

**TESTING APPLICATION STANDARD (TAS) 123-95**  
**STANDARD REQUIREMENTS FOR MORTAR USED**  
**IN MORTAR SET TILE SYSTEMS**

**1. Scope:**

- 1.1 This protocol covers: 1) the standard requirements of mortar for use in mortar set tile systems; 2) the procedures for testing such mortar if these standards are not initially met; and, 3) the approval process for all mortar which successfully meets either the standard requirements and/or the testing requirements.
- 1.2 This protocol applies to all mortar which is intended for use in Product Approved mortar set tile systems within the high-velocity hurricane zone jurisdiction.
- 1.3 All testing shall be conducted by an approved testing agency and all test reports shall be signed by an authorized signer of the testing agency and/or professional engineer.

**2. Referenced Documents:**

- 2.1 *The Florida Building Code, Building*
- 2.2 *ASTM Standards:*
  - C 270 Standard Specification for Mortar for Unit Masonry
  - C 91 Standard Specification for Masonry Cement
  - C 144 Standard Specification for Aggregate for Masonry Mortar
  - C 109 Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-inch or 50-mm Cube Specimens)
  - E 380 Excerpts from Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)
- 2.3 *Application Standards:*
  - TAS 101 Test Method for Static Uplift Test Resistance of Mortar or Adhesive Set Tile Systems

**3. Terminology & Units:**

- 3.1 Definitions—For definitions of terms used in this Protocol, refer to Chapter 2 and Section 1513 of the *Florida Building Code, Building*; and/or the RCI Glossary of Terms. Definitions from the *Florida Building Code, Building* shall take precedence.
- 3.2 Units—For conversion of U.S. customary units to SI units, refer to ASTM E 380.

**4. Significance and Use:**

- 4.1 The requirements outlined herein are intended to provide a guideline for mortar manufacturers in order to obtain a Roofing Component Product Approval for use of their product(s) in approved mortar set tile systems.

**5. Standard Requirements for Approval:**

- 5.1 Mortars for use in mortar set tile systems shall meet the “Proportion Requirements” and “Property Specifications” set forth in ASTM C 270 for type “M” masonry cement mortar which is premixed and bagged. The sand: masonry cement mixing ratio shall not be exceed 2.5:1.
- 5.2 Alternatively, mortars for use in mortar set tile systems shall consist of not greater than 2½ parts ASTM C 144 uniformly graded sand or 2½ parts ASTM C 332 lightweight aggregate in combination with one part ASTM C 91, type “M” masonry cement which is premixed and bagged.
  - 5.2.1 Mortars formulated as noted in Section 5.2 using lightweight aggregate are not required to meet the minimum compressive strength of those mortars from Section 5.1; however, the compressive strength shall be not less than 350 psi, as determined in compliance with ASTM C 109.

5.3 All mortars which meet the standard requirements set forth in Sections 5.1 or 5.2 shall be approved for use with flat tile profiles only based on submission of the following:

- completed application for roofing component Product Approval;
- certification from an approved testing agency that the mortars, or components thereof, meet the requirements set forth in Sections 5.1 or 5.2, respectively;
- street address where periodic quality control inspections may be carried out by a representative from the authority having jurisdiction;
- a sample of the premixed bag; and,
- a copy of the handling and mixing instructions.

5.4 Any mortars which deviate from the standard requirements set forth in Sections 5.1 or 5.2, either through differing proportions or a substitution of masonry cement, sand or lightweight aggregate, and any mortars intended for use with low and high profile tile shall be tested as set forth in Section 6 prior to receiving roofing component Product Approval.

5.4.1 Mortars which require testing, as noted in Section 5.2, and use lightweight aggregate as a component thereof are not required to meet the minimum compressive strength of those mortars from Section 5.1; however, the compressive strength shall be not less than 350 psi, as determined in compliance with ASTM C 109.

