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Distribution of Geological Disaster by Liquefaction-Fluidization on Boso peninsula and northern Tokyo bay reclaimed land

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Outline of liq-flu (liquefaction-fluidization) phenomena on Boso peninsula and characteristics of liq-flu disaster on southern Chiba city in Tokyo bay reclaimed land area by the earthquake are reported in this paper. The geological environment is different on Tokyo bay reclaimed land area, Kujyukuri plain area, Tonegawa river lowland area and Shimousa upland area. [OUTLINE OF LIQUEFACTION-FLUIDIZATION PHENOMENA ON BOSO PENINSULA]: 1) Liq-flu disaster distribute on artificial formation. 2) Liq-flu phenomena distribute mainly on northern Boso peninsula. Because the strength of shake increase to north of Boso peninsula. 3) Liq-flu disaster are more serious and widely at this earthquake than at 1987 east off Chiba prefecture earthquake. Houses and buildings with shallow depth foundation, block walls and electric poles submerged and tilted. Ground subside few ten centimeter and waved. Underground pipeline, tap water pipe and sewage pipe, were torn off. 4) 4 type sand volcanoes are recognized. 5) Seriousness of damage by liq-flu are different in reclaimed land. 6) Liq-flu phenomena distribute little on artificial formation with some preventive measure for liquefaction. [CHARACTERISTICS OF LIQUEFACTION-FLUIDIZATION DISASTER ON SOUTHERN CHIBA CITY IN TOKYO BAY RECLAIMED LAND]: 1) Liq-flu damage zones with few hundred meters wide distribute on this reclaimed land. Large part of the damage zones distribute on the thick part of the Holocene formation. 2) Liq-flu disaster distribute on sandy strata of Artificial formation, but the disaster distribute little on muddy strata of the formation (Kazaoka et al.,2000). Difference of few tens meter order seriousness of liq-flu disaster may depend on the litho-facies lateral change of Artificial formation and soil improvement. 3) Large amount of jetted coarse silt to fine sand poured into sewage pipe and drainage ditch. The drainage systems had been stopped up by the fine sediments. 4) Jetted sand distribute on 2 meter height, from road surface, in artificial hill. This shows the groundwater table to rise to 2 meters height from road surface. 5) Jetted sand distribute on corner of building and side of electric pole. 6) Strong shaking might decrease on liq-flu part, because tall furniture toppled little in there. Same phenomena happened at the 1995 Hanshin-Awaji Earthquake (Nirei et al.,1996). [SURVEY POINT FROM NOW]: It is very important the next surveys for urban planning against liq-flu disaster. 1) Recognition of lateral change of seriousness of damage and road deformation by liq-flu. 2) Recognition of lateral change and vertical change of litho-facies and groundwater flow in the Holocene formation and Artificial formation. 3) Recognition of correlation between amplification characteristic of shaking and geological structure.[FOR FUTURE RESTORATION AND RECOVERY]: 1) Against liq-flu damage: It is very important to prevent liq-flu on major road where emergency car goes through and lifeline lays under. It is consider that a drainage method of construction is suitable to prevent liq-flu on this reclaimed land because of flowing groundwater (Nirei,2003). It is necessary to consider as follows on damage control, damage situation of this earthquake, land use, geological environment, decrement effect of sheer wave by liquefaction. 2) Importance of groundwater: It is necessary to use daily the disaster prevention well and to monitor groundwater table and quality of the well. 3) Continuous landsubsidence after jetted sand. 4) Disaster education: Most of disaster is earth science field of the science. It is necessary to teach Artificial formation, the Holocene formation and the Neogene strata which disaster occur often on, and to teach geological disaster, Earthquake, Landsubsidence, Slope failure and Geo-pollution. Further it is necessary to teach sustainable use of Geo-resources, such as Land and Groundwater.

Keywords: Liquefaction-Fluidization, Boso peninsula, Artificial formation, Environmental Geology, Tokyo bay reclaimed land