Editorial | *Highlighting Significant Changes in ASCE 7-10*

By Donald O. Dusenberry, P.E., SECB

As always seems to be the case each time ASCE/SEI's *Minimum Design Loads for Buildings and Other Structures* (ASCE 7-10) is reissued, the new edition looks very different from the previous edition. There have been numerous editorial and format changes throughout, and a significant collection of updates based on recent research. In addition, there have been several fundamental changes that deserve highlighting.

Performance-Based Design

The basic philosophy of the document is adapting to the growing support for performance-based building codes. Now, for the first time, the basic requirements for determining the strength and stiffness of structures are described in the first chapter of ASCE 7-10 as being by the traditional strength or allowable stress approaches, or by newly-introduced performance-based procedures. Little has changed for the familiar strength and allowable stress procedures. However, ASCE 7-10 now sets forth the basic steps that designers might pursue to demonstrate that a structure provides appropriate reliability based on analyses and testing not directly defined in this standard. This sets the stage for new creativity in the satisfaction of the design intent that underlies this standard.

Wind Loads

A first glance at the wind speed maps in ASCE 7-10 will suggest that this edition of the standard requires design pressures that are much higher than those in the previous edition. This is not actually the case because adjustments in the load factor and elimination of importance factors for wind loads compensate.

Previous editions of the standard published importance factors that engineers applied to the wind pressures shown on a single map of wind speeds to adjust the risk to account for the occupancy of the building. The intent in previous editions was to change the mean recurrence interval for the design-base wind storm to adjust the conservatism of the design to suit the occupancy of the structure.

However, research has shown that return period statistics for wind speeds associated with hurricanes differ from those for wind speeds caused by other types of storms. The use of a single table of importance factors to modify the basic wind speeds in all parts of the country did not lead to uniform probability of exceedance (i.e., risk of overload) everywhere.

To address this inconsistency, instead of just one map, ASCE 7-10 now has a series of wind speed maps that are constructed directly for the risk categories. Each map is constructed to create uniform probability of exceedance throughout the country, regardless of the type of storm causing the wind. The importance factors on wind are eliminated by effectively including them directly in the wind speed maps.

That is not the only change in the wind speed maps. Following the lead of the seismic section of the standard which converted to long-return-period seismic events about two decades ago, the magnitudes of the mapped wind speeds in ASCE 7-10 now are set at strength limit states values. This means that the strength design load factor on wind loads is changed from previous editions' value of 1.6 to 1.0 in the new edition. For allowable stress design, wind pressures based on the mapped wind speeds are reduced by applying a factor of 0.6 to bring them into line with service load magnitudes.

These adjustments change design pressures in some parts of the hurricane region and some other areas of the country, where recent research indicates changes were necessary to create uniform risk. However, for the vast majority of the country these changes are implemented without changing design pressures significantly.

Seismic Loads

The ground motion maps in the seismic sections of the standard incorporate new seismic hazard data developed by the United States Geological Survey (USGS) and related changes developed by the Building Seismic Safety Council. The maps have been updated to reflect risk-targeted magnitudes, reflecting probabilistic ground motions that are based on unifying risk, rather than hazard as has been done in the past. They also now consider revised deterministic ground motions near active faults.

The net changes (either increasing or decreasing design ground motions) typically are small in the central portion of the United States and moderate (plus or minus 10%) in the western United States. The changes are more significant in certain cities where new hazard data developed by the USGS have improved understanding about seismic hazards.

The changes highlighted above are important for the creation of reliable structures that meet the needs of our population, while advancing the technology and processes for structural design to keep pace with our rapidly advancing tools and philosophies for design. There are other important changes, including reorganizing the wind loads section into topic-oriented chapters, that are intended to simplify the process for design engineers. In making these improvements, the committee that maintains this standard continues in its quest for reliable approaches that are straightforward for engineers to apply.▪

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