



# TECHNICAL NOTES on Brick Construction

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## Technical Notes 11D - Guide Specifications for Brick Masonry, Part 4 Continued [Aug. 1972] (Reissued Sept. 1988)

### INTRODUCTION

This issue of *Technical Notes* is a continuation of *Technical Notes* 11C Revised and contains additional sections and statements to be incorporated into the "Guide Specifications for Brick Masonry", *Technical Notes* 11A Revised and 11B Revised. This will make the guide specifications in those *Technical Notes* suitable for Engineered Brick Masonry.

The sections contained in these *Technical Notes* deal primarily with the quality assurance, selection of units, strength and construction tolerances to provide masonry that meets the minimum design requirements for Engineered Brick Masonry.

In the construction of Engineered Brick Masonry, quality control may be maintained in either of two ways: (1) by testing the brick and controlling the mortar which can be done by laboratory tests or by mixing proportions, or (2) by periodic testing of masonry prisms. This *Technical Notes* covers quality control by method (2), prism testing. *Technical Notes* 11C covers quality control by method (1), testing brick and control of mortar.

When quality control is maintained by prism tests, the brick masonry strength is determined in accordance with paragraph 4.2.2.1 of the BIA Standard, "Building Code Requirements for Engineered Brick Masonry". Test prisms are built as the walls are constructed and tested in compression at 7 days or 28 days. If prism tests are used, the quality control requirements of this *Technical Notes* should be incorporated into the guide specifications in *Technical Notes* 11A Revised and 11B Revised.

All other sections of the Guide Specifications for Brick Masonry (*Technical Notes* 11A Revised and 11B Revised) are appropriate for Engineered Brick Masonry.

### QUALITY ASSURANCE BASED ON PRISM TESTS

#### Guide Specification and Notes

#### PART I - GENERAL

##### 1.02 QUALITY ASSURANCE

*Delete sections and notes for 1.02 in Technical Notes 11A Revised, and substitute the following quality control requirements based on prism tests.*

##### A. Prism Tests:

##### 1. Preconstruction Prisms:

##### a. Build ten prisms:

(1) Of site materials insofar as possible.

(2) Use brick units similar as to color, texture, raw materials, moisture content and coring.

- (3) Under same conditions, insofar as possible, as the structure.
- (4) With same bonding, insofar as possible, as for structure.
- (5) With same mortar as for the structure.
- (6) With same joint thickness.
- (7) With same workmanship.

2. Site Control Prisms:

a. Build prisms as required by Section 1.02.D.1 at the direction of the Architect/Engineer.

- (1) Of site materials.
- (2) Of brick units selected at random from units delivered to the project.
- (3) At the project site.
- (4) With same bonding, insofar as possible, as the structure.
- (5) With site mortar.
- (6) With same joint thickness as for the structure.
- (7) With same workmanship.

3. Dimensions

a. Minimum height: 12 in. (305 mm).

b. Height-to-thickness ratio (h/t) range:

- (1) Minimum: 2
- (2) Maximum: 5

4. Mark each specimen for identification.

5. Store prisms:

a. Preconstruction prisms:

- (1) In air at temperatures not less than 65°; F. (18.3° C.).

b. Site control prisms:

- (1) At site for not less than 24 hr.
- (2) Thereafter, in air at temperatures not less than 65° F.(18.° C.).

6. Test prisms:

a. Preconstruction prisms:

(1) Five after aging 7 days.

(2) Five after aging 28 days.

b. Site control prisms:

(1) After aging 7 days.

c. Cap each prism with suitable material to provide bearing surfaces on each end:

(1) Plane within 0.003 in. (0.076 mm).

(2) Approximately perpendicular to the axis of the prism.

**NOTE:**

1.02.A.6.c It is suggested that calcined gypsum be used for the capping material.

