ASCE 7 Controversy

A Rebuttal

By Ronald O. Hamburger, S.E., SECB, FSEI

Jim DeStefano raises many good points as to the complexity of the building codes in general and the ASCE 7 standard in particular. I have made these same arguments many times over the years, in this same magazine and other venues. However, the challenges to adoption of ASCE 7-16 had nothing to do with code complexity or changes in design procedures. Rather, these challenges were about two things: 1) significantly increased values of wind pressure coefficients at areas of discontinuities on roofs, the principal concern of the roofing industry; and 2) changes to site class coefficients for long period structures on soft soil sites, causing an increase in seismic design values for some structures.

Countering these increases in design conservatism, the wind speed maps have been revised based on the availability of long-term wind data from hundreds of stations, allowing substantial reductions in design wind speeds and design wind loads across most of the U.S. In fact, except in exposure D, limited to a 600-foot wide strip along the Atlantic and Gulf coasts, these speed reductions mostly counter the change in cladding coefficients and allow substantial reductions in the required strength of the main wind force resisting system. Further reductions in wind load can be obtained by accounting for reduced air density at high elevation sites, allowing substantial reductions in wind pressures in places like Denver and Reno.

What else has changed? Well, the snow loading Chapter has indeed become longer and more complex. How? Instead of the so-called "case study" zones on the maps in mountainous regions, the Standard now provide tables with specific ground snow load values for most major communities in the affected areas. Thicker document? Yes. Easier to use? Yes. Other important changes include addition of a chapter on tsunami-resistant design, an Appendix on performance-based fire-effects design, and a substantial update of the seismic nonlinear response history procedures bringing them in line with procedures commonly used in the Western U.S. The seismic isolation and energy dissipation procedures have been harmonized with those in ASCE 41, which also has been updated to adopt the new response history procedures. The rain load procedures have been made substantially clearer and easy to apply.

Another change engineers will likely find useful is the availability of an electronic, web-based version of the standard and a companion tool that will enable determination of mapped values of snow, seismic, and wind loading parameters from a single source. This tool will also enable construction of transects to facilitate computation of topography coefficients for wind pressures. Engineers will be able to annotate their personal copies and index them to find frequently used criteria.

This aside, I agree that the Standard is far larger, more complex and challenging to use than the design criteria specified by building codes 40 years ago when Jim and I first entered practice. The complexity has slowly grown for several reasons, including, as Jim suggests, a desire to over-prescribe the design procedures rather than allowing engineers to use basic knowledge and judgment to determine loads and other facets of design. At the start of this cycle, I made a significant effort to reverse this, simplify the procedures, and eliminate prescription. At one point I pushed for a two-volume standard; one containing basic procedures that would apply to the design of most ordinary buildings, and the other containing more complex procedures used only a fraction of the time. The basic procedures would have included criteria for dead and live loads, snow loads for buildings of simple geometry, the simplified wind procedure, and the equivalent lateral force procedure for seismic. All other procedures, used only a fraction of the time, if ever, would have appeared in the second volume. We felt most engineers would use only the first volume, which they would find short and user-friendly. Those engineers who design more complex structures would go to the second volume, where the more elegant procedures would reside. Ultimately this concept was discouraged by ASCE staff as being confusing, since some loads, such as wind and seismic, would have chapters in multiple volumes. Perhaps we will find a way to do this in future editions

As noted, there is little doubt the codes are complex. In addition to the tendency to over-prescribe calculation procedures, previously discussed, there are other reasons for this complexity. Most engineers state they want the codes to be simple, reliable, and result in economical construction. My opinion is that you can satisfy only two of these at a time. The codes of 40 years ago were simple, less economical than today's requirements, and far less reliable. Using today's standards, you can still design simply and the design will be reliable. However, the resulting design likely will not be economical. Our standards have been developed assuming most engineers would prefer to use more complex procedures that are both economical and reliable.

In the end, complex evolving codes and standards do place a burden on engineers. We cannot complacently leave school thinking that we know everything that we will ever have to know. Instead, we have to keep current with developments in our field, learn new procedures, and yes, do more work. Of course, 40 years ago, the electronic slide-rule calculator was just becoming a mainstay. Today we have untold power at our fingertips in the form of personal computers, with far more power than the IBM and Sperry mainframes of 40 years ago, to help us deal with the complexity. Do we really want to go back to the world of the 1970s? I do not think so.▪

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