

## **Estimating engineering based wind speed distributions for EF scale**

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Wind speeds in tornadoes are subjectively estimated from damaged structures or trees in a tornado path. The subjective estimates are based on expert elicitation for EF scale. The wind speeds in EF scale for various damage indicators (DI) do not reflect the progressive failure mechanism of structures, wide variabilities in construction and tornado characteristics. To obtain a better estimate of the EF scale winds speeds, this research is focused on engineering based tornado damage simulations of a few DI's such as one or two story single-family house, manufactured home and freestanding towers. A three-dimensional time-stepping tornado wind field and detailed models of single family and manufactured homes are used to simulate tornado damage for these structures. The damage simulation considers possible failure modes and internal pressure change including the effect of pressure drop at the core of a tornado with the progressive collapse of the structure. Wind speeds are estimated for freestanding towers using a simple load and resistance model. Wind speed distributions for each DIs and EF scale obtained from model runs show high variability and overlapping wind speeds.