Performance of Masonry Buildings in St. Peter, Minnesota During the March 29, 1998 Tornadoes

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Abstract:

Thirteen tornadoes struck southern Minnesota, March 29, 1998. The city of St. Peter, MN and the adjacent campus of Gustavus Adolphus College, were hit by a multi-vortex tornado, classified as F4 on the Fujita scale, with path width and length that exceeded 1 mile (1.6 km) and 17 miles (27 km), respectively. The city of St. Peter and Gustavus Adolphus College have large inventories of masonry buildings with construction dates that span more than one century, several of which were damaged during the storm. A TMS Disaster Investigation team surveyed the performance of masonry buildings in St. Peter and Gustavus Adolphus College, given the large inventory of masonry buildings and news reports of widespread damage. This paper summarizes the data collected by the team, and provides an assessment of masonry building performance during the tornadoes.

The observed performance of masonry buildings was very good, as long as certain undesirable practices were avoided. No apparent trends were found which correlate damage vulnerability with either age of building at the time of the storm or design method used to proportion the building components (that is, engineered vs. empirical). Common instances of structural damage in masonry buildings were related to deficiencies in roof diaphragms and tie-downs to the masonry walls, as well as large unsupported openings in the masonry. Other types of masonry distresses observed include cracking and crushing from projectile impact, parapet uplift and collapse, brick veneer peeling, and loss of coping stones and cladding panels. Nonstructural damage was extensive with many buildings suffering window breakage, water damage and roof damage (loss of shingles and ballast, partial loss of membranes, and damage to coping and flashing, to complete roof lift off and removal).

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