

# Guide Specification for Higgins Brick Veneer

This is intended as a guide for specification and installation of anchored and adhered brick veneer under the provisions of Chapter 14 of the International Building Code. Chapter 14 incorporated, by reference, Chapter 6 of the Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402). Commentary to the code and specification notes are included. Also included is a new table for expanded uses of brick veneer for increased fire rating using equivalent thicknesses.

## BRICK VENEER

Building Code Requirements for Masonry Structures (ACI 530/ASCE 5/TMS 402), Chapter 6 lists general requirements for masonry veneer installation. These prescriptive requirements include a bond shear strength of 50 psi for Adhered Veneer, and compliance with the listing of the veneer ties listed in Building Code Requirements for Masonry Structures Section 6.2.2.5. The Uniform Building Code contained a prescriptive requirement that the masonry veneer tie system must be able to withstand a load capacity of at least twice the weight of the Anchored Veneer, or typically 160 pounds in tension or compression for a 4 inch thick brick veneer system. Since veneer, by code definition, is not a structural element and is not typically designed, the standard brick veneer methods are provided and clarified herein. Other code provisions are similar, Los Angeles City being slightly different, and including certain specific waivers as noted.

Some calculations indicate that when insulation is included in the wall, the most effective application for energy conservation is locating the insulation on the exterior of the structural frame. Brick veneer easily provides the required weatherproofing of the insulation. In addition to the commentary clarifying the Veneer Chapter, illustrations for Adhered and Anchored installation are given on the following sheets.

Lab tests and model analysis of earthquake and wind load resistance indicate the validity and further improvement of engineering design procedures which have been in Codes for many years. The International Building Code contains the method of cement mortar application for Adhered Veneer. However, the thin set method may be used satisfactorily, by the use of dry set material according to ANSI specification A118.1, applied in accordance with the methods of ANSI A 108.5. The thin application may be more rapid and economical. Also bond-enhancing additives may be used but the manufacturers' instructions for the various materials must be followed.

## Excerpts from the International Building Code [Chapter 14, Exterior Wall Coverings]

<b>SECTION 1401 GENERAL</b>	<b>COMMENTARY</b>
<p><b>1401.1 Scope.</b> The provisions of this chapter shall establish the minimum requirements for exterior walls; exterior wall coverings; exterior wall openings; exterior windows and doors; architectural trim; balconies and similar projections; and bay and oriel windows.</p>	<p>(a) The four foot height is exempted from the requirement because there is no appreciable hazard in the failure of such items.</p> <p>(b) The limitation of 30' above adjacent ground is because of the possibility of shrinkage and deflection of the wood construction compared to the negligible deflections that will occur in the stiff masonry veneer. However, if special provisions are made to minimize the type of distress, the building official may approve details for greater heights.</p>
<p style="text-align: center;"><b>SECTION 1402 DEFINITIONS</b></p> <p><b>ADHERED MASONRY VENEER.</b> Veneer secured and supported through the adhesion of an approved bonding material applied to an approved backing.</p> <p><b>ANCHORED MASONRY VENEER.</b> Veneer secured with approved mechanical fasteners to an approved backing.</p> <p><b>VENEER.</b> A facing attached to a wall for the purpose of providing ornamentation, protection or insulation, but not counting as adding strength to the wall.</p>	<p>The consideration of differential movement requires careful consideration of the expansion and contraction due to temperature changes, the shrinkage that may occur on concrete, or creep that may occur in prestressed concrete structures on which the veneer is mounted. Also, the deflection of the structure under load must be considered because the masonry veneer is stiff with relatively negligible deflection.</p>
<p style="text-align: center;"><b>SECTION 1403 PERFORMANCE REQUIREMENTS</b></p>	<p>(a) The basic requirements for structural design are under consideration.</p>

**1403.2 Weather protection.** Exterior walls shall provide the building with a weather-resistant exterior wall envelope. The exterior wall envelope shall include flashing, as described in Section 1405.3. The exterior wall envelope shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a water-resistive barrier behind the exterior veneer as described in Section 1404.2, and a means for draining water that enters the assembly to the exterior.

**Exceptions:**

1. A weather-resistant exterior wall envelope shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.

**SECTION 1404 MATERIALS**

**1404.2 Water resistive barrier.** A minimum of one layer of No. 15 asphalt felt, complying with ASTM D 226 for Type I felt or other approved materials, shall be attached to the studs or sheathing, with flashing as described in Section 1405.3, in such a manner as to provide a continuous water-resistive barrier behind the exterior wall veneer.

