

## Reports on Damage to Buildings, etc. brought about by the Tornado which hit Tsukuba, Ibaraki on May 6, 2012

OKUDA Yasuo, Research Coordinator for Disaster Mitigation of Buildings (Dr., Engineering)  
Research Center for Disaster Management

FUKAI Atsuo, Head

KABEYASAWA Toshikazu, Researcher(Dr., Engineering)  
Building Department, Standards and Accreditation System Division

TSUCHIMOTO Takahiro, Head ( Dr., Engineering)  
Research Center for Land and Construction Management, Evaluation System Division

(Key words) Tornado, F3, Ranking of Wind Damage, Falling

### 1. Introduction

Damage to buildings and other facilities cause by the tornado that occurred in Joso city of Ibaraki prefecture at around 12:35 on 6th May 2012, were brought about mainly in such area as Hojo, Osuna and North industrial Park in Tsukuba city of Ibaraki prefecture. According to the Metrological Agency, a gust of wind was caused by the tornado, and its damage ranged approximately 17km long and 500 meters wide spreading from Joso city to Tsukuba city at the estimated Fujita scale 3 judging from the damage.

NILIM and Building Research Institute(BRI) surveyed immediately after the occurrence of the tornado in order to grasp the damage to the buildings, etc. in Tsukuba city and made an on-spot summary report.<sup>1),2)</sup>

### 2. Damage Report

The Tsukuba city office has reported the damage, 1casualty, 37 injured, 210 totally collapsed buildings, 47 mostly collapsed, 197 half collapsed and 639 were partially damaged. Both NILIM and BRI have classified those buildings as damaged by the gusty wind focusing on the Hojo area of Tsukuba city and made the Damage Distribution map Fig. (1).

Among the buildings made of wood, there were various degrees of damage such as completely overturned buildings, removed superstructures, collapse, inclination, blown roof framework, blown roofing materials, broken windows and aluminum sash. Particularly the case of whole wooden houses ripped from their foundation and overturned (Photo-1) was unprecedented in our country. The mechanism that caused the damage was studied and the wind velocity at the outset of the damage was estimated.

Although there were no reports on direct damage to building complexes made of reinforced concrete hit by the tornado, damage to balcony rails, windows and sash was caused by the objects brought by the tornado (Photo-2).



Damage distribution map Fig. 1.



Overturned building (Photo-1) Wind pressure of the tornado and hit by flown objects (Photo-2).

### 3. Summary

We have surveyed the disasters by the Tornado occurred in Tsukubacity on May 6, 2012 and summarized the findings as above.

### Reference

1) TECHNICAL NOTE of NILIM No. 703 Damage investigation report on buildings brought about by the Tornado occurred in Tsukuba city of Ibaraki prefecture on 6th May 2012 (Heisei 24), as of January 2013.

<http://www.nilim.go.jp/lab/bcg/siryou/tmn/tmn0703.htm>

2)

Quick Report on Damage to Buildings by the Tornado on May 6, 2012 in Tsukuba City, Ibaraki Prefecture, JAPAN

<http://www.nilim.go.jp/lab/bbg/saigai/index.html>