
Damage Investigation of Buildings or the like by Tornadoes Occurring on September 2, 2013

OKUDA Yasuo (Dr Eng.), Research Coordinator for Disaster Mitigation of Building

Research Center for Disaster Management

ANDO Koji (Dr. Eng.), Head

KABEYASAWA Toshikazu (Dr. Eng.), Researcher

Standards and Accreditation System Division, Building Department

NAKAGAWA Takafumi (Dr. Eng.), Senior Researcher

Housing Production Division, Housing Department

(Key words) Tornado, Gale devastation rank, Gymnasium roof, timber houses

1. Outline of investigation

On September 2, 2013, a tornado ranked 2 on the Fujita scale occurred and caused damage to buildings or the like, centering on Koshigaya City, Matsubushi-machi, Saitama Prefecture and Noda City, Chiba Prefecture. NILIM carried out onsite investigations on September 2, 3 and 5 in order to comprehend the outline of the damage in regard to buildings and so forth in collaboration with the Building Research Institute.

2. Damage distribution

We carried out appearance inspections for 593 buildings in total, targeting areas which seemed to have especially momentous damage within the scope of investigations and judged the damage degree in view of damage of structural frames/roofs/exterior members or the like based on the gale damaged degree ranking (see chart). In this investigation, collapsed damage of 17 buildings (Rank 5) was confirmed in total. In addition, we have found that damage by tornadoes were more or less

distributed in a linear fashion.



Figure Distribution of gale damage degree rank

3. Damage to educational facilities

The damaged gymnasium of an educational facility has a flat surface size of 20m x 30m and height of about 10m, and the roof is a cubic truss with a reform construction implemented in 2005 (Photo1). For fixing the roofage to the main building, screws were used. The metal roof is partially twisted up due to breakup at connecting part between the main building and roofage and the broken part was about 25% of the total area. Moreover, part of the roof was bent upward. Furthermore, the fall of slope roof is confirmed in addition to the destruction of steel sheet roofage and the main building.



Photo 1: Damage in educational facility A
Gymnasium

4. Damage to timber housing

The timber house illustrated in Photo 2 shows the possibility of destruction due to the upper structure of a building blown from the neighboring area. As an example of the collapse of a whole structure, we corroborated a two-story house had its ground floor collapse and upper structure blown away leaving its foundation. Other than these, (1) damage to the roof truss, (2) damage to openings/exterior finishes and (3)

damage by incoming articles have been corroborated.



Photo 2: Collapse of upper structure in timber
housing

(Reference)

NILIM disaster investigation report (home):
Damages by tornadoes occurring on September 2,
2013 in Koshigaya City, Saitama Prefecture and
Noda City, Chiba Prefecture (flash report)
<http://www.nilim.go.jp/lab/bbg/saigai/h25koshigaya/130904tatsumaki.pdf>