**1404.4 Masonry.** Exterior walls of masonry construction shall be designed and constructed in accordance with this section and Chapter 21. Masonry units, mortar and metal accessories used in anchored and adhered veneer shall meet the physical requirements of Chapter 21. The backing of anchored and adhered veneer shall be of concrete, masonry, steel framing or wood framing.

**SECTION 1405  
INSTALLATION OF WALL COVERINGS**

**1405.2 Weather protection.** Exterior walls shall provide weather protection for the building. The materials of the minimum nominal thickness specified in Table 1405.2 shall be acceptable as approved weather coverings.

<b>TABLE 1405.2. MINIMUM THICKNESS OF WEATHER COVERINGS</b>	
<b>COVERING TYPE</b>	<b>MINIMUM THICKNESS (inches)</b>
Adhered masonry veneer	0.25
Anchored masonry veneer	2.625

**1405.3 Flashing.** Flashing shall be installed in such a manner so as to prevent moisture from entering the wall or to redirect it to the exterior. Flashing shall be installed at the perimeters of exterior door and window assemblies, penetrations and terminations of exterior wall assemblies, exterior wall intersections with roofs, chimneys, porches, decks, balconies and similar projections and at built-in gutters and similar locations where moisture could enter the wall.

**ADHERED VENEER**

**1405.9 Adhered masonry veneer.** Adhered masonry veneer shall comply with the applicable requirements in Section 1405.9.1 and Sections 6.1 and 6.3 of ACI 530/ASCE 5/TMS 402 (Building Code Requirements for Masonry Structures, referred to as Masonry Standards Joint

(b) Tests of adhesions method may be used to determine suitability.

(c) This is the simple empirical requirement. More precise methods may be used.

Exterior veneer, including its backing, shall provide a weatherproof covering.

(c) The unit size limitations of 36" and 720 sq. in. total area as well as 15 lbs. per sq. ft. are in full recognition of the practical difficulties of workmanship in installing elements larger than this unless one makes special provision in the design. As noted in the EXCEPTION, material weighing less than three lbs. per sq. ft. is not necessarily limited in dimension or area. This is in recognition of the fact that this lightweight material can be installed in relatively large units in a workmanlike manner.

(b) These requirements are primarily to provide that the stiff, unyielding masonry veneer not be subjected to the distress caused by flexible deflecting support which, by differential movement, may impose excessive stress on the anchorages.

The 30' height may be increased if supports are designed, and non-combustible, to provide for differential movement.

This provides for adequate design to meet specific conditions.

Lintels may be of reinforced masonry.

(c) This provides for the time-proven specification type of installations listed in the Uniform Building Code. (As noted and shown on drawings.)

Committee Code, or MSJC).

**1405.9.1 Interior adhered masonry veneers.** Interior adhered masonry veneer shall have a maximum weight of 20 psf (0.958 kg/m<sup>2</sup>) and shall be installed in accordance with Section 1405.9. Where the interior adhered masonry veneer is supported by wood construction, the supporting members shall be designed to limit deflection to  $\frac{1}{600}$  of the span of the supporting members.

## CHAPTER 6 -- VENEER

MSJC **6.3.2 Prescriptive requirements for adhered masonry veneer**

6.3.2.1 *Unit sizes* – Adhered veneer units shall not exceed  $2\frac{5}{8}$  in. (66.7 mm) in specified thickness, 36 in. (914 mm) in any face dimension, nor more than 5 ft<sup>2</sup> (0.46 m<sup>2</sup>) in total face area, and shall not weigh more than 15 lb/ft<sup>2</sup> (718 Pa).

6.3.2.2 *Wall area limitations* – The height, length, and area of adhered veneer shall not be limited except as required to control restrained differential movement stresses between veneer and backing.

6.2.3.3 *Backing* – Backing shall provide a continuous, moisture-resistant surface to receive the adhered veneer. Backing is permitted to be masonry, concrete, or metal lath and portland cement plaster applied to masonry, concrete, steel framing, or wood framing.

