1. Introduction

An earthquake of moment magnitude (M_w) 9.0 occurred off Sanriku coast at 14:46 JST on March 11, 2011 and caused tremendous damage of collapse and washed-away of buildings, houses and other structures by ground motion and tsunami in the Pacific coast of eastern Japan, including prefectures of Iwate, Miyagi, Fukushima, Ibaraki and Chiba. The earthquake has recorded the seismic intensity 7, highest in the Japan Meteorological Agency (hereinafter referred to as JMA) scale, in north of Miyagi prefecture (Kurihara city). The JMA named the earthquake as "The 2011 off the Pacific coast of Tohoku Earthquake" (hereinafter referred to as 'the 2011 Tohoku earthquake') and the national government named the disaster "the Great East Japan Earthquake" based on a Cabinet decision. As of July 11, the JMA has confirmed six major aftershocks of magnitude 7 or larger. The Japanese National Police Agency has confirmed 15,550 deaths, 5,688 injuries and 5,344 people missing, as well as 224,798 housing units collapsed, 434,327 housing units partially damaged and 32,443 non-residential buildings damaged.

The seismic intensity 6 lower (6-) in JMA scale has been recorded for the first time in Tsukuba city, Ibaraki prefecture, where the National Institute for Land and Infrastructure Management (hereinafter referred to as NILIM) and the Building Research Institute (hereinafter referred to as BRI) are located. Both research institutes share the main building. Some office rooms suffered from falling of cabinets and bookshelves, even a staff has been locked indoors. Although cracks of wall and other structural damage occurred in the main building, fortunately there was no one injured. Immediately after confirmation of safety of staff members who were working in the buildings both institutes initiated to collect information on earthquake damage. Some staff members who were visiting Tokyo and other areas could not return to office in the next few days, since all the transportation systems stopped. As the e-mail system even within the institute had become unstable, it was difficult to collect overall information, except by using the micro-wave communication lines that are owned by the Headquarter of the Ministry of Land, Infrastructure, Transport and Tourism (hereinafter referred to as MLIT) in Kasumigaseki, Tokyo. Some NILIM staff members remained at office in order to maintain contacts with MLIT and to collect further information, while other staffs returned to their homes to continue collecting information and to prepare for operation in the next days in the daytime because electricity supply had been disrupted in both institutes and even traffic signals were out of order.

From the next day, Saturday March 12, both NILIM and BRI started activities including field survey and established the "NILIM / BRI Joint Survey Team on Building Damage Investigation (hereinafter referred to as Joint Survey Team; Note 1)" in order to

prepare for the requests of support from the earthquake affected areas and for the future measures against earthquake and tsunami through learning of the damage situations to buildings. The Joint Survey Team has supported surveys on earthquake and the damage of buildings caused by the earthquake motions, mainly responding to the requests of MLIT for the first two weeks after the earthquake. In succession, NILIM and BRI jointly dispatched the team to the affected areas in Tohoku and Kanto regions in order to get an overall picture on damage by ground motion and also carried out surveys on damage of buildings in tsunami affected areas and so on, as joint surveys.

This report summarizes the research and studies that were mainly carried out during the six weeks after the earthquake until April 20 and that were published in Japanese as "Quick report of the Field Survey and Research on the 2011 off the Pacific coast of Tohoku earthquake (The Great East Japan Earthquake)". However the research and studies conducted after the date are also partly included. The Joint Survey Team has held a lot of meetings and continues discussion on survey results and necessary additional surveys. This report does not cover all the disaster since the earthquake affected area was huge spreading from Tohoku region to Kanto region, as the name, "the Great East Japan Earthquake" indicates.

Note 1: Members of the NILIM/BRI Joint Survey Team, as of April 20.
from NILIM, Kenji Takai, Tadashi Tonami, Isao Nishiyama, Atsuo Fukai, Tomoko Takagi, Ichiro Minato, Yoshiyuki Shibata, Katsuhiko Kusuda, Masanori Nishiyama, Haruhiko Watanabe, Hiroyuki Tanano, Yuji Kobayashi, Hiroshi Arai, Namihiko Inoue, Akiyoshi Mukai, Tatsuya Azuhata, Hitomitsu Kikitsu, Takahiro Tsuchimoto, Yoshihiro Iwata, Haruhiko Suwada, Tomohiro Naruse, Koji Kagiya, Tatsuya Iwami, Hideki Yoshioka, Ryo Ootake, Satoru Takahashi, Masashi Mori, Hiroshi Hasegawa, Kazuo Nishida, Satoshi Arikawa, Shuichi Takeya, Nozomi Kiuchi, Tomohiko Sakata, 33 staff members,
from BRI, Hiroshi Ito, Juntaro Tsuru, Takashi Nagasaki, Harunobu Murakami, Akira Iwasaki, Ryosuke Sasa, Shigeto Kawasaki, Masaaki Hasegawa, Shigenori Ootaka, Shuichi Go, Kazuhiko Karasawa, Hiroyuki Tasaki, Kunihiko Miyazawa, Zenichi Naito, Shoichi Ando, Takao Sawachi, Naoji Hasegawa, Nobuo Hurukawa, Izuru Okawa, Toshihide Kashima, Shin Koyama, Toshiaki Yokoi, Bunichiro Shibazaki, Tatsuhiko Hara, Tadashi Ishihara, Tsutomu Hirade, Masanori Iiba, Hiroshi Fukuyama, Hiroto Kato, Takashi Hasegawa, Yasuhiro Araki, Toshikazu Kabeyasawa, Mizuo Inukai, Koichi Morita, Masanori Tani, Nobuyoshi Yamaguchi, Shiro Nakajima, Takafumi Nakagawa, Yoshio Wakiyama, Taiki Saito, Tomohisa Mukai, Yasuo Okuda, Yuushiro Fujii, Ichiro Hagiwara, Yoshihiko Hayashi, Junichi Suzuki, Norimitsu Ishi, Wataru Gojo, 48 staff members

Note 2: Source of information (web-sites)

The web-sites for the 2011 Tohoku earthquake are established in NILIM (http://www.nilim.go.jp/) and BRI (http://www.kenken.go.jp/, http://iisee.kenken.go.jp/) showing original information of individual researches and surveys that are bases of this report.

Some data that are updated before the publication of this report were also added, when it is available.