WIND EFFECTS ON STRUCTURES:

AN INTRODUCTION TO WIND ENGINEERING

Emil Simiu

Center for Building Technology National Bureau of Standards Washington, D.C.

Robert H. Scanlan Department of Civil Engineering Princeton University Princeton, New Jersey

R

Technische Hochschule Darmstadt Fachbereich Mechanik Bibliothek Inv.-Nr._____B_M_80/79

A Wiley-Interscience Publication JOHN WILEY & SONS New York / Chichester / Brisbane / Toronto

Contents

Introduction 1

PART A ,THE ATMOSPHERE

- 1 Atmospheric Circulations 7
- 2 The Atmospheric Boundary Layer 36
- 3 Wind Climatology and Its Relation to Structural Design 76

PART B WIND LOADS AND THEIR EFFECTS ON STRUCTURES

I Fundamentals

- 4 Bluff Body Aerodynamics 111
- 5 Structural Dynamics 171
- 6 Aeroelastic Phenomena 193

II Applications to Design

- 7 Along-Wind Tall Building Response 247
- 8 Across-Wind and Torsional Response 276
- 9 The Wind Tunnel as a Design Tool 318
- 10 Wind-Induced Discomfort In and Around Buildings 343
- 11 Tornado Effects 386

Appendix A1 Elements of Probability Theory and Applications 407

Appendix A2 Random Processes 437 Index 451