



FLORIDA LATH & PLASTER BUREAU

Here's the situation:

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



Florida Lath & Plaster Bureau
6353 Lee Vista Blvd.
Orlando, Florida 32822
www.flapb.com

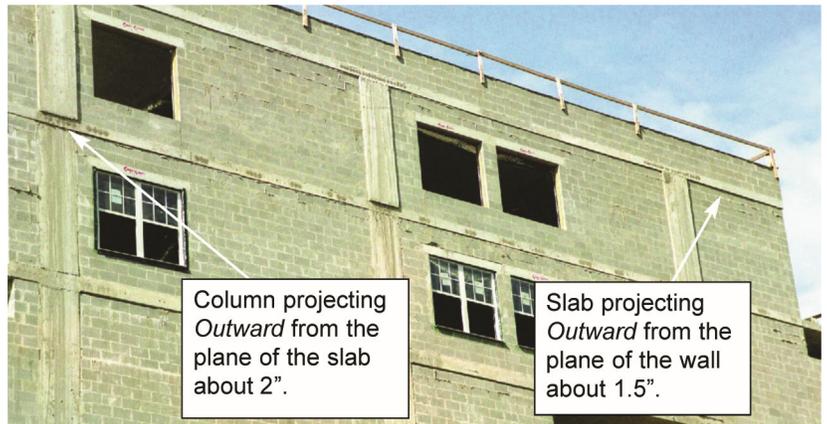
Technical Bulletin

TB-ST-#03-04.21

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

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, a cast in place column is shown to be flush with the outside of the concrete slab, other tradesmen often assume that it 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. Therefore, extreme care should be taken to ensure any issue actually exists prior to raising a flag.



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.

ACI 117 “Standard Specification for Tolerances for Concrete Construction” referenced in ACI 318.

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.

“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 corrective measures to be taken where substrate tolerances will require thicknesses exceeding those specified in Table 4. See Sections 6.2, A1.6.2 and X1.1.5.

What is required:

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. Failure to notify the general contractor, in writing, of deficiencies found amounts to tacit approval of the conditions which transfers the responsibility to the plasterer should he begin work. 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 man-

ufacturers representative when considering the use of these products.

The references below represent only a portion of the tolerances that may have an effect on your project. See the full documents for more information.

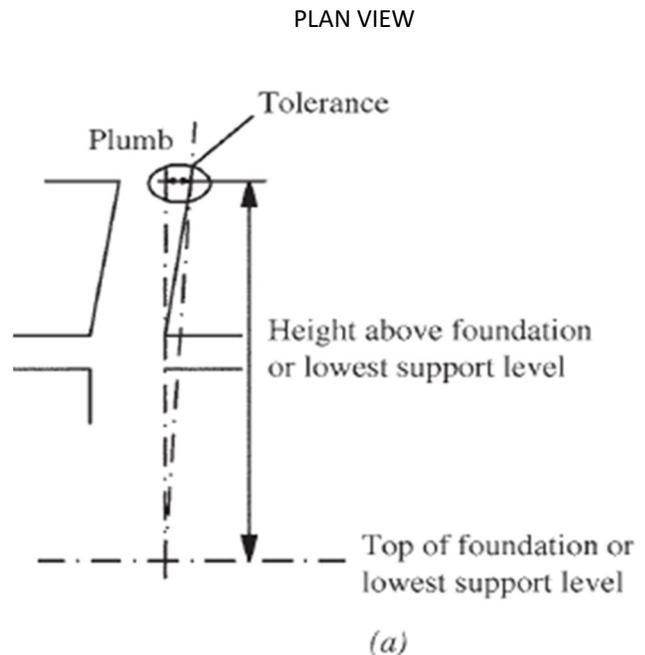
Reference 1: ACI 117 “Standard Specifications for Tolerances for Concrete Construction.”

4.1—Deviation from plumb

4.1.1 For heights less than or equal to 83 ft 4 in.

For lines, surfaces, corners, and arises: the lesser of 0.3% times the height above the top of foundations or lowest support level as shown on Project Drawings or ±1 in. This section shall not be used to evaluate local departure from a specified plane or form irregularities. Refer to Section 4.8.2 and 4.8.3, respectively.

For the outside corner of an exposed corner column and grooves in exposed concrete: the lesser of 0.2% times the height above the top of foundations or lowest support level as shown on Project Drawings or ±1/2 in. This section shall not be used to evaluate local departure from a specified plane or form irregularities. Refer to Section 4.8.2 and 4.8.3, respectively.



