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 U.S. General Services Administration

Stabilizing 2-Wythe Tile Walls Using Adhesive Foam Filler

Procedure code:

421201S

Source:

Jacob Weinberger US Courthouse/San Diego, CA - Hallenbeck

Division:

Masonry

Section:

Clay Tile Unit Masonry

Last Modified:

08/12/2016

PART 1---GENERAL

1.01 SUMMARY

A. This procedure includes guidance on stabilizing two-wythe clay tile walls with a light weight rigid adhesive filler in the cavity between the wythes for seismic retrofit.

NOTE: THIS PROCEDURE SHOULD BE EXECUTED BY A SPECIALIST TRAINED IN MASONRY STABILIZATION AND IS RECOMMENDED FOR USE IN VERY LIMITED APPLICATIONS.

B. The filler material shall adhere to clay tile and have strength and rigidity properties so that the tile-foam composite will respond to earthquake shaking as a wall of thickness equal to the existing out-to-out dimensions of the two-wythe wall.

C. See "General Project Guidelines" for general project guidelines to be reviewed along with this procedure. These guidelines cover the following sections:

1. Safety Precautions
2. Historic Structures Precautions
3. Submittals
4. Quality Assurance
5. Delivery, Storage and Handling
6. Project/Site Conditions
7. Sequencing and Scheduling
8. General Protection (Surface and Surrounding)

These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the Regional Historic Preservation Officer (RHPO).

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)

1.03 SUBMITTALS

- A. Product Data: Submit the manufacturer's product information including identification, packing, component mixing quantities and injection procedures curing times, workman's safety precaution, and by-products released to the atmosphere.
- B. Test Report: Submit the report of a testing program in compliance with Part 3 of this specification.
- C. Injection procedure: Submit data on injection procedures and equipment. Include proposed locations, spacings and sizes of injection ports.
- D. Submittals shall be reviewed by the Architect and approved by the Contracting Officer before proceeding.

1.04 QUALITY ASSURANCE

- A. Engage a testing laboratory acceptable to the RHPO.
- B. Testing laboratory responsibilities:
 - 1. Observe preparation of the walls for injection.
 - 2. At the beginning of the injection work, observe mixing and injection procedures for compliance with these specifications and manufacturer's instructions.
 - 3. Upon completion of the project, drill and observe 12 observation holes, (2 in each wall at each level) at locations to be selected by the Architect; confirm filling of the void between wythes with foam.

C. Mock-Ups:

NOTE: THE TESTING PROGRAM IS TO ESTABLISH ACCEPTABLE MATERIAL AND DEMONSTRATE THE INJECTION PROCEDURE. ALTERNATIVE MATERIALS AND PROCEDURES COMPLYING WITH PART 1 AND PART 2 MAY BE PROPOSED. DO NOT PROCEED WITHOUT REVIEW BY THE RHPO AND APPROVAL BY GSA.

- 1. Obtain clay tile units from the Building. Protect the units from damage and surface contamination.
- 2. Clean the surfaces that will receive mortar with a wire brush. Do not clean the surfaces to which the adhesive foam will be applied.
- 3. Construct two 2-wythe test panels and allow to cure for 28 days. Install the units with the internal cells horizontal.
- 4. Construct end forms to enclose a void between the tile wythes. The end forms shall not connect to the tile units in a way that prevents the units from deflecting outward under pressure from within the void. The forms shall be tight enough to confine the adhesive foam placed in lifts. Coordinate with the foam installer for form pressure and anticipated confinement requirements.
- 5. Place two component epoxy adhesive foam fill into the void in 12" lifts through holes core drilled into one wythe. (The holes for foam placement may be drilled prior to constructing the test panels). The depths of lifts shall be limited to prevent foam pressure from causing the wythes to bow outward and shall be the same as will be used in the building. Fill to within 2" of the top of the panel.
- 6. Allow the foam fill to cure as recommended by the manufacturer. Remove the forms.
- 7. Test the panels by loading to ultimate horizontal load.
- 8. Evaluation: The panels shall break by cracking horizontally through the panel at about mid-height, without crushing of the foam or delamination of the foam from a tile surface except in that offset zone between the crack path through the tile masonry. A break other than described above is not acceptable.
- 9. Report for each test panel:
 - a. Test set-up
 - b. Horizontal load at cracking
 - c. Horizontal load after cracking

- d. Location and orientation of crack
- e. Any delamination between foam and tile
- f. Any visible distortion of foam under load
- g. Any visible distortion of foam after cracking

PART 2---PRODUCTS

2.01 MANUFACTURERS

- A. Delta Plastics

2.02 MATERIALS

A. Fill Material:

1. Two-component epoxy adhesive foam complying with the testing program of Part 3, such as "Bisfoam-3 A & B" (Delta Plastics), or approved equal.
2. The cured foam, when exposed to an open flame, will char on the contact areas with little damage or deformation of the foam structure.
3. The foam is to have a density value of less than 75 along with a flame spread rating of less than 19.
CAUTION: THE SMOKE EMITTED MAY CONTAIN DECOMPOSITION PRODUCTS OF CARBON, HYDROGEN, WATER, AND TRACES OF FLUORINE, BUT MAY HAVE ONLY A VERY LOW OFFENSIVE ODOR QUALITY.

B. Form Materials: Materials to confine the foam and prevent flow out of the wall shall be as follows:

1. If least dimension of hole is less than 1-1/2 inch, use Type N mortar complying with ASTM C270. Fill the hole to a depth equal to 1-1/2 times the exposed least dimension.
2. If least dimension of hole is 1-1/2 inch or greater, use unit brick masonry (common brick) and type N mortar complying with ASTM C270; minimum thickness of unit masonry form shall be at least the thickness of the existing clay tile wythe in which it is placed.
3. If least dimension of hole is 1 inch maximum, use plastic foam joint filler: diameter/injection/preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material as recommended by sealant manufacturer and of size, shape and density to control sealant depth and produce optimum sealant performance.

C. Brick: Brick used for filling holes may be salvaged from the building. New brick shall conform with ASTM C62 grade MW.

2.03 EQUIPMENT

- A. Masonry drill
- B. Injection equipment

PART 3---EXECUTION

3.01 PREPARATION

A. Surface Preparation:

1. Expose wall surface to permit observation of voids that would prevent confinement of the foam.
2. Close and repair breaks and holes to confine the foam to the cavity between wythes of the wall, except at holes of less than 1-1/2 inch in least dimension, foam may be permitted to flow to within 1-1/2 times the holes least dimension from the face at the wall.
3. Drill injection/verification holes through one wythe at 12 inch maximum on center horizontal and vertical spacing. Injection/verification holes may be made in head or bed joints.

3.02 ERECTION, INSTALLATION, APPLICATION

- A. Begin injection through injection/verification ports at the lowest course of tile.
- B. Inject in approximately 12 inch lifts. Inject into injection holes until flow of foam is verified at adjacent holes at the same level. Plug verification holes with joint filler to confine the foam flow.
- C. Complete each lift for the full length of all walls before proceeding to the next lift. Allow each lift to cure before proceeding to the next lift.
- D. Clean-up spills as they occur. Protect finish materials from damage.

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