**6. Testing Requirements:**

6.1 Any mortars which deviate from the standard requirements set forth in Sections 5.1 or 5.2, either through differing proportions or a substitution of masonry cement, sand or lightweight aggregate, and any mortars intended for use with low or high profile tile shall be tested in compliance with TAS 101 with the following modifications:

6.1.1 Testing shall include 5 samples each desired tile profile.

6.1.2 The static uplift testing shall result in the following minimum characteristic resistance loads ( $F'$ ).

Tile Type	Minimum Characteristic Resistance Load (lbf)
High Profile	30
Low Profile	26
Flat	50

6.1.3 The moment calculations shall be omitted from the requirements of TAS 101.

6.2 On successful completion of this testing, the manufacturer shall submit the applicable items listed in Section 5.3, together with the final test report(s), from TAS 101 testing, to receive a roofing component Product Approval.

**7. Mortar Set Tile System Manufacturers:**

7.1 Mortar set tile system manufacturers may interchange any approved, premixed, bagged mortar product into mortar set tile system(s).

**TESTING APPLICATION STANDARD (TAS) 123-95  
APPENDIX A**

**STANDARD REQUIREMENTS OF TILE ADHESIVE USED  
TO REPAIR OR SUPPLEMENT TILE ATTACHMENT**

- 1. Scope:**
- 1.1 This protocol covers the testing requirements for tile adhesive applied to Product Approved nail-on, mortar set or adhesive set tile systems.
- 1.2 All testing shall be conducted by an approved testing agency and all test reports shall be signed by an authorized signer of the testing agency and/or professional engineer.
- 2. Referenced Documents:**
- 2.1 *ASTM Standards:*
- C 661 Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer
- C 1021 Standard Practice for Laboratories Engaged in the Testing of Building Sealants
- D 95 Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation
- D 412 Standard Test Method for Rubber Properties in Tension
- D 572 Standard Test Method for Rubber Deterioration by Heat and Oxygen
- D 897 Standard Test Method for Tensile Properties of Adhesive Bonds
- D 1079 Standard Definitions of Terms Relating to Roofing, Waterproofing, and Bituminous Materials
- D 2565 Operating Xenon Arc-type Night Exposure Apparatus With and Without Water for Exposure of Plastics
- E 380 Excerpts from Standard Practice for Use of the International System of Units (SI) (the Modernized Metric System)
- 2.2 *Application Standards:*
- TAS 101 Test Procedure for Static Uplift Resistance of Mortar or Adhesive Set Tile Systems
- TAS 102 Test Procedure for Static Uplift Resistance of Mechanically Attached, Rigid, Roof Systems
- 2.3 *Roof Consultants Institute Glossary of Terms*
- 3. Terminology and Units:**
- 3.1 Definitions—For definitions of terms used in this Protocol, refer to ASTM D 16; and/or ASTM D 1079; and/or Chapter 2 of the *Florida Building Code, Building*; and/or The RCI Glossary of Terms. Definitions from the *Florida Building Code, Building* shall take precedence.
- 3.2 Units—For conversion of U.S. customary units to SI units, refer to ASTM E 380.
- 4. Significance and Use:**
- 4.1 This protocol appendix applies only to tile adhesives used in tile systems as a:
- repair component for mortar or adhesive set tile applications; or,
  - supplement to the attachment in a nail-on tile application.

**5. Test Limitations and Precautions:**

- 5.1 The protocol may involve hazardous materials, operations and equipment. This protocol does not purport to address all of the safety problems associated with its use. It is the responsibility of the user to consult and establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**6. Materials and Manufacture:**

- 6.1 Tile adhesive used for the purposes of tile repair or supplemental attachment shall consist of a synthetic rubber and resins or such other base component material that will comply with the undernoted performance and physical characteristics.
- 6.2 Colors shall be tan, terra-cotta, gray or such other color which blends with tile coloring.

**7. Sampling:**

- 7.1 Sampling shall be in compliance with requirements set forth in ASTM C 1021. Particular reference is made to Subsection 5.2.1 of the procedure.

**8. Performance Testing & Requirements:****8.1 Composition:**

- 8.1.1 Water content—Tile adhesive shall meet the maximum water volume percentage noted in Table 1, below, when tested in compliance with Section 9 of ASTM D 95.
- 8.1.2 Nonvolatile matter—Tile adhesive shall meet the minimum nonvolatile matter mass percentage noted in Table 1, below, when tested in compliance with ASTM D 2369.

