



WACEL

**SPRAYED FIRE –RESISTIVE
MATERIALS**

STUDY GUIDE

February 2012

STUDY GUIDE

Examination: The SFRM examination is based on the references listed below. It is 3 hours in length and open–book. The examination is comprised of 75, multiple-choice questions. All of the listed references (except for references H and I) can be used during the examination and must be brought by the examination candidate. WACEL does **NOT** provide these references. A basic calculator (i.e., no printing or programming capabilities) is also authorized.

The scope of this examination includes both field applied sprayed fire-resistive materials (SFRM) and thin-film intumescent fire-resistive materials (TFIFRM). Inspection criteria include published industry standards, ASTMs, manufacturers' technical information, and the International Building Code.

Please Note: At the time of this examination update, the industry is still in transition from the 2006 to the 2009 International Building Code. Some jurisdictions have not yet implemented the 2009 edition, and some projects may have been approved under the 2006 edition. Due to the changes that affect fire-resistive materials between the two editions, a working knowledge of the differences is required and will be evaluated. Subsequent revisions to this certification examination will phase out the 2006 requirements as appropriate.

A general outline of the topics that will be evaluated include:

- An understanding of sprayed fiber, cementitious, and intumescent fire-resistive materials.
- An ability to determine if the IBC 2006 or 2009 standards apply and a working knowledge of the differences.
- A knowledge of how to properly conduct quality assurance testing using appropriate ASTMs and/or the AWCI Technical Manuals 12-A and 12-B.
- An understanding of substrate and environmental conditions that could influence the suitability of applied, fire-resistive materials.
- An ability to determine testing and observation standards and frequencies using approved construction documents, approved submittals, and the International Building Code.
- A working knowledge of the International Building Code's Special Inspection Program.

References: WACEL does NOT provide these references.

- A. 2006 International Building Code, Section 1704.12, Chapter 17, Structural Tests and Special Inspections.
- B. 2009 International Building Code, Section 1704.11, Chapter 17, Structural Tests and Special Inspections, Table 403.2.4, and Section 703.2.3.

- C. ASTM E 605-93 (2006), Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members.
- D. ASTM E 736-00 (2006), Cohesion/Adhesion of Sprayed Fire-Resistive Material Applied to Structural Members.
- E. ASTM E 1513-93 (2005), Application of Sprayed Fire-Resistive Materials (SFRMs).
- F. Technical Manual 12-A, Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; an Annotated Guide, The Association of the Wall and Ceiling Industries – (3rd Edition).
- G. Technical Manual 12-B, Standard Practice for the Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an annotated guide, the Association of the Wall and Ceiling Industry (2d Edition).
- H. Underwriters Laboratories Inc.[®] (UL) Fire Resistance Directories.
- I. ICC-ES Evaluation Reports.

Learning Objectives

- I. Knowledge of the basic concepts and the essential policy and technical publications impacting the use of field-applied, sprayed, fire-resistive materials:
 - A. Knows the purpose of SFRMs and TFIFRMs.
 - B. Can describe the different types of SFRM.
 - C. Can apply the specific standards for the inspection, testing, and acceptance of SFRM and TFIFRM contained in the IBC 2006 and IBC 2009, and is knowledgeable of the differences.
 - D. Understands the organization, use, and applicability of the UL Fire Resistance Directories.
 - E. Is highly familiar with the use and applicability of the ASTMs and AWCI publications used for the observations and testing associated with SFRM and TFIFRM.
 - F. Can discuss the various safety considerations that must be addressed when inspecting SFRM as addressed in ASTM E 1513.
 - G. Understands the differences in the testing frequencies specified by the various ASTMs, building code documents, and AWCI publications for thickness, density, and cohesion/adhesion.
 - H. Knows that if there are any differences between the IBC and other SFRM publications as to frequency or SFRM acceptance criteria that the IBC governs.

- II. Can review project-specific, contract documents and related submittals to determine if all inspection-related standards appear to be properly defined:
 - A. Knows how the inspection, testing, and observations associated with SFRM and TFIFRM are part of the Special Inspection Program of the IBC (See Learning Objective IX).
 - B. Can review and extract required testing and observations from approved submittals that include applicable UL designs and manufacturers' technical literature.
 - C. Can review approved contract specifications and drawings to extract any applicable SFRM and TFIFRM requirements.
 - D. Can discuss the differences between restrained and unrestrained assemblies and how they apply to the inspection process (IBC 703.2.3).
 - E. Is familiar with the increased bond strength requirements introduced by the 2009 IBC for high-rise structures (Table 403.2.4).
 - F. Demonstrates an ability to review available project and industry literature and identify information needs or issues that must be addressed by the appropriate design professional.

