



Technical Bulletin

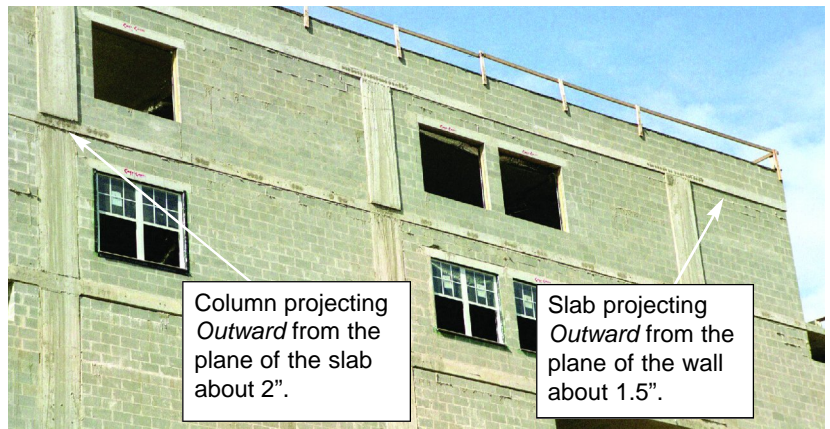
TOLERANCES: Concrete Masonry Infill & Stucco Exterior with Concrete Frame Buildings

Here's the situation:

Many High-Rise buildings (8 to 25 stories) are constructed with cast in place concrete frames and concrete block infill walls. Typically the building plans call for the concrete columns and concrete slabs to be flush to the outside of the building. A Portland cement-based plaster (Stucco) is the most commonly specified finish.

The issues:

The designer locates the specific elements of the structure in the building drawings, expecting these elements to be constructed according to the project plans and documents. Example, if a cast in place column is to be flush with the outside of the concrete slab, it is assumed that will be constructed flush with the outside of the slab. However, the reality of construction is that buildings are constructed of numerous materials and components with varying degrees of tolerance; and not with the degree of accuracy and perfection of Computer-Aided Design software. Having said that, it would be a mistake to confuse the tolerances in the code with misaligned or misplaced building elements.



From time to time, the concrete frame or the concrete masonry is out of alignment by quite a bit more than a fraction of an inch. The stucco contractor is then asked to fix it. However, with such an offset, the stucco contractor cannot execute his work within the tolerances spelled out in the code and standards which govern his work. This puts the stucco contractor in a "no-win" position. Does he try to satisfy the demands of the project or complete his work within criteria required by the building code?

Understanding the Code and Standards Tolerances:

The Florida Building Code is the presiding building code and law in the State of Florida.

ACI 318 "Building Code Requirements for Structural Concrete" is mandated in the Florida Building Code.



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ACI 117 “Standard Specification for Tolerances for Concrete Construction” referenced in ACI 318 requires adjacent members of concrete to vary no more than 1/4” in height and alignment. See reference 1.

ACI 530 “Building Code Requirement and Specification for Masonry Structures” is mandated in the Florida Building Code for masonry construction, and requires that the masonry elements are within 1/4” to 1/2” of the intended location. See reference 2.

ASTM C926 “Standard Specification for the Application of Portland Cement-Based Plaster” is mandated in the Florida Building Code for stucco, and has specific criteria for substrate tolerances. This specification also requires the installation of metal plaster base where the thickness of stucco exceeds the thickness specified in Table 1. See reference 3.

What is required:

If the building plans call for the slab, column, and masonry to be flush with no offset, it should be expected that the building will be built in accordance with the tolerances of the codes and standards. Prior to beginning his work, it is the responsibility of the stucco contractor to examine the wall, and either accept the condition of the wall or report any deficiencies to the general contractor. It is the responsibility of the general contractor to repair any deficiencies prior to the commencement of the stucco application. See reference 4.

What to do:

The wall should be brought into compliance with the plans and specifications before the stucco is applied. The repair of the wall may be performed by the stucco contractor, but this repair work should not be considered as part of the originally specified stucco application. Repair methods and materials can be found in ACI 546R Concrete Repair Guide.

Caution:

The general category of “**Concrete Repair Materials**” has been used to build-out areas of misalignment found in the substrate. Whereas most of these sophisticated compounds have performed to expectations, some have been found to actually cause cracking and delamination to take place. Consult a manufacturers representative when considering the use of these products.

Reference 1: ACI 117 “Standard Specifications for Tolerances for Concrete Construction.”
Section 4.5.3.1 “Vertical alignment of corner of exposed corner columns.... 1/4” in 10 ft.”

Note: Classes of Surfaces, i.e. Class B “Concrete formed surfaces intended to receive plaster or stucco.”

Section 4.5.4 “Offset between adjacent pieces of formwork ...shall not exceed....1/4” (Class B)

Note: It is an error to interpret an alignment tolerance of 1” between a column and a slab edge.

Reference 2: ACI 530.1 “Specification for Masonry Structures.”

Section 3.3 G Site tolerances

b. Variation from plumb.....+/- 1/4” in 10 ft.

c. True to a line+/-1/4” in 10 ft.

Section 3.3 G.3 Location of element

a. Indicated in plan +/- 1/2”

b. Indicated in elevation..... +/- 1/4” in story height

Reference 3: ASTM C 926 “Standard Specification for Portland Cement - Based Plaster.”

Section 5.2 Tolerances....”....shall be straight and true within 1/4” in 10 ft.....”

Table1. Nominal Plaster Stucco

On masonry1/2” for 2 coat work, or 5/8” for 3 coat work

On concrete.... 3/8” for 2 coat work, or 5/8” for 3 coat work

Section 5.2.3....”where total plaster thickness will exceed the total plaster thickness specified in Table 1,...metal plaster base shall be installed in accordance with Specification C 1063”.

Reference 4: ASTM C 926 “Standard Specification for Portland Cement - Based Plaster.”

Section A1.6 requires that: “Surfaces and accessories to receive plaster shall be examined before plastering is applied thereto. The proper authorities shall be notified and unsatisfactory conditions shall be corrected prior to the application of plaster. Unsatisfactory conditions shall be corrected by the party responsible for such conditions.”