

Concrete Floor Slabs on Cambered Structural Steel

ASCC Position Statement #39

Concrete floors placed on metal decking are often supported by unshored cambered structural steel beams. The objectives of this steel-concrete system are to obtain a level floor and a slab thickness within tolerances as the fresh concrete is placed and screeded on the metal decking supported by the cambered steel beams. To accomplish these objectives requires the dead load deflection of the concrete to offset the induced camber in the steel beam. If these do not offset, the finished concrete floor elevation may be too high or too low.

The economical use of cambered steel beams is considered standard practice (“Economical Use of Cambered Steel Beams” by Larson and Huzzard, AISC, *Conference Proceedings*, 2003) and requires the concrete contractor to place a constant slab thickness, within tolerances, that provides the dead load deflection to offset the design engineer’s specified camber. However, there is no exact science for either specifying or providing the required amount of camber.

“Specifying Camber” by Downey, AISC, *Modern Steel Construction*, July 2006, and “Economy in Steel,” by Carter et al., AISC, *Modern Steel Construction*, April 2000, include the following guidelines for designers specifying camber in steel beams:

- Don’t specify camber for spandrel beams, beams with lengths less than 24 ft, or beams with cantilevers or beams in moment frames.
- Don’t specify camber of less than 3/4 in.
- Don’t overspecify camber.
- Consider specifying 2/3 to 3/4 of the calculated camber.

AISC specifications indicate that a measured camber ranging from 3/4 to 1-1/2 in. for a 40-ft-long beam is acceptable if the construction documents specify

a 1 in. camber. Camber measurements are taken in the shop in the unstressed condition and there is likely to be a loss in camber, perhaps 25%, as a result of transporting the steel from the shop to the site.

AISC states: “All parties involved should meet and agree upon the best approach for the project. Do not promise the owner a perfectly flat floor—cambering is not an exact science. Even for a design executed perfectly, there will be variations in floor elevation.”

“Specifications for Tolerances for Concrete Construction and Materials (ACI 117-10) and Commentary” requires a *minus* thickness tolerance of 1/4 in. and allows for a specified flatness tolerance. It does not, however, include an elevation or levelness tolerance. AISC states that for a typical office building, it is preferable to have a small amount of camber remain (about 1/2 in.) after placing the slab to accommodate some superimposed dead load and live load.

ASCC concrete contractors will place floors within the ACI 117 slab thickness tolerance of -1/4 in. when the engineer specifies cambered steel beams. ASCC contractors agree with AISC that with cambered steel beams, even with perfectly executed design and construction, there will be variations in the floor elevation.

If you have any questions, contact your ASCC concrete contractor or the ASCC Technical Hotline at (800) 331-0668.



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