

SEISMICITY AND FOUNDATION DETAILS

SUBMISSION TO DEPARTMENT OF BUILDING AND HOUSING

31 OCTOBER 2011

BACKGROUND TO IPENZ

The Institution of Professional Engineers New Zealand (IPENZ) is the lead national professional body representing the engineering profession in New Zealand. It has approximately 12,000 Members, including a cross-section from engineering students, through practising engineers, to senior Members in positions of responsibility in business. IPENZ is non-aligned and seeks to contribute to the community in matters of national interest giving a learned view on important issues, independent of any commercial interest.

EXECUTIVE SUMMARY

On 19 May 2011 the Department of Building and Housing made urgent changes to the Building Code's supporting documents for structure. The changes increased the minimum seismic hazard factor for the Canterbury earthquake region and required stronger foundations for buildings in that area.

The Structural Engineering Society (Sesoc) represents IPENZ Members involved in the structural issues of the building and construction industry. Sesoc has been particularly active in post-earthquake work, and IPENZ recognises Sesoc as the source of structural expertise.

IPENZ drew attention to the Building Code changes in its weekly electronic newsletter *engineering direct* on 13 October. This publication goes to over 7500 engineers. IPENZ invited readers to make individual submissions and indicated it planned to make a submission supporting the direction of the changes.

IPENZ continues to support the direction of these changes, and looks forward to some of them having wider geographical applicability.

1. SPECIFIC COMMENTS

1.1 NZS 1170.5 STRUCTURAL DESIGN ACTIONS

1.1.1 Hazard factor Z

In April 2011 Sesoc gave interim advice that the hazard factor in the Canterbury region be increased to a minimum of $Z = 0.3$ for all periods below $T = 1.5$ seconds. IPENZ published this advice in *engineering direct* on 14 April. Subsequent discussions have emphasised that this is a minimum value, as there is a school of thought that suggests it should be equal to the value for Wellington, where $Z = 0.4$.

1.1.2 Risk factor R

In the same interim advice, Sesoc recommended that the risk factor for serviceability limit states be increased to $R = 0.33$, and IPENZ published it as noted above.

1.2 NZS 3604 TIMBER FRAMED BUILDINGS

An IPENZ Member who has been very active in the earthquake recovery effort notes that in the structural elements above the sub-floor framing, timber-framed houses performed very well, in some respects better than he had expected from the Standard.

1.2.1 “Good ground”

Late in 2010 the IPENZ representatives on the committee revising NZS 3604 advocated in the strongest possible terms that the potential for liquefaction should contra-indicate “good ground”. To the consternation of IPENZ, other members of that committee were prepared to allow potentially liquefiable soils to be “good ground”. The matter was so important that IPENZ was on the verge of withdrawing its support for the revision, but eventually was persuaded to support it on the strength of a preface note indicating more research was necessary.

IPENZ is pleased that the Building Code changes now exclude from “good ground” ground where liquefaction and/or lateral spread could occur.

In November 2010 IPENZ advised Standards New Zealand that Petone, areas of the Kapiti Coast, and parts of Hawkes Bay could also suffer liquefaction, but that the forms of it could be different from those recently seen in Canterbury. IPENZ looks forward to liquefiable soils not being classified as “good ground” being extended to areas other than Canterbury.

1.2.2 Slab-on-ground foundations

For many years IPENZ has disapproved of the diagrams in NZS 3604 that allowed ground slabs under single-storey buildings to be unreinforced except at re-entrant corners. We are pleased to see that all slabs in the Canterbury region now require reinforcing, and look forward to this requirement being extended to other areas.

1.2.3 Connection of slab to perimeter foundation

IPENZ approves of the requirement to connect the slab steel to the perimeter foundation steel.

1.2.4 Ductility

IPENZ recognises the need for ductility in reinforcing steel. We are aware that some manufacturing processes give poor ductility, but have no information on the detailed requirements of NZS 4671.

1.2.5 Minimum slab reinforcing

An IPENZ Member currently building a new house notes that the commonly-used 665 mesh has a kg/m² value slightly greater than that required. In a slab 100 mm thick, this provides a steel:concrete area ratio of 0.15%, which barely covers the temperature and shrinkage reinforcement requirement, and is less than the minimum value required by the concrete design standard for one-way slabs.

1.2.6 Dowelled joints

IPENZ approves of fitting steel dowels to minimise the risk of differential settlement.

1.2.7 Brick veneer ties

IPENZ has observed that many brick veneer walls failed during the Canterbury earthquakes, and approves of Standard guidance for ties. We have no information on NZS 4210.

We have a report that some Oamaru Stone veneers behaved worse than did the brick veneers in the same neighbourhood.

1.2.8 Specific engineering design

IPENZ Members often find it necessary to apply specific engineering design to features within an acceptable solution. Early in 2011 we gave publicity to DBH's *Guidance on house repairs following the Canterbury Earthquake* and pronounced it "excellent". We recognised that further work was in progress, and look forward to the results of this.

The IPENZ Member mentioned in 1.2 above reports a rib-raft slab built with geotechnical advice near the Avon-Heathcote estuary after the September earthquake. After the February aftershock he inspected this slab and found that it had tilted and suffered some cracking damage. This indicates that some ground presents extremely difficult challenges.

1.3 NZS 4229 CONCRETE MASONRY BUILDINGS

This Standard mimics NZS 3604 in matters relating to "good ground" and concrete ground slabs, and so the IPENZ comments on 4229 follow those of 3604.

CONCLUSION

IPENZ supports the Building Code changes, and looks forward to them being extended in geographical scope.

We appreciate the opportunity to make this submission and are able to provide further clarification if required.

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