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Specification for Tolerances for Concrete Construction and Materials (ACI 117M-10) and Commentary (ACI 117RM-10)

An ACI Standard

Reported by ACI Committee 117

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Specification for Tolerances for Concrete Construction and Materials and Commentary

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Specification synopsis: This specification provides standard tolerances for concrete construction and materials. This document is intended to be used by specification writers and ACI committees writing standards as the reference document for establishing tolerances for concrete construction and materials.

Commentary synopsis: This report is a commentary on the "Specifications for Tolerances for Concrete Construction and Materials (ACI 117M)." It is intended to be used with ACI 117M for clarity of interpretation and insight into the intent of the committee regarding the application of the tolerances set forth therein.

Keywords: architectural concrete; concrete; construction; drilled piers; formwork; foundation; mass concrete; pier; prestressed concrete; reinforced concrete; reinforcement; specification; splice; tilt-up concrete; tolerances.

ACI 117M Specification and Commentary are presented in a side-by-side column format, with code text placed in the left column and the corresponding commentary text aligned in the right column. To distinguish the specification from the commentary, the specification has been printed in Helvetica, which is the typeface for this paragraph.

The Commentary is printed in Times Roman, which is the typeface for this paragraph. Commentary section numbers are preceded by the letter "R" to distinguish them from specification section numbers. The commentary is not a part of ACI Specification 117M-10.

ACI 117M-10 supersedes ACI 117-06 and was adopted March 1, 2010 and published July 2010.

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INTRODUCTION

SPECIFICATION

COMMENTARY

This commentary pertains to "Specifications for Tolerances for Concrete Construction and Materials (ACI 117M-10)." The purpose of the commentary is to provide an illustrative and narrative complement to the specification; it is not a part of the specification.

No structure is exactly level, plumb, straight, and true. Tolerances are a means to establish permissible variation in dimension and location, giving both the designer and the contractor limits within which the work is to be performed. They are the means by which the designer conveys to the contractor the performance expectations upon which the design is based or that the project requires. Such specified tolerances should reflect design assumptions and project needs, being neither overly restrictive nor lenient.

Necessity rather than desirability should be the basis of selecting tolerances.

As the title "Specifications for Tolerances for Concrete Construction and Materials (ACI 117M)" implies, the tolerances given are standard or usual tolerances that apply to various types and uses of concrete construction. They are based on normal needs and common construction techniques and practices. Specified tolerances at variance with the standard values can cause both increases and decreases in the cost of construction.

Economic feasibility—The specified degree of accuracy has a direct impact on the cost of production and the construction method. In general, the higher degree of construction accuracy required, the higher the construction cost, and the lower the degree of construction accuracy, the higher the cost of required repairs.

Relationship of all components—The required degree of accuracy of individual parts can be influenced by adjacent units and materials, joint and connection details, and the possibility of the accumulation of tolerances in critical dimensions.

Construction techniques—The feasibility of a tolerance depends on available craftsmanship, technology, materials, and project management.

Compatibility—Designers are cautioned to use finish and architectural details that are compatible with the type and anticipated method of construction. The finish and architectural details used should be compatible with achievable concrete tolerances.

SPECIFICATION

COMMENTARY

Contract document references

ACI specification documents—The following American Concrete Institute standards provide mandatory tolerance requirements for concrete construction and can be referenced in Contract Documents:

117M	Specification for Tolerances for Concrete Construction and Materials and Commentary
ITG-7M	Specification for Tolerances for Precast Concrete
301M	Specifications for Structural Concrete
303.1	Standard Specification for Cast-in-Place Architectural Concrete
336.1	Specification for the Construction of Drilled Piers
TMS 602/530.1/ ASCE 6	Specification for Masonry Structures and Commentary

ACI informative documents—The documents of the following American Concrete Institute committees cover practice, procedures, and state-of-the-art guidance for the categories of construction as listed:

General building..... ACI 302, 303, 304, 305, 311, 315, 336, 347
Special structures.....ACI 207, 307, 313, 325, 332, 334, 358
Materials 211, 223
Other 228

SECTION 1—GENERAL REQUIREMENTS

SPECIFICATION

1.1—Scope

1.1.1 This specification designates standard tolerances for concrete construction.

1.1.2 The indicated tolerances govern unless otherwise specified.

Tolerances in this specification are for typical concrete construction and construction procedures and are applicable to exposed concrete and to architectural concrete. Materials that interface with or connect to concrete elements may have tolerance requirements that are not compatible with those contained in this document.

This specification does not apply to specialized structures, such as nuclear reactors and containment vessels, bins, prestressed circular structures, and single-family residential construction. It also does not apply to precast concrete or to shotcrete.

Tolerances for specialized concrete construction that is outside the scope of this specification shall be specified in Contract Documents.

1.1.3 A series of preconstruction tolerance coordination meetings shall be scheduled and held prior to the commencement of the Work. The Contractor, subcontractors, material suppliers, and other key parties shall attend. All parties shall be given the opportunity to identify any tolerance questions and conflicts that are applicable to the work with materials, prefabricated elements, and Work assembled/installed in the field by the Contractor.

