Application of Aeroelasticity in Civil Engineering

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Abstract

The Tacoma Bridge disaster, in the 40s, has opened a new interesting chapter in Civil Engineering. Besides, development of Science caused to use other sciences in Civil Engineering. Certain types of civil engineering structures can be subjected to aero-Dynamic forces generated by structural motions. These motions, called self-excited, are in turn affected by the aerodynamic forces they generate. Behavior associated with self-excited motions is called aeroelastic. Aeroelastically is divided in tow group: Static aeroelasticity and dynamic aeroelasticity. Tall chimneys, buildings structures, Cable bridges, Communication masts, Electricity transmission lines, Lighting columns and Marine structures May also respond aeroelastically and need to be designed accordingly. In this research we tried to discuss whether the seismic design is sufficient for aeroelastic forces. Finally tried to explain Aeroelasticity application's in Civil Engineering.

Keywords: Aeroelasticity, seismic design, civil structures, aerodynamic forces, bridge.

1. INTRODUCTION

Tall chimneys, buildings structures, Cable bridges, Communication masts, Electricity transmission lines, Lighting columns and Marine structures May also respond aeroelastically and need to be designed accordingly. Aeroelasticity is applicable for Aerospace Vehicles, Transportations, Medical and Computer Technology. Often the civil structures that mentioned are designing for seismic loads not for aeroelastic forces. Mathematical modelling, Numerical simulation, Wind tunnel testing, Hybrid experimental-numerical, dynamic testing and Validation against large scale tests and full scale measurements are some methods for Considering Aeroelasticity forces on structures. It's essential to study other issues like:

- Other flow-induced vibrations
- Structural health monitoring
- Vibration damping systems
- Hybrid testing
- Pedestrian – structure interaction

In addition studying deeply some of Civil engineering problems such as slender structures, large amplitude, fatigue damage and Structural non-linearity and interactions shows the effect of the aerodynamic forces. All cases which mentioned above are some of examples among large number of Aeroelasticity application's in Civil engineering. After some disaster in 1995, some affects such as wind on structures discussed [1].

In this research we tried to discuss whether the seismic design is sufficient for aeroelastic forces. Finally tried to explain Aeroelasticity application's in Civil Engineering.