7. Test in accordance with relevant provisions of ASTM E 447-\_\_\_\_\_, with the following provisions:

a. For h/t less than 5, reduce specimen compressive strength by correction factors as follows:

Ratio of height to thickness (h/t)	2	2.5	3	3.5	4	4.5	5
Correction factor <sup>a</sup>	0.73	0.8	0.86	0.91	0.95	0.98	1

interpolate to obtain intermediate values.

b. If the coefficient of variation of the sample tested exceeds 10%, obtain the compressive strength by multiplying the average compressive strength of the specimens by

$$1 - 1.5 \left( \frac{v}{100} - 0.10 \right)$$

$$100$$

where v is the coefficient of variation of the sample tested.

**B. Brick Tests:**

1. Preconstruction Tests:

a. Test five brick for compressive strength to determine acceptability of units for compliance with specifications.

b. Use brick similar to those selected for use, matching color, texture, raw material, moisture content and coring.

c. Cost of tests shall be borne by the General Contractor.

2. Test in accordance with ASTM C 67-\_\_\_\_\_, with the following additional requirements:

a. If the coefficient of variation of the compression samples tested exceeds 12%, obtain compressive strength by multiplying average compressive strength of specimens by

$$1 - 1.5 ( \underline{v} - 0.12 )$$

100

where v is the coefficient of variation of sample tested.

### C. Preconstruction Requirements:

#### 1. Prebid conference:

a. A prebid conference, directed by the Architect/ Engineer, will be held one week prior to the bid opening to discuss:

- (1) Structural concept.
- (2) Method and sequence of masonry construction.
- (3) Special masonry details.
- (4) Quality control requirements.
- (5) Material requirements.
- (6) Job organization.
- (7) Workmanship.

b. Attendance is mandatory for all prospective:

- (1) General contractors.
- (2) Masonry subcontractors.
- (3) Brick suppliers.

#### **NOTE:**

1.02.C This requirement may be deleted if not necessary for the project due to bidders being knowledgeable with engineered brick masonry.

1.02.C.1.b Invitation to attend should be extended to others, such as the inspectors (local building department and other government agencies) and Owner.

#### 2. Preconstruction Testing and Certification:

a. After award of the contract, the General Contractor shall:

- (1) Within 14 days, submit to the Architect/Engineer for approval the name of the independent laboratory which will perform the site control tests and provide the certificates and test reports required in Section 1.03.

(2) Upon approval of the laboratory, certificates and test reports, and prior to any masonry construction, make arrangements for the following tests for each combination of brick and mortar:

(a) Tests of ten prisms in accordance with preconstruction requirements, Section 1.02.A.

(b) Test five brick in accordance with Section 1.02.B.

b. Masonry work can begin only after approval of testing.

c. Testing is acceptable if test results indicate that materials meet the minimum requirements of Part II - Products, or Section 3.02.K.

d. Cost of preconstruction testing shall be borne by the General Contractor.

**NOTE:**

1.02.C.2 Inspection, laboratory and testing for quality control can be a responsibility of the Structural Engineer. If so, revise section.

**3. Preconstruction Conference:**

a. A preconstruction conference, directed by the Architect/Engineer, will be held after the award of the General Contract, but prior to beginning of masonry work to discuss:

(1) Structural concept.

(2) Method and sequence of masonry construction.

(3) Special masonry details.

(4) Standard of workmanship.

(5) Quality control requirements.

(6) Job organization.

b. Attendance is mandatory for:

(1) General contractor job superintendent.

(2) Masonry subcontractor job superintendent.

(3) Masonry subcontractor foreman.

(4) At least two masons.

(5) Authorized representative of the brick supplier.

(6) Mortar material suppliers.

**NOTE:**

1.02.C.3.b Invitations to attend should be extended to others, such as inspectors (local building department and other government agencies) and Owner.

D. Job Site Quality Control:

1. Site control prism tests:

- a. Use 7-day compressive strength of brick prisms to control quality.
- b. Build, store and test prisms in accordance with site control requirements, Section 1.02.A.
- c. Build three prisms for each 5000 sq. ft. (465 m<sup>2</sup>) of wall area as directed by the Architect/Engineer.

