



# TECHNICAL NOTES on Brick Construction

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## Technical Notes 11 - Guide Specifications for Brick Masonry, Part 1 Rev. [Dec. 1971] (Reissued August 2001)

### INTRODUCTION

Numerous methods are being explored to reduce constantly rising building costs. One means in which many segments of the construction industry believe holds promise of lowering these costs is the use of specific, definitive and concise specifications. They must convey to the contractor the exact requirements of the project and be organized to facilitate take-off and estimating. Many general contractors have testified that the use of such specifications results in lower contract bids.

During recent years, organizations, such as the American Institute of Architects (AIA), Producers' Council (PC), Associated General Contractors of America (AGC), and the Construction Specifications Institute (CSI), have made the improvement of construction specifications one of their major activities.

In accordance with the work of these agencies, the guide specifications in this series of *Technical Notes* are written to follow the CSI format insofar as possible.

*Use of Standards.* It is recommended that, where suitable standards exist, such as those developed by the American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), American Concrete Institute (ACI) and other similar nationally recognized organizations, they be used and included in the project specifications by reference.

*Use of Detailed Descriptive Requirements.* While detailed descriptive requirements are generally necessary as a means of specifying installation or workmanship, it is recommended that they be used only as a last resort in specifying materials.

*Use of Performance Specifications.* Performance specifications are not, in general, considered suitable for specifying architectural building products. It is recommended that, if performance specifications are used to specify building materials, they should state results desired or properties desired, but not both.

*Use of Trade Names.* It is recommended that, if building products are specified by trade names, the "special conditions" contain a clause providing that substitutes will be considered on a quality and price basis, and that the phrase "or equal", frequently included in such specifications, be eliminated.

The following paragraph is suggested for substitutions:

*Variation From Materials Specified:* It is intended that materials or products specified by name of manufacturer, brand, trade name or by catalog reference shall be the basis of the bid and furnished under the contract, unless changed by mutual agreement. Where two or more materials are named, the choice of these shall be optional with the contractor. Should the contractor wish to use any materials or products other than those specified, he shall so state, naming the proposed substitutions and stating what difference, if any, will be made in the contract price for such substitution should it be accented.

*Use of Allowances.* It is recommended that allowances be used only with discretion. In all cases of allowances, there should be sufficient description to indicate to the contractor the extent of labor required to install the items for which allowances are listed. Also, all allowances should be listed under special conditions or under a separate section with cross references to the individual trade sections involved.

### SPECIFICATIONS FOR STRUCTURAL CLAY PRODUCTS

Standard specifications for the various types and grades of brick and tile have been developed by technical committees of the American Society for Testing and Materials. Membership of these committees is balanced among consumers, manufacturers and a general interest group made up of engineers, scientists, educators, testing experts and representatives of research organizations. Because of this balance of committee membership, ASTM specifications are widely accepted and it is recommended that the appropriate ASTM specifications be included by reference in all specifications for solid brick, hollow brick, structural facing tile (glazed or unglazed) and structural clay tile.

ASTM standards are under continuous review by the stands committees having jurisdiction over them. From time to time these standards are revised as a result of new developments. The ASTM designation of a standard consists of a letter and a number permanently assigned to the standard, a dash and a number indicating the year the standard was approved: as for example, C 216-69 which designates the Standard Specifications for Facing Brick approved in 1969. If the letter T follows the year designation, it indicates a tentative standard.

When ASTM specifications are included by reference in project specifications, the full designation, including the year of approval, should be given, since, obviously, after a contract has been awarded, a revision of specifications by ASTM does not alter the contract. Similarly, the dates of any other specifications or codes included by reference should be given.

*Solid Masonry Units.* ASTM Specifications C 216, C 62, and C 126 cover solid building brick, facing brick and ceramic glazed units made from clay and/or shale. Under these specifications, a solid masonry unit may be cored not in excess of 25 per cent; consequently, the term "solid brick" is not confined to those units which have no cores, unless so stated in the project specifications.

*Hollow Masonry Units.* ASTM Specification C 652 covers hollow building brick, facing brick or hollow masonry units made from clay, shale, fire clay or mixtures thereof, and fired. The term "hollow" in this specification is defined to mean any unit cored in excess of 25 per cent, but not more than 40 per cent, in every plane parallel to the bearing surface.

*Supplementary Requirements.* ASTM specifications for brick and tile do not fix the size or color and texture of the units. They do, however, include requirements for several grades and types of products, and some of them contain optional requirements which are applicable to specific projects, if so specified.

When ASTM specifications are included in project specifications by reference, it is essential that they be supplemented with project requirements covering size, color, grade, type, etc. Without these supplementary provisions, the specifications are incomplete and inadequate as a basis for estimating.

*Size.* Size of units required should be included in the project specifications. Without this information, a contractor cannot accurately estimate quantity of materials or the labor required to construct the masonry.

It is recommended that the specified size be the manufactured size. Individual unit dimensions may vary from the specified or manufactured size by the allowable tolerances included in the appropriate ASTM specifications for the particular type or grade.

Specifying nominal sizes of clay masonry units is not recommended, due to the ambiguity of the term "nominal". In some fields, it is understood to mean approximate and actual dimensions may vary from the nominal only by permissible variations in dimensions included in the specifications. However, in modular design, the nominal dimension of a masonry unit is understood to mean the specified or manufactured dimension plus the thickness of the mortar joint with which the unit is designed to be laid; that is, modular brick, whose nominal length is 8 in., would have a specified (manufactured) length of 7 1/2 in. if designed to be laid with a 1/2 - in. joint, or 7 5/8 in. if designed to be laid with a 3/8 - in joint.