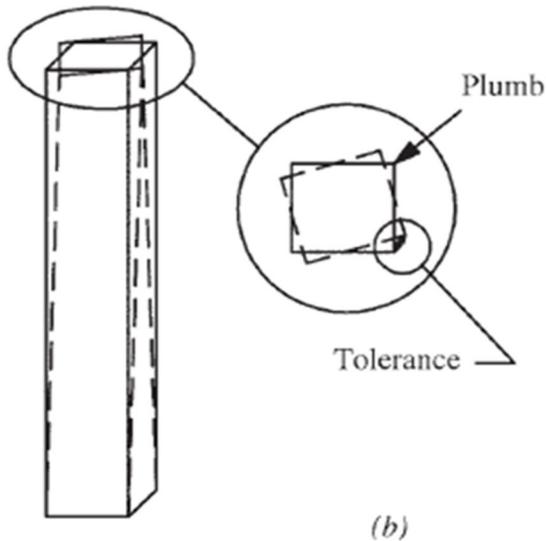


Fig. R4.1.1—Deviation from plumb.

4.1.2 For heights greater than 83 ft 4 in.

For lines, surfaces corners, arises, and elements: the lesser of 0.1% times the height above the top of foundations or lowest support level as shown on Project Drawings or ±6 in. This section shall not be used to evaluate local departure from a specified plane or form irregularities. Refer to Section 4.8.2 and 4.8.3, respectively.

For the outside corner of an exposed corner columns and contraction joint grooves in concrete exposed to view: the lesser of 0.05% times the height above the top of foundations or lowest support level as shown on Project Drawings or 3 in. This section shall not be used to evaluate local departure from a specified plane or form irregularities. Refer to Section 4.8.2 and 4.8.3, respectively.

4.8.2 Formed surfaces over distances of 10 ft

- All conditions, unless noted otherwise in this section±0.3%
- Outside corner of exposed corner column±0.2%
- Contraction joint grooves in exposed concrete...±0.2%

4.8.3 Formed surface irregularities (gradual or abrupt)

Abrupt irregularities shall be measured within 1 in. of the irregularity. Gradual surface irregularities shall be measured by determining the gap between concrete and near surface of a 5 ft straightedge, measured between contact points.

- Class A Surface..... +1/8 in.
- Class B Surface..... +1/4 in.***
- Class C Surface..... +1/2 in.
- Class D Surface..... +1 in.

*Class B surfaces include those intended to receive stucco.

Reference 2: ACI 530.1 “Specification for Masonry

Structures.”

Section 3.3 F Site tolerances

- b. Variation from plumb.....+/- 1/4” in 10 ft., 3/8” in 20 ft., 1/2” max.
- c. True to a line+/-1/4” in 10 ft., 3/8” in 20 ft., 1/2” max.

Section 3.3 F.3 Location of element

- a. Indicated in plan +/- 1/2” in 20 ft., 3/4” max.
- b. Indicated in elevation..... +/- 1/4” in story height, 3/4” max.

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

Section 6.2 Tolerances.....”shall be straight and true within 1/4” in 10 ft.....”

Table 4. 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 6.2.3....”Where bond cannot be obtained by one or more of the methods in 6.2.2. a furred or self furring plaster base shall be installed in accordance with Specification C1063 or C1787 as appropriate.”

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

Section A1.5 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. The plastering contractor shall use this portion of the construction specifications for acceptance or rejection of such surfaces.”

1.1.5 Corrective measures for conditions cited in 6.2.2 include the application of a repair/build-out mortar; grinding/chipping of the concrete base; or combinations thereof; or, where all other measures fail, installation of a furred or self-furring plaster base. Because these measures may have structural or integrity consequences, they should be considered by all concerned parties with the ultimate selection left to the discretion of the design.

Conclusions

Note the differences in tolerances between these three reference documents. It is these differences which lead to confusion and discrepancies on the jobsite. The coordination of the tolerances in relation to each other is a design responsibility.

Potential issues can be mitigated through open communications and remediation. However, remediation is a contractual obligation not assigned to any specific trade and any remedial actions undertaken should be approved by the design authority prior to any action.

Inclusion of a clause or an allowance for remediation in the Contract Documents may also be helpful.