

Creating new standard plans pertaining to countermeasures against ceiling collapses in buildings

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1. Backgrounds

Technical standards regarding countermeasures to prevent ceiling collapses in buildings were issued in August 2013, based on the Building Standard Act (Ministry of Land, Infrastructure and Transport notification No. 771 and others) following the human/physical damage caused by ceiling collapses in gymnasiums and large-scale halls in recent earthquakes, especially in the Great East Japan Earthquake.

The basic concept behind the technical standards is to control the seismic displacement of suspended ceilings by using bracing members to avoid collisions with the surrounding walls and providing sufficient space (clearance). (Figure 1)

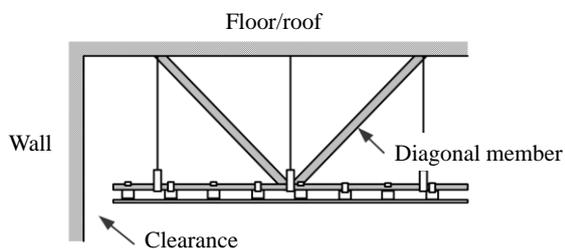


Figure 1: Image of the current standard

On the other hand, in order to increase the flexibility of design and construction, bracing members will not be provided where it could be an obstacle for the placement of equipment like air-conditioning ducts, for example. The standardization of a new structural method that does not require clearance between the ceiling plane and the surrounding walls is desired as well.

Based on the results of the 2013 Building standard maintenance promotion business S4 issue "Examination into the upgrading of standards pertaining to the

earthquake-resistant design of suspended ceilings," and with technical support from the Building Research Institute, a new standard proposal (hereafter "New standard plan") pertaining to ceiling collapse countermeasures is being considered.

2. Overview of the new standard plan

The New standard plan attempts to secure structural safety by allowing the external force exerted on the ceiling plane during an earthquake to be transferred to the building's structural member not through the bracing member but through the surrounding walls. (Figure 2)

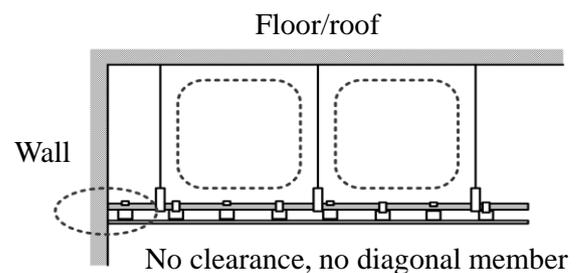


Figure 2: Image of the New standard plan

Regarding the new standard plan, the following two points are important.

- i) The components of the ceiling plane and surrounding walls shall have enough rigidity and strength to avoid damage by external forces including the force exerted by collisions.
- ii) The ceiling plane will be on a level plane with no spaces between the surrounding walls

However, we do not have sufficient knowledge to minutely analyze the impact force exerted by collisions.

Therefore, the new standard plan generally limits

specifications, such as unit mass, joints suspension length and etc., to the range confirmed through experiments. The ceiling's scale (width/depth) is limited according to the strength of the ceiling plane tested by experiments and the calculated horizontal seismic coefficient at the floor level.

The new standard plan is aimed to reduce ceiling collapses in the event of an earthquake larger than a moderate earthquake by preventing damages caused by a moderate earthquake. In this regard, it is same as the current standard.

3. Future Work

Based on the New standard plan, revisions will be scheduled by the Housing Bureau regarding technical standards based on the Building Standard Act (2013, Ministry of Land, Infrastructure and Transport notification No. 771 and others). In order to enable the smooth enforcement of the new standards, NILIM will edit a practical reference manual for design and building confirmation.

(Reference)

<http://www.nilim.go.jp/lab/bcg/siryou/tnn/tnn0751.htm>