

SLAB THICKNESS RECOMMENDATIONS

To Whom It May Concern:

There are multiple references to the recommended minimum slab thickness offered by the Tilt-Up Concrete Association (TCA) in publications and resources. These can presently be found in *TCA Guideline for Temporary Wind Bracing of Tilt-Up Concrete Panels During Construction*, which is available as a free download from the TCA website (section 8.1); *The Construction of Tilt-Up* and *Engineering Tilt-Up*, both available for purchase through the TCA website. These documents provide clarity to the issue that all tilt-up panels, when braced to a building's floor slab, must consider the designed thickness of the slab. In most cases, the building's floor slab is designed by the Engineer of Record prior to the tilt-up contractor being selected and therefore the influence of the bracing scheme. Therefore, in March of 2014, TCA published a position statement on the issue of responsibility stating:

The Owner's designated representative for construction shall be responsible for assigning a qualified firm to review the floor slab capacity for the bracing of the tilt-up panels in accordance to the latest edition of the TCA bracing guidelines.

This position statement can be found on TCA's website and published at Tilt-Up TODAY magazine.

Looking at the resources, section 8.1 of the Bracing Guideline document presents "a method that may be used to estimate the minimum floor slab thickness." It also states, "this method should be used for estimating purposes only," and "The floor slab should be designed by a professional engineer to resist the applied brace forces furnished by the brace supplier." In other words, the Engineer of Record is unlikely to know the forces the braces will transfer into the floor slab at the time the permit drawings are produced. However, a floor slab may be designed sufficient to far exceed the capacity of such an estimated minimum floor slab thickness based on ACI 318 and influenced by ACI 302.

The Construction of Tilt-Up is the primary state-of-the-art resource for teaching tilt-up construction. It is also the official study resource for the ACI/TCA Tilt-Up Supervisor Certification. Chapter 5 provides a discussion of issues for the floor slab, however, prior to that discussion, the manual encourages involvement of the contractor in pre-design meetings as much

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as possible for addressing “limitations and concerns such as slab thickness, panel size (height, weight, width, thickness, and configuration), temporary bracing requirements... This is of particular importance if one of the team members is not familiar with tilt-up.” In Chapter 5, a discussion of the influences for proper floor slab design is noted. Direction is given to the contractor that the Engineer of Record is likely to have designed the floor slab for conditions of the finished building use loads but not considered such influences as the types of joints, dowel sizes (if used) and spacings, the crane size and resulting loads, as well as the bracing scheme and access use on the slab. The chapter proceeds to suggest that “experience has shown” that a 5-in. (127 mm) floor slab on well-compacted soil is satisfactory for most load conditions. It also suggests that many contractors prefer a 6-in. (152 mm) floor slab thickness for less curling, etc. This could be more currently stated that *for industrial-use buildings, it is common to use a minimum 6-inch thick slab due to floor loading conditions (rack storage, forklifts) but for other building uses (where there is light floor loading) a minimum 5-inch thick slab is necessary for brace anchorage. Alternatively, a portion of the slab can be thickened where the braces will be attached as long as the thickened slab has been designed for the uplift and shear forces from the braces.* This chapter puts forth that capacity charts for the bolts used to anchor the brace feet to the slab have not been developed for slab thickness less than 5-in. (127 mm). In other words, these conditions are suggested values based on state-of-the-art and therefore are offered as recommended practice, not absolute minimums based on design formulas and performance testing.

Engineering Tilt-Up is the final reference of significance to the discussion of minimum floor slab thickness. In this design aid reference for engineers to learn how tilt-up panels are designed, guidance is given for the parameters to consider for influencing the thickness of wall panels. In this itemized list, number 6 is “will the wall panels be braced to the concrete slab on grade during construction? How does this affect the design of the slab-on-grade? Who is responsible for specifying this?” Here the engineer is alerted that the floor slab may be influenced by means and methods to handle the short-term loads of panels and the bracing for wind conditions. There is a decision to make for how this influences the concrete slab-on-ground or specifying to the contractor what responsibilities he/she will assume. The remaining discussion of floor slabs in this reference are directed at the force resistance or capacity of floor slabs to complete the shear diaphragm of the in-place, completed building shell and not construction-period design conditions, which are directed for this condition to the prior two documents.

Today, new floor systems are usually built in stages. Unfortunately, when the schedule has the panels ready to brace to the slab, only the first stage is in place and is often only 3 in. (76 mm) thick. On such projects, it becomes even more imperative that the contractor has the engineer responsible for the bracing design evaluate any required modifications to the slab due to brace loading. As mentioned previously, these modifications usually involve thickening small

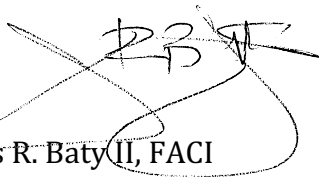
sections of the slab parallel to the panels being braced. Adding light reinforcing that extends into the existing thin section of slab is also considered. This does put more pressure on tilt-up scheduling because input from the bracing engineer is required before slab construction can begin.

The TCA also recognizes that today, proprietary slab designs are becoming more common in the industrial market where there may be of great value in increasing the modulus of rupture (uncracked flexural strength) of the slab to allow for a thinner slab cross-section and/or greater joint spacing. In this case, brace loads and anchorage requirements should be coordinated with the proprietary slab designer/detailer.

In this fashion, the TCA positions adequate direction for in-experienced or unsupported building teams to reasonably determine effective design and construction conditions for the building's floor slab. At the same time, reference to the design formulas used to determine capacities as well as the sources of the loads introduced during the construction of tilt-up buildings permits the engagement of custom design solutions specific to the working or performance capabilities of the systems to be utilized. The TCA seeks to offer room for the advancement of new technologies within the established and reliable track record of the industry.

For more information on this issue, feel free to contact us at TCA Headquarters.

Sincerely,

A handwritten signature in black ink, appearing to read 'JB II', with a large, sweeping flourish underneath.

James R. Baty II, FACI

Manager for Regulatory and Technical Affairs