6.2.3.4 Adhesion developed between adhered veneer units and backing shall have a shear strength of at least 50 psi (345 kPa) based on gross unit surface area when tested in accordance with ASTM C 482, or shall be adhered in compliance with Article 3.3 C of ACI 530.1/ASCE 6/TMS 602.

MSJC 3.3 C *Placing adhered veneer*

1. Brush a paste of neat portland cement on the backing and on the back of the veneer unit
2. Apply Type S mortar to the backing and to the veneer unit.
3. Tap the veneer unit into place, completely filling the space between the veneer unit and the backing. Sufficient mortar shall be used to create a slight excess to be forced out between the edges of the veneer units. The resulting thickness of the mortar in back of the veneer unit shall not be less than  $\frac{3}{8}$  in. (9.5 mm) nor more than  $1\frac{1}{4}$  in. (31.8 mm).
4. Tool the mortar joint with a round jointer when the mortar is thumbprint hard.

## SECTION 104 DUTIES AND POWERS OF BUILDING OFFICIAL

(IBC) **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

## SECTION 1405

## INSTALLATION OF WALL COVERINGS ANCHORED VENEER

**1405.5 Anchored masonry veneer.** Anchored masonry veneer shall comply with the provisions of Sections 1405.5, 1405.6, 1405.7 and 1405.8 and Sections 6.1 and 6.2 of ACI 530/ASCE 5/TMS 402.

### **6.2.2** *Prescriptive requirements for anchored masonry veneer*

**6.2.2.1** Except as provided in Section 6.2.2.11, prescriptive requirements for anchored masonry veneer shall not be used in areas where the basic wind speed exceeds 110 mph (177 km/hr) as given in ASCE 7-02.

**6.2.2.2** Connect anchored veneer to the backing with anchors that comply with Section 6.2.2.5 and Article 2.4 of ACI 530.1/ASCE 6/TMS 602.

### **6.2.2.3** *Vertical support of anchored masonry veneer*

**6.2.2.3.1** The weight of anchored veneer shall be supported vertically on concrete or masonry foundations or other noncombustible structural supports, except as permitted in Sections 6.2.2.3.1.1, 6.2.2.3.1.4, and 6.2.2.3.1.5.

**6.2.2.3.1.1** Anchored veneer is permitted to be supported vertically by preservative-treated wood foundations. The height of veneer supported by wood foundations shall not exceed 18 ft (5.49 m) above the support.

**6.2.2.3.1.2** Anchored veneer with a backing of wood framing shall not exceed the height above the noncombustible foundation given in Table 6.2.2.3.1.

**6.2.2.3.1.3** If anchored veneer with a backing of cold-formed steel framing exceeds the height above the noncombustible foundation given in Table 6.2.2.3.1, the weight of the veneer shall be supported by noncombustible construction for each story above the height limit given in Table 6.2.2.3.1.

### **Table 6.2.2.3.1 — Height limit from foundation Height at gable, ft (m)**

**6.2.2.3.1.4** When anchored veneer is used as an interior finish on wood framing, it shall have a weight of 40 lb/ft<sup>2</sup> (1915 Pa) or less and be installed in conformance with the provisions of this Chapter.

**6.2.2.3.1.5** Exterior masonry veneer having an installed weight of 40 psf (195 kg/m<sup>2</sup>) or less and height of no more than 12 ft (3.7 m) shall be permitted to be supported on wood construction. A vertical movement joint in the masonry veneer shall be used to isolate the veneer supported by wood construction from that supported by the foundation. Masonry shall be designed and constructed so that masonry is not in direct contact with wood. The horizontally spanning element supporting the masonry veneer shall be designed so that deflection due to dead plus live loads does not exceed  $l/600$  or 0.3 in. (7.6 mm).

**6.2.2.3.2** When anchored veneer is supported by floor construction, the floor shall be designed to limit deflection as required in Section 1.10.1.

**6.2.2.3.3** Provide noncombustible lintels or supports attached to noncombustible framing over openings where the anchored veneer is not self-supporting. The deflection of such lintels or supports shall conform to the requirements of Section 1.10.1.

**6.2.2.4** *Masonry units* - Masonry units shall be at least 2<sup>5</sup>/<sub>8</sub> in. (66.7 mm) in actual thickness.

