An ASCE 7 White Paper
The Issue of Serviceability Requirements in Building Codes and Standards

The General Structural Requirements Subcommittee of ASCE 7 is reaching out to the engineering community for input on the idea of serviceability limit states as they relate to ASCE 7. In order to make an informed decision, respondents are encouraged to study how serviceability is currently treated in ASCE 7-10; study the points raised in this white paper including a review of some or all of the references included; and finally, complete a brief survey that addresses this topic.

Currently, the ASCE 7-10 Standard, Minimum Design Loads for Buildings and Other Structures, requires that a designer address both strength limit states (Section 1.3.1 in general and 1.3.1.1 specifically) and serviceability limit states (Section 1.3.2). Section 1.3.2 on serviceability states “Structural systems, and members thereof, shall be designed to have stiffness to limit deflections, lateral drift, vibration and any other deformations that adversely affect the intended use and performance of buildings and other structures”. ASCE 7-10 Appendix C “Serviceability Considerations”, a non-mandatory appendix, also contains guidelines (but no specific limits). Current building codes primarily address life safety and strength limit states, and also have addressed some, but certainly not all, important serviceability limit states affecting building performance.

Specification and code writers face the challenge of how to address serviceability issues going forward, recognizing that the profession is moving forward with an emphasis on Performance Based Design concepts in codes and standards. The debate centers around whether codes and standards should address serviceability issues faced by designers in a more general way with performance based guidelines as is currently done; or, should they contain more specific minimum limits on deflections, drift, floor vibration, thermal effects, etc. Clearly, the issue can be argued from both sides. With the profession developing performance based design approaches, this issue is important to setting the direction that code and standards will take in the future.

Factors being raised that support a more thorough treatment of serviceability issues include the following:
1. The current general language in Section 1.3.2 can be used in a legal argument on design performance against the designer for perceived performance problems raised by a Client.
2. Specific minimum limits or targets on serviceability (deflections, drift, floor vibration, etc) would allow a designer defend his/her design against challenges about whether serviceability design has been addressed. In effect, engineers could “check the box” saying that such minimum serviceability limits are met and therefore, the design is adequate.
3. Some designers do not adequately address serviceability or are not knowledgeable about serviceability requirements; specific limits in the standard would help improve serviceability performance of buildings.
4. Some international standards (e.g. The Canadian Code, Eurocodes, etc) place serviceability requirements in their standards and the US should as well.
5. With more emphasis by some clients and stakeholders on maintenance, loss of operation and repair costs after hazard events, serviceability should be more thoroughly addressed in codes and standards.

Factors being raised against a more thorough treatment of serviceability issues include the following:
1. Serviceability requirements can be very complex and simplified minimum targets are highly dependent on the manner in which the analysis is carried out and the assumptions that are made.
2. Serviceability requirements vary widely among stakeholders. Serviceability targets and goals are a matter that should be addressed at the beginning of the design process between the designer and client being served.
3. Strength limit states are a matter of life safety and are properly addressed in a code and standard; serviceability limit states are a contractual matter between the designer and the client and have no place in a code or standard.
4. Serviceability limit states are more properly addressed in design guides where more detail and controlling factors can be discussed by experts in the field. The topic is too complex to place simplified limits in a code or standard without significant commentary to back it up.

5. Calculations on serviceability limits can vary widely depending on the analysis approach and assumptions made. Putting specific limits in a code or standard without a significant attention to the matter of how the limits are calculated and the proper assumptions to be made for different conditions would only serve to complicate the issue and invite legal disputes in cases where serviceability performance is being challenged by a client.

6. Placing minimum or target serviceability requirements in a code or standard with the necessary commentary to explain it serves to increase the size and complexity of a standard that is already being criticized for its size and complexity.

7. Placing more serviceability requirements in the standard seems to contradict the goals of performance based design, which seek to place more flexibility on design approaches that are less prescriptive, lead to a specific target performance for a given project, and place a greater emphasis and respect on the contributions of structural engineers in society.

Other arguments can be made on both sides of this issue as well. The public survey created in conjunction with this white paper seeks your input on addressing serviceability in future editions of the ASCE 7 Standard.

Suggested References on Serviceability Requirements


