

Technological Support Software on Calculation of Land Liquefaction Hazard for General Users

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1. Development of technological support software

In ground liquefaction, although harm to human lives is rare, in view of health damages such as headaches and dizziness or the like and damage to housing properties and so on, it brings on tremendously big costs. For this reason, the City bureau of the Ministry of Land, Infrastructure and Tourism officially announced its *Technical Guidelines in Respect to Judgment for Liquefaction Potential in Residential Land* (hereinafter referred to as Technical Guidelines) in April 2013.

However, in order to conduct judgment calculations in accordance with these Technical Guidelines, the mathematical formulas and graphs indicated in the *Architecture Foundation Design Guidelines* of the Architectural Institute of Japan and the *Specifications for Highway Bridges* of the Japan Road Association are very complex and require specialized knowledge.

In order to solve this problem, the Urban Planning Department of the National Institute for Land and Infrastructure Management has developed technological support software called *Judgment Calculation Sheet for Liquefaction Damage Potential of Residential Land* (hereinafter referred to as the calculation software) to simply conduct judgment calculations with data obtained from ground investigations. The calculation software has been configured based on Excel, with which most people have a general knowledge of

ground (whether the FL value is smaller than 1 or larger than 1). Moreover, the calculation results are plot-indicated in the judgment chart shown in the technological guidelines, and copies of output sheets are contrived to be used for conference data of autonomous bodies.

2. For facilitation liquefaction hazard map

For the prevention of liquefaction damage, ensuring an environment under which everybody can be conscious about whether his or her land has a risk of liquefaction is important.

The number of local governments where liquefaction risk degree maps are prepared and publicized in one way or another is 40 prefectural and city governments and 282 municipalities as of April 2012, to the extent efforts have progressed. However, the content of efforts varies according to the local government. In particular, in quite a few cases the original sources to judge the risks did not utilize boring investigations but were prepared depending on simple methods such as visual judgment of terrain. In addition, although the existence or nonexistence of the occurrence of liquefaction and the scale of damage varies according to the scale of the presumed earthquake vibration, there is no integrated concept; furthermore, in the current situation the color coding for maps varies considerably.

The Technical Guidelines prescribe the input earthquake vibration to be the medium earthquake vibration of Level 1 (maximum acceleration 200 gal, magnitude in the epicenter 7.5). Although this is considered to be an integrated scale in the future, since this is not a great earthquake, it should be considered to be the lowest limit of the level of the countermeasure against liquefaction.

Inasmuch as the calculation software we developed currently can readily be downloaded from the Homepage of the National Institute for Land and Infrastructure Management, we expect it to be utilized by many local governments and citizens and that the configuration and publication of liquefaction risk maps will progress based on accumulated ground investigation information.

[Reference]

Homepage of the National Institute for Land and Infrastructure Management

<http://www.nilim.go.jp/lab/jbg/takuti/takuti.html>

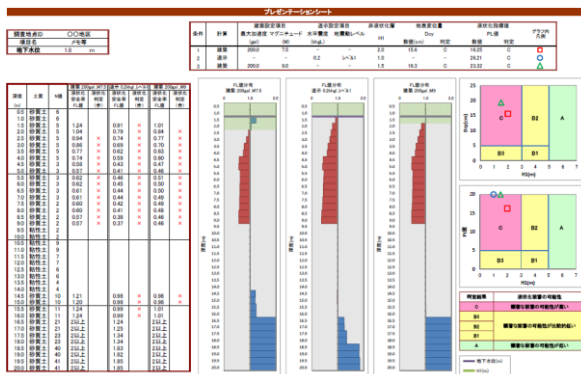


Figure: Output image of calculation software

As shown in the figure, the calculation results are indicated by visual graphs in tandem with numerical values to make it apparent whether or not there is a risk of liquefaction, using a scale with intervals of 50cm under the surface of