### **6.2.2.5** *Anchor requirements*

#### **6.2.2.5.1** *Corrugated sheet-metal anchors*

**6.2.2.5.1.1** Corrugated sheet-metal anchors shall be at least 7/8 in. (22

mm) wide, have a base metal thickness of at least 0.03 in. (0.8 mm), and shall have corrugations with a wavelength of 0.3 to 0.5 in. (7.6 to 12.7 mm) and an amplitude of 0.06 to 0.10 in. (1.5 to 2.5 mm).

**6.2.2.5.1.2** Corrugated sheet-metal anchors shall be placed as follows:

(a) With solid units, embed anchors in the mortar joint and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar cover to the outside face.

(b) With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar or grout cover to the outside face.

**6.2.2.5.2** *Sheet-metal anchors*

**6.2.2.5.2.1** Sheet-metal anchors shall be at least <sup>7</sup>/<sub>8</sub> in. (22.2 mm) wide, shall have a base metal thickness of at least 0.06 in. (1.5 mm), and shall:

(a) have corrugations as given in Section 6.2.2.5.1.1, or

(b) be bent, notched, or punched to provide equivalent performance in pull-out or push-through.

**6.2.2.5.2.2** Sheet-metal anchors shall be placed as follows:

(a) With solid units, embed anchors in the mortar joint and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar cover to the outside face.

(b) With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar or grout cover to the outside face.

**6.2.2.5.3** *Wire anchors*

**6.2.2.5.3.1** Wire anchors shall be at least wire size W1.7 (MW11) and have ends bent to form an extension from the bend at least 2 in. (50.8 mm) long.

**6.2.2.5.3.2** Wire anchors shall be placed as follows:

(a) With solid units, embed anchors in the mortar joint and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar cover to the outside face.

(b) With hollow units, embed anchors in mortar or grout and extend into the veneer a minimum of 1<sup>1</sup>/<sub>2</sub> in. (38.1 mm), with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar or grout cover to the outside face.

**6.2.2.5.4** *Joint reinforcement*

**6.2.2.5.4.1** Ladder-type or tab-type joint reinforcement is permitted. Cross wires used to anchor masonry veneer shall be at least wire size W1.7 (MW1 1) and shall be spaced at a maximum of 16 in. (406 mm) on center. Cross wires shall be welded to longitudinal wires, which shall be at least wire size W1.7 (MW1 1).

**6.2.2.5.4.2** Embed longitudinal wires of joint reinforcement in the mortar joint with at least <sup>5</sup>/<sub>8</sub>-in. (15.9-mm) mortar cover on each side.

**6.2.2.5.5** *Adjustable anchors*

**6.2.2.5.5.1** Sheet-metal and wire components of adjustable anchors shall conform to the requirements of Section 6.2.2.5.1, 6.2.2.5.2, or 6.2.2.5.3.

Adjustable anchors with joint reinforcement shall also meet the requirements of Section 6.2.2.5.4.

**6.2.2.5.5.2** Maximum clearance between connecting parts of the tie shall be <sup>1</sup>/<sub>16</sub> in. (1.6 mm).

**6.2.2.5.5.3** Adjustable anchors shall be detailed to prevent disengagement.

**6.2.2.5.5.4** Pintle anchors shall have at least two pintle legs of wire size W2.8 (MW18) each and shall have an offset not exceeding 1<sup>1</sup>/<sub>4</sub> in. (31.8 mm).

**6.2.2.5.5.5** Adjustable anchors of equivalent strength and stiffness to those specified in Sections 6.2.2.5.5.1 through 6.2.2.5.5.4 are permitted.

**6.2.2.5.6** *Anchor spacing*

**6.2.2.5.6.1** For adjustable two-piece anchors, anchors of wire size W1.7

(MW11), and 22 gage (0.8 mm) corrugated sheet-metal anchors, provide at least one anchor for each 2.67 ft<sup>2</sup> (0.25 m<sup>2</sup>) of wall area.

**6.2.2.5.6.2** For other anchors, provide at least one anchor for each 3.5 ft<sup>2</sup> (0.33 m<sup>2</sup>) of wall area.

**6.2.2.5.6.3** Space anchors at a maximum of 32 in. (813 mm) horizontally and 18 in. (457 mm) vertically.

**6.2.2.5.6.4** Provide additional anchors around openings larger than 16 in. (406 mm) in either dimension. Space anchors around perimeter of opening at a maximum of 3 ft (0.91 m) on center. Place anchors within 12 in. (305 mm) of openings.

