculating the required restraint forces for all of the NSE components in question.

Guidance has been provided by BRANZ on the responsibilities associated with the producer statements, as below,

#	TYPE	BY	COMMENT
PS1	Design	Seismic Specialist or Building Services Contractor	Certifies that the proposed works, if constructed as designed, will comply with the requirements of the NZBC.
PS2	Design review	Seismic Specialist	Where a PSI is provided by the contractor, the seismic specialist should provide a corresponding PS2 to certify that the proposed works, if correctly constructed, will comply with the requirements of the NZBC
PS3	Construction	Building Services Contractor	Certifies that the works have been completed in accordance with the seismic specialist's design documentation.
PS4	Construction review	Seismic Specialist	Certifies that construction monitoring and information provided by the contractor indicates that works have been completed in accordance with the seismic specialist's design documentation.

As a building services engineer, I have been engaged over 10 x projects to acquire/supply of the NSE design for these projects specifically for the mechanical services and fire sprinkler systems. Below are some of the issues that I have faced during those projects as a building service engineer. I have outlined how to rectify them as well in the context.

PROPRIETARY DESIGN

Issue:

Each Structural / Seismic NSE engineer has their own specific design and recommendation for the product to be used. Due to this approach, any partial design by another NSE engineer or a building services engineer is not considered and only proposed to have a clean fresh design. There have been instances where NSE engineers have refused to even have a look at the design made by the building services engineer.

Solution:

As per the design and producer statement guidelines, a building services engineer can design the NSE system, and a seismic specialist can review and supply a PS2 for the design. In the process, the seismic engineer may ask for further evidences, calculations and can supply advises and recommendations to the designer before satisfying with the design and issuing a PS2. At least have a look on the proposed design by the building services engineers and communicate with them before failing or rejecting their design.

TIME FRAME

Issue:

The standard terms are to supply the PS4 within 10 days of supply of all the evidences and NSE engineer's site visits. The building services engineer / contractors have to beg for the PS4 and most of the time it comes at the last day.

Solution:

We get that companies and individual engineers' are busy. However, 10 days, is not a reasonable time frame considering this being one of the last cert for the completion of the project. Engineers for other services such as mechanical or Fire supplies the PS4 within 2 working days of the visit along with the final report if the visit was successful without any defect(s). If the companies or engineers' are flooded with the work; they shouldn't take on more work, simple is that.

CONSTRUCTION REVIEW VISITS

Issue:

For small to some medium new builds, the NSE engineer only visit the site once at the end of the project and that could be too late for the contractor to change/alter the seismic bracings/parts if failed by the NSE engineer. Needless to say that by the time a failed report comes through by the NSE engineer; the project would be at its final days of completion and ceilings are already in place.

Solution:

At least 2 x site visits must be proposed at the beginning or mid of the project and of course at the end so that the contractors will have enough time to rectify the defects.

DESIGN OF OTHER SERVICES FOR THE SAME PROJECT

Issue:

While sending out the short form agreement, we never been asked by the NSE engineer that who are doing the seismic design for other services for the same project. It is always better practically and of course financially for all services of a specific project to be designed by the same seismic engineer.

Solution:

A simple email to the people engaging the Seismic engineer asking about other services would be suffice to achieve this. If the building service that NSE engineers are engaged with doesn't have this answer, just ask for the name/contact of the main contractor or main builder for the project and then ask them the same question. At your surprise, its highly likely that you will get design work from other services if not all for that same project. And if that is the case; the co-ordination of NSE services would be much efficient and beneficial.

CONCLUSION AND SUMMARY

Non-Structure Elements have a vital role in the development of a structure and so does the NSE engineers. Should the proposed solutions be employed in day-to-day practices as outlined in above points and scenarios; a much better co-ordination and seamless sign-offs will take place which will be beneficial for the NSE engineer, client and the project of any scope.

CITED REFERENCES

NZS 1170.5:2004 *Structural design actions - Part 5: Earthquake actions - New Zealand*
NZS 4219:2009 *Seismic performance of engineering systems in buildings*
BRANZ *Code of Practice for the Seismic Performance of Non-Structural Elements*
10 x projects requiring NSE design

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