1. Record Nr. UNINA9910139057603321

Autore	Xu You-Lin <1952->
Titolo	Wind effects on cable-supported bridges / / You-Lin Xu
Pubbl/distr/stampa	Singapore : , : Wiley, , 2013
ISBN	1-118-18829-2 1-299-31590-9 1-118-18830-6
Descrizione fisica	1 online resource (772 pages) : illustrations, charts
Disciplina	624.2/52
Soggetti	Cable-stayed bridges Wind-pressure
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	Wind Effects on Cable-Supported Bridges; Contents; Foreword by Ahsan Kareem; Foreword by Hai-Fan Xiang; Preface; Acknowledgements; 1 Wind Storms and Cable-Supported Bridges; 1.1 Preview; 1.2 Basic Notions of Meteorology; 1.2.1 Global Wind Circulations; 1.2.2 Pressure Gradient Force; 1.2.3 Coriolis Force; 1.2.4 Geostrophic Wind; 1.2.5 Gradient Wind; 1.2.6 Frictional Effects; 1.3 Basic Types of Wind Storms; 1.3.1 Gales from Large Depressions; 1.3.2 Monsoons; 1.3.3 Tropical Cyclones (Hurricanes or Typhoons); 1.3.4 Thunderstorms; 1.3.5 Downbursts; 1.3.6 Tornadoes; 1.3.7 Downslope Winds 1.4 Basic Types of Cable-Supported Bridges; 1.4.1 Main Features of Cable-Supported Bridges; 1.4.2 Suspension Bridges; 1.4.3 Cable-Stayed Bridges; 1.4.4 Hybrid Cable-Supported Bridges; 1.5 Wind Damage to Cable-Supported Bridges; 1.5.1 Suspension Bridges; 1.5.2 Cable-Stayed Bridges; 1.5.3 Stay Cables; 1.5.4 Road Vehicles Running on Bridge; 1.6 History of Bridge Aerodynamics; 1.7 Organization of this Book; 1.8 Notations; References; 2 Wind Characteristics in Atmospheric Boundary Layer; 2.1 Preview; 2.2 TurbulentWinds in Atmospheric Boundary Layer; 2.3 Mean Wind Speed Profiles 2.3.1 The "Logarithmic Law"; 2.3.2 The "Power Law"; 2.3.3 Mean Wind Speed Profile Over Ocean; 2.3.4 Mean Wind Speed Profile in Tropical Cyclone; 2.4 Wind Turbulence; 2.4.1 Standard Deviations; 2.4.2

Turbulence Intensities; 2.4.3 Time Scales and Integral Length Scales; 2.4.4 Probability Density Functions; 2.4.5 Power Spectral Density Functions; 2.4.6 Covariance and Correlation; 2.4.7 Cross-Spectrum and Coherence; 2.4.8 Gust Wind Speed and Gust Factor; 2.5 Terrain and Topographic Effects; 2.5.1 Change of Surface Roughness; 2.5.2 Amplification of Wind by Hills
2.5.3 Amplification Factor and Speed-up Ratio; 2.5.4 Funneling Effect; 2.6 Design Wind Speeds; 2.6.1 Exceedance Probability and Return Period; 2.6.2 Probability Distribution Function; 2.6.3 Generalized Extreme Value Distribution; 2.6.4 Extreme Wind Estimation by the Gumbel Distribution; 2.6.5 Extreme Wind Estimation by the Method of Moments; 2.6.6 Design Lifespan and Risk; 2.6.7 Parent Wind Distribution; 2.7 Directional Preference of High Winds; 2.8 Case Study: Tsing Ma Bridge Site; 2.8.1 Anemometers in WASHMS; 2.8.2 Typhoon Wind Characteristics
2.8.3 Monsoon Wind and Joint Probability Density Function; 2.9 Notations; References; 3 Mean Wind Load and Aerostatic Instability; 3.1 Preview; 3.2 Mean Wind Load and Force Coefficients; 3.2.1 Bernoulli's Equation and Wind Pressure; 3.2.2 Mean Wind Load; 3.2.3 Wind Force Coefficients; 3.3 Torsional Divergence; 3.4 3-D Aerostatic Instability Analysis; 3.5 Finite Element Modeling of Long-Span Cable-Supported Bridges; 3.5.1 Theoretical Background; 3.5.2 Spine Beam Model; 3.5.3 Multi-Scale Model; 3.5.4 Modeling of Cables; 3.6 Mean Wind Response Analysis; 3.6.1 Determination of Reference Position; 3.6.2 Mean Wind Response Analysis

Sommario/riassunto

As an in-depth guide to understanding wind effects on cable-supported bridges, this book uses analytical, numerical and experimental methods to give readers a fundamental and practical understanding of the subject matter. It is structured to systemically move from introductory areas through to advanced topics currently being developed from research work. The author concludes with the application of the theory covered to real-world examples, enabling readers to apply their knowledge. The author provides background material, covering areas such as wind climate, cable-supported bridges, wind-induced damage, and the history of bridge wind engineering. Wind characteristics in atmospheric boundary layer, mean wind load and aerostatic instability, wind-induced vibration and aerodynamic instability, and wind tunnel testing are then described as the fundamentals of the subject. State-of-the-art contributions include rain-wind-induced cable vibration, wind-vehicle-bridge interaction, wind-induced vibration control, wind and structural health monitoring, fatigue analysis, reliability analysis, typhoon wind simulation, non-stationary and nonlinear buffeting response. Lastly, the theory is applied to the actual long-span cable-supported bridges. Structured in an easy-to-follow way, covering the topic from the fundamentals right through to the state-of-the-art Describes advanced topics such as wind and structural health monitoring and non-stationary and nonlinear buffeting response Gives a comprehensive description of various methods including CFD simulations of bridge and vehicle loading Uses two projects with which the author has worked extensively, Stonecutters cable-stayed bridge and Tsing Ma suspension bridge, as worked examples, giving readers a practical understanding.