*Color and Texture.* Generally, the color and texture of the brick or structural facing tile in a masonry wall vary slightly. These variations, which prevent monotony in the appearance of the finished wall, are one of the most attractive features of brick and tile. Because of these variations and of the wide variety of colors and textures produced by the industry, it is impossible to write descriptions of either color or texture which will accurately identify the products required.

For this reason, ASTM specifications for brick and structural clay facing tile provide that texture and color shall conform to an approved sample showing the full range of color and texture that will be acceptable. The number of

units required in the sample should be stated in the project specifications and will depend upon the range of color and texture. In general, it will be from three to five.

*Grade and Type.* Most ASTM specifications for brick or structural clay tile cover two or more grades, and specifications for facing brick, hollow brick and ceramic glazed structural facing tile include requirements for two or more types. Specifications for structural clay facing tile cover two types and two classes.

When these specifications are included in project specifications by reference, it is essential that the grade and type or type and class of product required be specified. Failure to do so makes it difficult for the contractor to estimate the project and frequently results in a demand for extras after the contract is awarded.

*Cell Arrangement.* Structural clay tile are produced with either vertical cells or horizontal cells. Furring tile, nominal thickness 2 in., in ceramic glaze often referred to as "soaps", are produced with either solid backs or open (ribbed) backs. If either vertical-cell or horizontal-cell units are required for specific locations, this should be stated in the project specifications. Similarly, if solid-back soaps or furring are required, it should be so stated. Otherwise, product specifications make the selection optional with the supplier.

*Plaster Base Finish.* Specifications for structural clay facing tile and structural clay tile contain requirements for the finish of surfaces suitable for the application of plaster. When such surfaces are required, they should be specified in the project specifications; otherwise, the finish of the unexposed (back) of the unit is optional with the supplier.

*Tests.* Most ASTM specifications for structural clay products provide that the cost of tests of units furnished for any particular project "shall be borne by the purchaser", unless the tests indicate that the units do not conform to the requirements of the specifications, in which case "the cost shall be borne by the seller". Project specifications should state the number of tests that will be required and should indicate who is responsible for selecting the samples and who pays the cost of testing.

## **PROJECT SPECIFICATIONS FOR STRUCTURAL CLAY PRODUCTS**

As previously indicated, it is recommended that ASTM specifications, supplemented to meet project requirements, be used in specifying brick and structural clay tile. These specifications are suitable for use in any of the following forms:

*Open Specifications.* This type of specification, frequently required in public work, makes no reference to product trade names. In such a specification, ASTM specifications should be included by reference, supplemented with project requirements, and an "approved sample" of the required color and texture should be available for inspection by bidders prior to submission of bids.

*Trade Names.* For private work, specifying facing brick and structural facing tile by trade or manufacturer's names gives the contractor definite information as to the product required and provides the architect with assurance that the quality desired will be furnished.

In general, when this method is used, three or more acceptable products are named and the contractor is given the option of selecting among them.

When trade names are used for specifying brick or tile, it is recommended that the units be required to comply with applicable ASTM specifications and that samples of acceptable units be available for inspection of bidders prior to bidding; also, that a provision for substitution, similar to that previously recommended, be included in the specifications.

*Allowances.* The use of allowances for cost of facing brick and facing tile has been used successfully for many years and, in general, this method is recommended by the Structural Clay Products Institute. Allowances place all contractors on an equal basis and permit the owner to select products that he considers most desirable. However, when this method is employed, the specifications should state the size and texture of the units that will be selected, the tests that will be required and the responsibility for payment of tests.

## **GUIDE SPECIFICATIONS**

The guide specifications in *Technical Notes* 11A Revised and 11B Revised are written for both reinforced and non-reinforced brick masonry, designed to comply with ANSI A41.1-1953 (R1970), "Building Code Requirements for Masonry", ANSI A41.2-1960 (R 1970), "Building Code Requirements for Reinforced Masonry", or equivalent sections in the Model Building Codes.

The guide specifications in these *Technical Notes* can be used for engineered brick masonry designed to comply with *Building Code Requirements for Engineered Brick Masonry*, BIA, August 1969, or equivalent sections in the Model Building Codes, when additional quality assurance requirements are incorporated into the specification. See *Technical Notes* 11C Revised.

The specifications do not cover requirements for structural clay tile, concrete masonry units, glass block or stone. Where these materials and design procedures are included in the masonry section, the specifications should be supplemented or revised. It will be found, however, that many of the requirements pertaining to brick masonry are also applicable to other types of masonry construction.

"Guide Specifications for Masonry Mortar" will be included as a separate *Technical Notes* 11E to comply with CSI format.

Metric numbers listed are conversions from the current customary system and are not industry agreed-upon standards; i.e., a typical modular 3 1/2 x 2 1/4 x 7 1/2 - in.. (actual size) brick may be produced at some dimensions other than 89 x 57 x 191 mm when metric dimensions are adopted within the industry.

The cold weather protection requirements contained in paragraph 1.05.C are those recommended by the International Masonry Industry All-Weather Council, published December 1, 1970.

In using these specifications, the specification writer should check each section to insure compliance with project requirements and modify the paragraphs or delete those not needed.

## REFERENCES

1. *Brick and Tile Engineering*, Harry C. Plummer, Brick Institute of America (BIA), November 1967.
2. *Building Code Requirements for Engineered Brick Masonry*, BIA, August 1969.
3. *Recommended Practice for Engineered Brick Masonry*, J. G. Gross, R. D. Dikkers and J. C. Grogan, BIA, November 1969.
4. *Specifications for Clay Masonry Construction*, BIA, February 1962.
5. *Technical Notes on Brick Construction*, BIA, published monthly.
6. *Building Code Requirements for Masonry*, ANSI - A41.1-1953 (R 1970).
7. *Building Code Requirements for Reinforced Masonry*, ANSI - A41.2-1960 (R 1970).