ACCURIS

ESDU Wind Engineering

Designing for the effects of wind is critical

The **ESDU Wind Engineering Series** is a comprehensive and rigorously validated collection of engineering design methods, data, and software aimed at enabling engineers to predict accurately the effects of wind on structures. It's part of the broader ESDU portfolio, which provides independently validated analysis tools and guidance for various engineering disciplines.

Key Features of the Series

➤ Wind Speeds & Turbulence Profiles

The Series includes methods and programs to estimate design wind speeds and turbulence characteristics across diverse terrains. This includes modelling topographic effects, mean and gust speeds, and turbulence intensity.

Why it matters:
It helps engineers determine design wind speeds for different locations and conditions, ensuring structures can withstand extreme events resulting in safe structural design.

➤ Force and Pressure Coefficients

Structured procedures allow the calculation of aerodynamic loads and pressure coefficients for a wide range of structures: stacks, masts, polygonal towers, lattice frameworks, boundary walls, and standard building shapes. Surface roughness and high Reynolds number effects are also addressed.

Why it matters:
The Series provides accurate pressure and force data for structural design and for calculating wind-induced forces and pressures accurately, thus reducing risk of failure under wind loads.

➤ Dynamic Response Analysis

The Series supports dynamic effect evaluation — such as buffeting, vortex shedding, and galloping — which is especially critical near the natural frequencies of structures.

It offers guidance on:
- dynamic loading calculations;
- interaction effects (*e.g.*, closely spaced circular structures);
- vibration and damping characteristics for different structural types.

Why it matters:
Such analyses are critical for tall, slender structures where dynamic wind effects can cause vibrations or fatigue in order to prevent unwanted or even catastrophic scenarios.

➤ Natural Vibration Characteristics

The Series provides tools to determine natural vibration attributes — such as mode shapes, natural frequencies, and damping — for buildings and simple structural forms such as bridges, thus assisting in wind or earthquake response prediction.

Why it matters:
It ensures structures avoid resonance with wind-induced vibrations, improving safety and comfort.

➤ Design Methods and Worked Examples

Step-by-step calculation procedures are included, along with practical examples for common structural types.

Why it matters:
It simplifies application of theory to real-world projects, saving time and reducing errors.

➤ Software Tools

Programs to automate wind load and dynamic response calculations are included.

Why it matters:
It speeds up design workflows and ensures consistency through the use of validated methods.

Series Structure & Validation Process

Organizational Framework

The introductory Data Item (ESDU 02011) outlines the Series' structure, amendment history, and contents, ensuring transparency and ease of reference.

Data Items and Software Integration

The Series is comprised of Data Items — self-contained modules including theory, references, worked examples, and software designed to automate calculations.

Validation by Expert Committees

Developed and continuously refined under the guidance of international industrial and academic specialists, each ESDU method undergoes rigorous validation to ensure reliability and industry recognition.

Summary of Content

Section	Focus Areas
Wind Speeds & Turbulence	Mean, gust, extreme speeds; turbulence metrics across terrains
Pressure & Force Coefficients	Aerodynamic loading on common structural elements
Dynamic Effects	Buffeting, vortex shedding, galloping; vibrational interactions
Vibration & Damping Characteristics	Determination of natural frequencies, modes, and damping for structural systems
Natural Vibration Characteristics	Response to wind or seismic excitation

ESDU Case Study
Wind Engineering at ESDU

With the desire to build increasingly taller buildings and longer bridges, assessing the effects of wind loads has become even more important. One example is the world's tallest building – the Burj Dubai Tower.

Validated methods and software within the ESDU Wind Engineering Series were used in the design of this building. The size of such buildings is, however, just one factor that has contributed to the increasing interest in wind engineering, a discipline that deals with the analysis and prediction of the effects of wind on structures. The types of increasingly innovative, light, flexible, complex structures that architects are designing also have a considerable impact on wind considerations.

Reliable methods and data are required to analyze is the complex effects that wind has on a structure. Buildings and structures are flexible and the taller that they are, the more likely that they are to sway with the wind. However, too much movement can be disturbing to building occupants and architects can counter this effect by installing systems to minimize swaying. It is therefore increasingly important to be able to predict accurately the effect of wind loads on structures — before wind tunnel testing of models and subsequent construction.

Since 1970, Accuris ESDU has been publishing its Wind Engineering Series, which has been designed to provide validated methods and data for predicting the wind loads on buildings and other structures — and their response to those loads.

In the first instance, Wind Engineering is the study of the nature of wind itself, and the Wind Engineering Series is a means of predicting the nature of the wind and its potential extremes, including local topographical effects, and using that information to calculate the pressures and forces acting on structures. With these data, architects and structural engineers can reliably calculate the structural response. The ESDU Wind Engineering Series lays out the steps engineers must follow to calculate these responses, supported by ESDU Engineers as part of their subscription.

About Accuris

For over 60 years, our teams have focused on meeting the current and future needs of engineers and on understanding, facilitating and improving their day-to-day workflows.

Today, Accuris specializes in SaaS technology solutions that leverage proprietary artificial intelligence and unmatched access to engineering data and insights embedded into workflows to solve problems, reduce risk, and accelerate innovation. We work with over 6,000 global customers and 650,000 engineering end users in over 100 countries and dozens of industries – including aerospace and defense, energy, sustainability, construction, architecture, and more. Accuris partners with 400+ Standards Development Organizations to support their non-profit missions, streamlining access to 2.8 million engineering standards for innovation and progress across the globe.

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