**\*\*OR\*\***

- c. Provide three prisms for each story height.
- d. Site control test data shall be acceptable if the 7-day prism strength indicates that the 28-day strength will be equal to or greater than the required minimum ultimate compressive strength. See Section 3.02.K.
- e. Cost of control prisms to be borne by the General Contractor

**NOTE:**

1.02.D.1.c Select, depending upon whichever is more frequent.

E. Furnish Sample Panel:

1. 4 ft. (1.2 m) long by 3 ft. (1 m) high, of the proposed color range, texture, bond, mortar and workmanship.
2. Erect panel in the presence of the Architect/Engineer before installation of materials.
3. Provide separate panels for each type of brick or mortar.
4. Do not start work until Architect/Engineer has accepted sample panel.
5. Use panel as standard of comparison for all masonry work built of same material.
6. Do not destroy or move panel until work is completed and accepted by Owner.

1.03 SUBMITTALS

*Add the following section to 1.03 in Technical Notes 11A Revised:*

D. Prism Test Reports:

1. Test reports are to be submitted to Architect/Engineer for approval.
2. Testing and reports are to be completed by an independent laboratory.
3. Test reports shall show:
  - a. Age at test.
  - b. Storage conditions.

- c. Dimensions (h/t).
- d. Compressive strength of individual prisms.
- e. Coefficient of variation (v).
- f. Ultimate compressive strength of masonry ( $f'_m$ ) which has been corrected for the coefficient of variation and the hit of the prisms tested.

## PART II -PRODUCTS

### 2.01 BRICK

#### A. Facing Brick:

##### *1. Delete Note and replace with:*

##### **NOTE:**

2.01.A.1 Grades and Types. Brick subject to the action of weather or soil, but not subject to frost action when permeated with water, shall be of grade MW or grade SW and where subject to temperature below freezing while in contact with soil shall be grade SW. Brick used in loadbearing or shear wall construction shall comply with the dimensional and distortion tolerances specified for type FBS of ASTM C 216-\_\_\_\_\_. Where such brick do not comply with these tolerance requirements, the compressive strength of brick masonry shall be determined by prism tests.

## PART III -EXECUTION

### 3.02 GENERAL ERECTION REQUIREMENTS

*Delete Section 3.02.I in Technical Notes 11B Revised, and replace with the following Section 3.02.I and add Sections 3.02.J And 3.02.K*

I. Lay brick with \_\_\_\_\_-in. mortar joints, not to exceed 1/2 in. (12.7 mm).

#### J. Construction Tolerances:

1. Maximum variation from plumb in vertical lines and surfaces of columns, walls and arrises:

- a. 1/4 in. (6.4 mm) in 10 ft. (3 m).
- b. 3/8 in. (9.6 mm) in a story height not to exceed 20 ft. (6 m)
- c. 1/2 in. (12.7 mm) in 40 ft. (12 m) or more.

2. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:

- a. 1/4 in. (6.4 mm) in any story or 20 ft. (6 m) maximum.
- b. 1/2 in. (12.7 mm) in 40 ft. (12 m) or more.

3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:

- a. 1/4 in. (6.4 mm) in any bay or 20 ft. (6 m).
- b. 1/2 in. (12.7 mm) in 40 ft. (12 m) or more.

4. Maximum variation from plan location of related portions of columns, walls and partitions:

a. 1/2 in. (12.7 mm) in any bay or 20 ft. (6 m).

b. 3/4 in. (19 mm) in 40 ft. (12 m) or more.

5. Maximum variation in cross-sectional dimensions of columns and thicknesses of walls from dimensions shown on drawings:

a. Minus 1/4 in. (6.4 mm).

b. Plus 1/2 in. (12.7 mm).

K. Minimum Ultimate Compressive Strength of Masonry ( $f'_m$ ) \_\_\_\_\_ psi ( \_\_\_\_\_ kgf/cm<sup>2</sup>).

**NOTE:**

3.02.K Ultimate compressive strength as determined by the Structural Engineer may vary for different parts and walls of the building. If so, provide sections to cover all design requirements.