acceleration can be obtained using a simple static analysis. It is suggested that caution must be exercised when combining the loads instead of response according to the preceding expression, for example,

$$\hat{P}_j = \overline{P}_j + \sqrt{\hat{P}_{Bj}^2 + \hat{P}_{Rj}^2} \qquad \text{(C26.9-23)}$$

because the background and the resonant load components have normally different distributions along the building height. Additional background can be found in ISO (1997) and Sataka et al. (2003).

**Example:** The following example is presented to illustrate the calculation of the gust effect factor. Table C26.9-1 uses the given information to obtain values from Table 26.9-1. Table C26.9-2 presents the calculated values. Table C26.9-3 summarizes the calculated displacements and accelerations as a function of the height, $z$.

**Given Values:**

Basic wind speed at reference height in exposure $C$ = 90 mi/h
Type of exposure = $B$
Building height $h$ = 600 ft
Building width $B$ = 100 ft
Building depth $L$ = 100 ft
Building natural frequency $n_1$ = 0.2 Hz
Damping ratio = 0.01
$C_{fx}$ = 1.3
Mode exponent = 1.0
Building density = 12 lb/ft$^3$ = 0.3727 slugs/ft$^3$
Air density = 0.0024 slugs/ft$^3$

**Aerodynamic Loads on Tall Buildings—An Interactive Database.** Under the action of wind, tall buildings oscillate simultaneously in the along-wind, across-wind, and torsional directions. While the along-wind loads have been successfully treated in terms of gust loading factors based on quasi-steady and strip theories, the across-wind and torsional loads cannot be treated in this manner, as these loads cannot be related in a straightforward manner to fluctuations in the approach flow. As a result, most current codes and standards provide little guidance for the across-wind and torsional response ISO (1997) and Sataka et al. (2003).

To provide some guidance at the preliminary design stages of buildings, an interactive aerodynamic loads database for assessing dynamic wind-induced loads on a suite of generic isolated buildings is introduced. Although the analysis based on this experimental database is not intended to replace wind tunnel testing in the final design stages, it provides users a methodology to approximate the previously untreated across-wind and torsional responses in the early design stages. The database consists of high-frequency base balance measurements involving seven rectangular building models, with side ratio ($D/B$, where $D$ is the depth of the building section along the oncoming wind direction) from 1/3 to 3, three aspect ratios for each building model in two approach flows, namely, BL1 ($\overline{\alpha}$ = 0.16) and BL2 ($\overline{\alpha}$ = 0.35) corresponding to an open and an urban environment. The data are accessible with a user-friendly Java-based applet through the worldwide Internet community at http://aerodata.ce.nd.edu/interface/interface.html. Through the use of this interactive portal, users can select the geometry and dimensions of a model building from the available choices and specify an urban or suburban condition. Upon doing so, the aerodynamic load spectra for the along-wind, across-wind, or torsional directions is displayed with a Java interface permitting users to specify a reduced frequency (building frequency × building dimension/wind velocity) of interest and automatically obtain the corresponding spectral value. When coupled with the supporting Web documentation, examples, and concise analysis procedure, the database provides a comprehensive tool for computation of wind-induced response of tall buildings, suitable as a design guide in the preliminary stages.

**Example:** An example tall building is used to demonstrate the analysis using the database. The building is a square steel tall building with size $H \times W1 \times W2 = 656 \times 131 \times 131$ ft ($200 \times 40 \times 40$ m) and an average radius of gyration of 59 ft (18 m).

The three fundamental mode frequencies, $f_1$, are 0.2, 0.2, and 0.35 Hz in $X$, $Y$, and $Z$ directions, respectively; the mode shapes are all linear, or $\beta$ is equal to 1.0, and there is no modal coupling. The building density is equal to 0.485 slugs/ft$^3$ (250 kg/m$^3$). This building is located in Exposure A or close to the BL2 test condition of the Internet-based database (Zhou et al. 2002). In this location (Exposure A), the reference 3-sec design gust speed at a 50-year recurrence interval is 207 ft/s (63 m/s) [ASCE 7-98], which is equal to 62 ft/s (18.9 m/s) upon conversion to 1-h mean wind speed with 50-yr MRI ($207 \times 0.30 = 62$ m/s). For serviceability requirements, 1-h mean wind speed with 10-yr MRI is equal to 46 ft/s (14 m/s) ($207 \times 0.30 \times 0.74 = 46$). For the sake of illustration only, the first mode critical structural damping ratio, $\zeta_1$, is to be 0.01 for both survivability and serviceability design.

Using these aerodynamic data and the procedures provided on the Web and in ISO (1997), the wind load effects are evaluated and the results are presented in Table C26.9-4. This table includes base moments