**6.2.2.5.7** *Joint thickness for anchors* — Mortar bed joint thickness shall be at least twice the thickness of the embedded anchor.

**6.2.2.6** *Masonry veneer anchored to wood backing*

**6.2.2.6.1** Veneer shall be attached with any anchor permitted in Section 6.2.2.5.

**6.2.2.6.2** Attach each anchor to wood studs or wood framing with a corrosion-resistant 8d common nail, or with a fastener having equivalent or greater pullout strength. For corrugated sheet-metal anchors, locate the nail or fastener within 1/2 in. (12.7 mm) of the 90-degree bend in the anchor.

**6.2.2.6.3** Maintain a maximum distance between the inside face of the veneer and outside face of the solid sheathing of 1 in. (25.4 mm) when corrugated anchors are used. Maintain a maximum distance between the inside face of the veneer and the wood stud or wood framing of 4 1/2 in. (114 mm) when other anchors are used. Maintain a 1-in. (25.4-mm) minimum air space.

**6.2.2.7** *Masonry veneer anchored to steel backing*

**6.2.2.7.1** Attach veneer with adjustable anchors.

**6.2.2.7.2** Attach each anchor to steel framing with corrosion-resistant screws that have a minimum nominal shank diameter of 0.190 in. (4.8 mm).

**6.2.2.7.3** Cold-formed steel framing shall be corrosion resistant and have a minimum base metal thickness of 0.043 in. (1.1 mm).

**6.2.2.7.4** Maintain a 4 1/2-in. (114-mm) maximum distance between the inside face of the veneer and the steel framing. Maintain a 1-in. (25.4-mm) minimum air space.

**6.2.2.8** *Masonry veneer anchored to masonry or concrete backing*

**6.2.2.8.1** Attach veneer to masonry backing with wire anchors, adjustable anchors, or joint reinforcement. Attach veneer to concrete backing with adjustable anchors.

**6.2.2.8.2** Maintain a 4 1/2-in. (114-mm) maximum distance between the inside face of the veneer and the outside face of the masonry or concrete backing. Maintain a 1-in. (25.4-mm) minimum air space.

**6.2.2.9** *Veneer laid in other than running bond* — Anchored veneer laid in other than running bond shall have joint reinforcement of at least one wire, of size W1.7 (MW1 1), spaced at a maximum of 18 in. (457 mm) on center vertically.

**1405.5.2 Seismic requirements.** Anchored masonry veneer located in Seismic Design Category C, E or F shall conform to the requirements of Section 6.2.2.10 of ACI 530/ASCE 5/TMS 402. Anchored masonry veneer located in Seismic Design Category D shall conform to the requirements for Seismic Design Category E of F.

(MSJC) 6.2.2.10 *Requirements in seismic areas*

6.2.2.10.1 *Seismic Design Category C*

6.2.2.10.1.2 Isolate the sides and top of anchored veneer from the

structure so that the vertical and lateral seismic forces resisted by the structure are not imparted to the veneer.

6.2.2.10.2 *Seismic Design Category D*

6.2.2.10.3 *Seismic Design Categories E and F*

6.2.2.10.3.1 The requirements for Seismic Design Category D and the requirements of this section apply to anchored veneer buildings in Seismic Design Categories E and F.

6.2.2.10.3.2 Support the weight of anchored veneer for each story independent of other stories.

6.2.2.10.3.3 Provide continuous single wire joint reinforcement of wire size W1.7 (MW11) at a maximum spacing of 18 in. (457 mm) on center vertically. Mechanically attach anchors to the joint reinforcement with clips or hooks.

### **Anchored Veneer**

#### **Section 3006**

**(a) Permitted Backing.** Exterior veneer including backing shall provide a weatherproof covering.

**(b) Height and Support Limitations.** Anchored veneers shall be supported on footings, foundations or other non-combustible support except as provided under Section 2515.

In seismic Zones No. 2, 3 and 4 the weight of all anchored veneers installed on structures more than 30 feet in height above the non-combustible foundation or support shall be supported by non-combustible, corrosion-resistant structural framing. The structural framing shall have horizontal supports spaced not more than 12 feet vertically above the initial 30 foot height. The vertical spacing between horizontal supports may be increased when special design techniques, approved by the building official, are used in the construction.

