

A trend of countermeasures for the long-period earthquake ground motion to architectural structures

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1. Actions after submitting the draft proposal for the long-period earthquake ground motion countermeasures

In the field of architecture, the long-period earthquake ground motion (i.e.: ground motion that includes long period of pitch and roll and has the characteristics of generating slow and long lasting tremor) is considered to give severe effect on high-rise buildings which have the long proper period of their own and also to affect seismic isolated buildings. On December 21, 2010 draft proposal for the countermeasures was issued from MILT and invitation of public opinions had been made until February 2011. (Ref. (1)) As a result, following opinions were received:

- The most agreed with the basic idea that something should be done to accommodate with long-period ground motion.
- It should cover Nankai earthquake and interrelated earthquakes.
- Not only the input, but the acceptable conditions for the building should also be shown.
- Retroaction of the new standard to existing buildings would be difficult, to which some easing steps and/or subsidy should be necessary.

On The 2011 off the Pacific coast of Tohoku Earthquake which occurred just after public opinions were invited, long-period ground motions were observed. (Ref. (2))

In the building standard development promotion project* that started soon after, the following deliberations were made. (Ref. (3), (4) and (5))

*It is the project, when the State lays down and/or revise technical criteria in the legislation such as the Building Standard Act, it will publicly seek for the collection and accumulation of the basic data and technical knowledge such as experimental data concerning the agenda which the State had set and subsidize the cost that had occurred (hereinafter called: "BDP").

2. The improvement method of preparation for the long-period earthquake ground motion (BDP Agenda No. 42)

Earthquake ground motion which was shown in the countermeasure draft proposal. Also, collected information regarding The 2011 off the Pacific coast of Tohoku Earthquake and prepared long-period earthquake ground motion wave profile for those earthquakes. Furthermore, in 2012 fiscal year, deliberations of improving flexibility and reliability of earthquake ground

motion preparation method for interrelated earthquakes.

3. Deliberation concerning architectural structure safety verification method (BDP Agenda No. 27-1, -2, -3)

Since 2010 fiscal year, with regard to reinforced concrete buildings, steel construction buildings and seismic isolated buildings, implementations of the structural testing for multiple cycle load, response evaluation of the buildings and earthquake observation of the buildings are in progress. Especially, in fiscal 2011, response analysis and investigation on high-rise buildings which were observed during The 2011 off the Pacific coast of Tohoku Earthquake were conducted. Also in fiscal 2012, shaking table tests for reinforced concrete building test structure, multiple cyclic load testing for the steel frame test structure, and multiple cyclic load testing for seismically isolated member of actual-size level were conducted and technical data concerning performance assessment of structural objects are being gathered.

4. Next step

It is anticipated that countermeasures for the long-period earthquake ground motion will be made up by not only focusing on the earthquake ground motion preparation method shown in above section 2 and documents for the performance assessment for structural objects shown in above section 3, but also taking in the accounts of the area of discussions made by the Central Disaster Prevention Council, Headquarters for Earthquake Research, the Building Construction Standard Committee in NILIM and the Working Group for the Long-Period Ground Motion set up in above committee.

【References】

- (1) Draft proposal for the countermeasures on the long-period earthquake ground motion on high-rise buildings
http://www.mlit.go.jp/report/press/house05_hh_000218.html
- (2) TECHNICAL NOTE of NILIM No.674, Damage investigation report of the 2011 Tohoku-Pacific Ocean Earthquake, Mar.2012
http://www.nilim.go.jp/lab/bcg/siryoutnn/tn_nilim.htm
- (3) Invite for implementing body: BDP fiscal 2011
http://www.mlit.go.jp/jutakukentiku/house/jutakukentiku_ho_use_fr_000037.html
- (4) Invite for implementing body: BDP fiscal 2012
http://www.mlit.go.jp/report/press/house05_hh_000307.html
- (5) Outlines of Results, listed: BDP fiscal 2011
http://www.mlit.go.jp/jutakukentiku/house/jutakukentiku_ho_use_fr_000047.html