

ScholarWorks@UMass Amherst

OPEN ACCESS DISSERTATIONS

Title

Risk Quantification of Maple Trees Subjected to Wind Loading

Author

Cihan Ciftci, *University of Massachusetts Amherst* Follow

Date of Award

9-2012

Document Type

Open Access Dissertation

Degree Name

Doctor of Philosophy (PhD)

Degree Program

Civil Engineering

First Advisor

Sergio Brena

Second Advisor

Brian Kane

Third Advisor

Sanjay Arwade

Subject Categories

Chemical Engineering

Abstract

Because of property damage and people injuries in, almost, every year in different locations of the earth, unfortunately the topic of understanding trees and their risk assessments under wind forces has not lost its importance since approximately a half of the last century. In contrast to loss its importance, the number of researchers or studies increases with time thanks to inter-disciplinary studies on that topic. In this Thesis, tree dynamics and their risk assessments subjected to wind forces were addressed by two different disciplines (civil engineering and environmental conservation).

To mention includes of this inter-disciplinary study, first, a finite element modeling was developed for a real tree in Belchertown, MA. Then this modeling was compared with the experimental tests. After comparing the model and the tests of the real tree, same methodology of the modeling was, again, applied to a different tree in Amherst, MA. Second, a number of wind samples were generated randomly in order to apply to the models of the trees. Then, by comparing the moments at the stem of the trees and calculated maximum moments of the stems, the fragility curves of the failures of these trees was obtained with respect to mean wind-speed of the random wind samples. Third, the decay effects on the fragility curves were investigated by considering decreasing moment capacity of tree cross-sections due to decays. Finally, crown structure effects on tree dynamics were examined by several parametric studies which were applied to the tree in Belchertown, MA. These parametric studies refer to separately changes in several physical (such as stem diameter, branch slenderness ratio etc.) and material property (MOE) of the tree. Thus, thanks to these parametric studies, tree dynamics were understood better and the complex relationship between the stem and branches of the tree was explained better. Those better understandings, off course, produced several important practical outcomes for the life of the trees and as well as human-being.

Recommended Citation

Ciftci, Cihan, "Risk Quantification of Maple Trees Subjected to Wind Loading" (2012). *Open Access Dissertations*. 635.

https://scholarworks.umass.edu/open_access_dissertations/635

[Download](#)

DOWNLOADS

Since December 12, 2012

Included in

[Chemical Engineering Commons](#)

Share

COinS