Non-combustible, non-corrosive lintels and non-combustible supports shall be provided over all openings where the veneer unit is not self-spanning. The deflections of all structural lintels and horizontal supports required by this subsection shall not exceed 1/600 of the span under the full load of the veneer.

**(c) Area Limitations.** The area and length of anchored veneer walls shall be unlimited, except as required to control expansion and contraction and by Section 3001 (b).

**(d) Application.** In lieu of the design required by Section 3004 (a) and (c), anchored veneer may be applied (as noted and shown on drawings

## **VENEER APPLICATION METHODS**

### **Adhered Veneer**

1. A paste of neat Portland cement shall be brushed on the backing and the back of the veneer unit. Type S mortar shall then be applied to the backing and the veneer unit. Sufficient mortar shall be used to create a slight excess to be forced out the edges of the units. The units shall be tapped into place so as to completely fill the space between the units and the backing. The resulting thickness of mortar in back of the units shall be not less than ½ inch nor more than 1-1/4 inch.
2. Units of tile, masonry, stone or terra cotta, not over 1 inch in thickness shall be restricted to 81 square inches in area unless the back side of each unit is ground or box screeded to true up any deviations from plane. These units and glass mosaic units of tile not over 2 inches by 2 inches by 3/8-inch in size may be adhered by means of Portland cement. Backing may be of masonry, concrete or Portland cement plaster on metal lath.

Metal lath shall be fastened to the supports in accordance with the requirements of Chapter 47. Mortar, as described in Table No. 30-A shall be applied to the backing as a setting bed. The setting bed shall be a minimum of 3/8 inch thick and a maximum of 3/4-inch thick. A paste of neat Portland cement or half Portland cement and half graded sand shall be applied to the back of the exterior veneer units and to the setting bed and the veneer pressed and tapped into place to provide complete coverage between the mortar the mortar bed and veneer unit. A Portland veneer grout shall be used to point the veneer.

The above two specification methods have been in the UBC for many years and provide satisfactory installations. Alternate adhered veneer installations may be provided by use of bond-enhanced mortars and by thin-set cements according to the manufacturer's specifications, as verified by tests.

## **Anchored Veneer**

### **Masonry and stone units (5 inches maximum in thickness)**

Masonry and stone veneer not exceeding 5 inches in thickness may be anchored directly to structural masonry, concrete, or studs in one of the following manners:

1. Anchor ties shall be corrosion-resistant, and if made of sheet metal, shall have a minimum size of No. 22 gauge by 1 inch or if of wire, shall be a minimum of No. 9 gauge. Anchor ties shall be spaced so as to support not more than 2 square feet of wall area but not more than 24 inches on center horizontally.

An air space of at least one inch may be maintained between the backing and the veneer in which case temporary spot bedding may be used to align the veneer

2. Veneer may be applied with a one-inch (1") minimum grouted backing space which is reinforced by not less than two inch (2" x 2") No. 16 galvanized wire mesh placed over waterproof paper backing and anchored directly to stud construction.

The stud spacing shall not exceed sixteen inches (16") on center. The galvanized wire mesh shall be anchored to wood studs by galvanized steel wire furring nails at four inches (4") on center or by barbed galvanized nails at six inches (1-1/8") on center with one and one-eighth inch (1-1/8") minimum penetration.

In Seismic Zone No. 3 and No. 4 anchor ties shall be provided to horizontal joint reinforcement wire of No. 9 gauge or equivalent. The joint reinforcement shall be continuous with butt splices between ties permitted.

When applied over stud construction, the studs shall be spaced a maximum of 16 inches on center and approved papers shall first be applied over the sheathing or wires between studs except as otherwise provided in Section 1707.

The galvanized wire mesh may be attached to steel studs by equivalent wire ties. If this method is applied over solid sheathing, the mesh must be attached at the top and the bottom with not less than 8-penny common wire nails. The grout fill shall be placed to fill the space intimately around the mesh and veneer facing.

The Los Angeles City Code permits two veneer features that had not been in the body of the code, but are in special approval. One is that veneer over openings may be supported by bolting to wood lintels, and the other is that the veneer jambs may be considered as structural support for veneer lintels.

## GUIDE SPECIFICATION

### 4.01 SCOPE

a) Installation of veneer in the areas indicated by the drawings and specified herein.