**TABLE 1  
TILE ADHESIVE COMPOSITION REQUIREMENTS**

Component	Criteria	Value
Water	Volume %	Maximum 1.5%
Nonvolatile Matter	Mass %	Minimum 65% + 5%

- 8.2 Uniformity—A thoroughly blended sample of tile adhesive shall show no separa-

tion of material after standing for 72 hours at room temperature ( $73.3^{\circ} \pm 3.6^{\circ}$  F) in a closed container.

- 8.3 Workability—The tile adhesive shall be of such a consistency that it is easily forced from a tube with a  $\frac{1}{4}$  inch diameter hole with a hand held caulk gun at temperatures ranging from 40°F (4°C) to 100°F (38°C).

- 8.4 Adhesion—Tile adhesive shall meet the minimum adhesion requirements noted in Table 2, below, when tested in compliance with ASTM D 897.

**TABLE 2  
TILE ADHESIVE ADHESION REQUIREMENTS**

Bonded Component Interface	Conditioning	
	3000 hours @ 72°F (22.2 °C)	3000 hours @ 180°F (82.2 °C)
Concrete to Mortar	65 psi	35 psi
Concrete to Concrete	100 psi	143 psi
Concrete to Wood	85 psi	70 psi
Clay to Clay	128 psi	128 psi
Slate to Slate	112 psi	199 psi

- 8.5 Tensile/elongation—Tile adhesive shall meet the minimum requirements noted in Table 3, below, when tested in compliance with ASTM D 412.

**TABLE 3  
TILE ADHESIVE TENSILE/ELONGATION REQUIREMENTS**

Physical Property	Conditioning	
	3000 hours @ 72°F (22.2 °C)	1000 hours @ 158°F (70.0 °C)
Tensile Strength	1000 psi	1200 psi
Elongation	400%	370%
Modulus	700 psi	NA

- 8.6 Static uplift resistance—Tile adhesive shall be tested for resistance to static uplift loading in compliance with TAS 102, except as noted below.

**8.6.1 Test specimen:**

- The test specimen shall include high profile, concrete “S-shaped” tiles mechanically attached directly to the deck with a single 8d annular ring shank nail.

- Tile adhesive shall be applied at the “test tile” headlap in a single  $\frac{3}{8}$  inch wide by  $1\frac{1}{4}$  inch long bead placed between  $1\frac{1}{2}$  inches and 2 inches from the nose of the “test tile.”
- The test specimen shall be conditioned as specified in Section 8 of TAS 101.

#### 8.6.2 Calculations:

- Calculations need not include those for restoring moment due to gravity or attachment resistance expressed as a moment.

#### 8.6.3 Requirement:

- The tile attachment, when installed in compliance with Section 8.6.1, shall provide a minimum characteristic resistance load ( $F'$ ) not less than 35 lbf.

8.7 Shore “A” hardness - Tile adhesive shall meet the minimum requirements noted in Table 4, below, when tested in compliance with ASTM C 661.

**TABLE 4  
SHORE 'A' HARDNESS REQUIREMENTS**

Conditioning	Hardness	Flexibility
Unconditioned	80 + 5	flexible
4 months @ 158°F (70°C) 1000 hours of UV Exposure (ASTM D 2565)	80 +7 80 +7	flexible flexible
1000 hours O <sub>2</sub> Bomb @ 158°F (70°C) (ASTM D 572)	80 +7	flexible
2000 hours O <sub>2</sub> Bomb @ 158°F (70°C) (ASTM D 572)	80 +7	semi-flexible

## 9. Packaged Material:

9.1 Packaged material shall be certified by the manufacturer to be in compliance with the provisions of this protocol and shall be labeled in compliance with Section 1517 of the *Florida Building Code, Building*. Product Approval documents shall be provided to the purchaser or end user upon request.

9.2 Shipping containers shall be marked with the name of the material, stock number, lot number, year of issue and quantity therein and the name of the manufacturer or supplier.

## 10. Rejection and Reinspection:

10.1 The Authority Having Jurisdiction may periodically purchase commercial quantities of the Approved product for testing to confirm compliance with the provisions of this protocol. Failure to meet the minimum requirements set forth in this protocol shall constitute grounds for rejection of the lots and suspension of the Product Approval. In cases of rejection the Authority Having Jurisdiction shall request removal of the rejected lot number(s) from commercial sale.

10.2 The Authority Having Jurisdiction may, after rejection of one or more lots, require third party quality control inspection as a provision to lifting of approval suspension.