1.2—Requirements

1.2.1 Concrete construction and materials shall comply with specified tolerances.

COMMENTARY

R1.1—Scope

R1.1.2 Specification of more restrictive tolerances for specialized construction, such as architectural concrete, often results in an increase in material cost and time of construction.

R1.1.3 Preconstruction tolerance coordination meetings provide an opportunity for key participants to identify and to resolve tolerance compatibility issues prior to construction.

R1.2—Requirements

An example of a specific application that uses a multiple of toleranced items that together yield a toleranced result is the location of the face of a concrete wall. The wall has a tolerance on location (Section 4.2.1), measured at the foundation of the wall, and is allowed to deviate from the specified plane (Sections 4.1 and 4.8.2). The application of the location tolerance (Section 4.2.1) cannot be used to increase the plumb tolerance contained in Section 4.1. Similarly, the tolerance on member thickness (Section 4.5) shall not be allowed to increase the tolerance envelope resulting from the application of Sections 4.1, 4.2.1, and 4.8.2. If the base of the wall is incorrectly located by the maximum amount allowed by Section 4.2.1, then the plumb tolerance (Section 4.1) dictates that the face of the wall move back toward the correct location, and at a rate that does not exceed the

er to Fig. R1.2.3.

SPECIFICATION

COMMENTARY

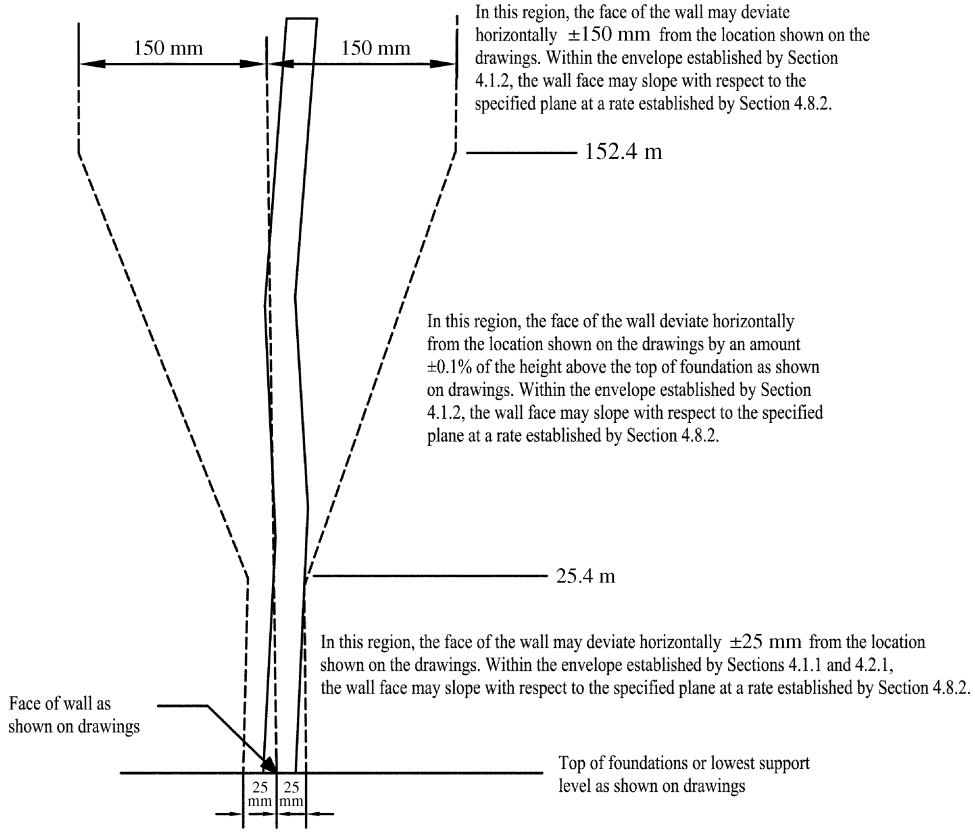

Fig. R1.2.3—Use of multiple of toleranced items to yield toleranced result.

1.2.2 Tolerances shall not extend the structure beyond legal boundaries. Tolerances are measured from the points, lines, and surfaces defined in Contract Documents. If application of tolerances causes the extension of the structure beyond legal boundaries, the tolerance must be reduced.

R1.2.2 If the application of tolerances causes the extension of the structure beyond legal boundaries, the Architect/Engineer should be notified to initiate conflict resolution.

1.2.3 Tolerances are not cumulative. The most restrictive tolerance controls.

R1.2.3 Accumulations of individual tolerances on a single item should not be used to increase an established tolerance. Individual tolerances are unique to their specific application and should not be combined with other tolerances to form a tolerance envelope. The separately specified tolerances must remain separate and not cumulative.

Each tolerance stands alone when evaluating the acceptability of concrete construction. Refer to Fig. R1.2.3.

1.2.4 Plus (+) tolerance increases the amount or dimension to which it applies, or raises a deviation from level. Minus (–) tolerance decreases the amount or dimension to which it applies, or lowers a deviation from level. Where only one signed tolerance is specified (+ or –), there is no specified tolerance in the opposing direction.