### 4.02 WORK INCLUDED

- a) Installing, pointing and cleaning of the veneer on surfaces constructed by others.
- b) Building in of all vents, conduits, inserts, and flashing, as furnished, set and braced by others.
- c) Removal of surplus veneer material and waste after completion of the veneer work.

### 4.03 WORK NOT INCLUDED

- a) Embedding or attaching anchoring devices.
- b) Shoring and bracing.
- c) Furnishing and fabricating of steel reinforcing.
- d) Furnishing scratch coat backing or support for veneer.
- e) Cleaning due to paint, plaster, and other trades.
- f) Protection of aluminum frames.
- g) Preparation of backing surface to receive veneer.

### 4.04 MATERIAL

- a) **Water** must be clean and potable.
- b) **Sand** shall be according to ASTM designation C-144, except that not less than 5% shall pass the No. 100 sieve.
- c) **Portland cement** shall conform to ASTM C-150 Type I or Type II low alkali.
- d) **Lime.** Hydrated lime shall conform to ASTM Designation C-207, Type S.
- e) **Color.** Sufficient lime-proof color fast mineral pigment shall be added as approved by the architect.
- f) **Veneer units.** Brick shall be as manufactured by Higgins Brick, of color and texture as approved by the architect.
- g) **Ties & anchors** shall be corrosion resistant. Manufacturers' proven capacity must be submitted.
- h) **Storage and Handling.** Material shall be stored and handled in such a manner as to prevent deterioration, chipping, breakage, or intrusion of foreign material.

### 4.05 MORTAR

- a) **Mortar** shall consist of one part Portland cement, one-half part hydrated lime, and 4 ½ parts clean, well-graded sand, measured damp loose. Alternate mixes with bond enhancing additives may be used if approved by the architect.
- b) **Mortar** shall be mixed long enough for thorough intimate mixing of all ingredients.
- c) **Mortar Re-tempering.** Re-tempering mortar on boards shall be done by adding water within a basin formed with the mortar and reworked.
- d) **Dry-Set Mortar** in compliance with ANSI 118.5 may be used for bond coat, as alternate to the mortar. It shall be installed in compliance with ANSI 108.5

## NOTES TO SPECIFIER

The detail and listing of "work included" and "work not included" is subject to considerable discussion and is listed here with the intent of clarifying the work included or not included by consideration of the jurisdiction that may be involvd.

The specifier should check that such items are included in other appropriate sections, especially item (d).

- a) Domestic water is satisfactory.
- b) The sand should be uniformly graded with emphasis on the finer materials, to produce a more dense and workable mortar or grout. Sands on the coarse side of the range do not provide a waterproof or neat-looking job and are difficult to use in the field.
- (c) Specify "low alkali" to reduce efflorescence tendency. Cement is a source of soluble materials that contribute to efflorescence, although there are many other contributors.
- (d) Quicklime may also be used.
- (e) Proprietary factory-mixed colored pointing mortars are available. Some colors can be achieved only by use of white cement.
- (f) The size, color and texture shall be selected and specified by the architect. They may be specified by reference to specific jobs or buildings.
- (h) The intent here is that the materials be kept in an acceptable condition during and after job delivery.
  
- (a) This mortar ratio is in compliance with the Uniform Code. Up to five or six parts of damp, loose sand might be used to compensate for bulking and to provide for a leaner mix with less shrinking. Latex mortars have proven satisfactory for bond and ease of application.
  
- (d) This provides for an economical thin bond coat by a specifically prepared mix and unit application. **backing surface is true and accurate and the units are true.**

#### 4.06 SAMPLES AND TESTS

- a) Submit samples of units, including range of colors, and size tolerances for approval.
- b) Provide sample area for approval.
- c) The quality shall be as per ASTM C216. Facing Brick Dimensional tolerance deviation shall be not greater than limits of ASTM C216.
- d) Tests of material are to be in accord with current applicable ASTM or ANSI.
- e) Ties must be substantiated for capacity.

#### 4.07 BACKING

Surface should be clean and damp, but not wet.

#### 4.08 WORKMANSHIP

- a) **Wetting.** The veneer units shall be wetted at least one hour before laying and shall be noticeably damp but free from surface water at the time of laying.
- b) **Laying.** Spread a slurry, then mortar approximately three-eighths (3/8") inch thick over the backing area, by troweling firmly. Then spread mortar over the adhering face of the unit, sufficient to create a slight excess which will be forced out at the edges of the unit. The units shall be tapped into place so as to eliminate voids in the mortar. As an alternate installation, the "thin-set" or "dry-set" method may be used. The recommendation of the manufacturer on the cement shall be followed, in compliance with ANSI specifications.
- c) **Ties.** The ties must be attached and anchored to develop required capacity.
- d) **Jointing.** The exposed joints shall be filled as the work progresses. After joints are thumbprint firm, they shall be tooled to a smooth concave surface with an approved tool.
- e) Control or expansion joint shall coincide exactly with any control joints in the backing or support and be continuous through the mortar and veneer and as shown or called for in the details.

#### 4.09 CLEANING

- a) Mortar stains shall be removed with clear water promptly as work progress. Keep it clean.
- b) Sealing and waterproofing shall be taken into consideration as a deterrent to efflorescence and other problems associated with water penetration.

#### NOTES TO SPECIFIER

The specifier may ask for a sample area or panel, suggested as follows: "A sample panel not less than 3'x3' shall be constructed for the architect's approval. It must show the method, jointing, range of completion and approval of the veneer." This will assure a meeting of the minds regarding final appearance and acceptance. The quality and cleanliness of workmanship is more important to the final veneer appearance and acceptance than is the unit. This quality must be mutually agreed upon prior to the start of the work.

- c) The designer must choose if standard or special tolerance is to be met.
- d) This is a minimum statement and should be studied and amplified for specific jobs. It is suggested the specifier list the tests he requires, the number of tests, and who pays for the tests.
- a) Care must be exercised in freezing weather. If the work is subjected to hot dry winds, moisture must be added.
- b) The code provisions for adhered veneer by the use of Portland cement has been satisfactory for many years. However, newer methods have been developed through ANSI to improve installation procedures, e.g.:
  - ANSI A118.1 Dry-set mortar
  - ANSI A118.2 Conductive mortar
  - ANSI A118.3 Chemical resistant
  - ANSI A118.4 Latex-Portland cementThese provide for installation procedures such as:
  - ANSI A108.1 with Portland cement
  - ANSI A108.2 with Portland cement
  - ANSI A108.3 with Portland cement
  - ANSI A108.5 Dry-set mortar
  - ANSI A108.7 Conductive dry-set mortarThese also have been used satisfactorily. However, true surfaces and strict adherence to those specifications must be enforced.
- d) The specifier shall state the desired effect for tooled joints, or state, "as based on the approved sample", or for example, "as in (designated) site."
- e) This subject is a complex one and the specifier must check carefully to see that the intent of the designer is realized by the details and the augmenting specs. Different types of support and veneer may require different joint spacings for crack control by relief of stress accumulation.
- a) The best way to clean masonry is to KEEP IT CLEAN and avoid mortar contact on the wall surface. Stains must be removed before penetration and before start of set. Acid cleaning or other may be necessary for adequate cleaning if the veneer is dirtied. Specific sealing and cleaning methods should be considered, as recommended by Higgins Brick.

## **FIRE RATING FOR BRICK VENEER**

**2.3.3 Adhered Veneer:** Metal lath is installed in compliance with Section 2506.1 of the code. Where lath is attached to steel framing, minimum 1 inch long, No. 6 drywall screws are used. For exterior walls, a weather resistive barrier described in Section 2506.4 of the code is required. As an alternative, paper backed metal lath recognized in a current evaluation report with paper complying with Section 1402.1 of the code may be used. The Portland cement plaster is applied in compliance with Section 2508 of the code to a minimum 3/8 inch thickness. The thin veneer units are applied in compliance with Section 1403.5.4.1 of the code in running bond.

**For one hour fire resistance,** the total thickness of plaster, mortar, and brick veneer shall be at least 1-3/4 inch.

**For two hour fire resistance,** the total thickness of plaster, mortar, and brick veneer shall be at least 2 inches.

**2.3.4 Anchored Veneer:** Anchored veneer is installed in compliance with Section 1403.6.4.2 of the code for 2 to 5 inch thick units and Section 1403.6.4.3 of the code for units up to 10 inches thick. Stud spacing is limited to 16 inches on center and a weather resistive barrier complying with Section 1402 of the code is required on the exterior side of exterior walls. Anchored units may be used for one or two hour fire resistive assemblies.