- III. Can accomplish preliminary inspections:
 - A. Knows the applicable temperature and humidity requirements for the proper application of SFRM and TFIFRM.
 - B. Can determine if the substrate is acceptable for the proper application of SFRM or TFIFRM.
 - C. Can evaluate if the space where SFRM or TFIFRM is to be applied is properly ventilated.
 - D. Reviews the manufacturer's literature for a specific project to determine any additional technical requirements such as storage, mixing, application, etc.
 - E. Can identify if any supplementary products such as bonding agents or sealants are recommended and/or identified for use.
 - F. Knows how to determine if SFRM can be applied to a painted or primed substrate using the guidance contained in ASTM E 1513, the UL design, or Technical Manual 12-A.

- IV. SFRM Thickness determinations:
 - A. Can describe the correct thickness testing procedures for standard structural elements.
 - B. Knows how to properly measure and record the thickness of SFRM in accordance with ASTM E 605 or Technical Manual 12-A.

- C. Understands the purpose of and can correctly use reduced tip thickness results when authorized.
- D. Can correctly compute the “minimum allowable thickness” and maximum recorded thickness for any specified or actual thickness.
- E. Knows how to determine and report deficient test results.

V. SFRM Density Testing:

- A. Can properly take and record a SFRM sample for density testing per ASTM E 605 or Technical Manual 12-A.
- B. Understands the two different methods of SFRM density testing authorized by ASTM E 605.
- C. Knows how to determine and report deficient test results.

VI. SFRM Bond Strength (Cohesion/Adhesion) Testing:

- A. Knows how to properly conduct an adhesion/cohesion test in accordance with ASTM E 736 or Technical Manual 12-A.
- B. Is familiar with the alternate adhesion/cohesion procedure for SFRM resulting in high strengths presented by the AWC Technical Manual 12-A.
- C. Knows how to determine and report deficient test results.
- D. Understands the difference between a cohesive and adhesive failure.

VII. TFIFRM Inspections:

- A. Is aware that both the 2006 and 2009 versions of the International Building Code defer to AWC’s Technical Manual 12-B for inspections of TFIFRM.
- B. Knows the temperature, humidity, and substrate condition requirements for the application of TFIFRM.
- C. Knows the full scope of the TFIFRM inspections procedure.
- D. Is knowledgeable of the possible considerations and actions if primers or topcoats are used with TFIFRM.
- E. Is highly familiar with the necessary information or documents needed to properly accomplish TFIFRM inspections.
- F. Is aware of the calibration recommendations for the electronic gauges used for TFIFRM determinations.
- G. Knows how to properly take, compute, and record TFIFRM thickness determinations.
- H. Can determine the minimum testing frequency to be used when testing TFIFRM.

VIII. Condition of Finished Applications:

- A. Understands the criteria for a visual inspection of a finished SFRM or TFIFRM application to include the absence of cracks, voids, spalls, delaminations, or substrate exposure.
- B. Is aware of the SFRM and TFIFRM patching requirements addressed in ASTM E 1513, Technical Manual 12-A, Technical Manual 12-B, and UL requirements.
- C. Knows the guidance criteria addressed in ASTM E 1513 and manufacturer's requirements to minimize the possibility of SFRM delamination on the underside of roof decks.

IX. Has an overall knowledge of the Special Inspection Program as outlined in Chapter 17 of the International Building Code.

- A. Understands the difference between periodic and continuous inspections.
- B. Knows the specific fire-resistant material inspection requirements of the International Building Code.
- C. Is aware of the purpose, the submission requirements, and the general content of a Schedule of Special Inspections.
- D. Is aware of who the Special Inspectors must be employed by and who must approve their qualifications.
- E. Knows when Special Inspections are required.
- F. Is aware of the reporting and notification requirements of the Special Inspection Program.

WACEL SKILL MATRIX FOR SPRAYED FIRE-RESISTIVE MATERIAL (SFRM) AND THIN FILM INTUMESCENT FIRE-RESISTIVE MATERIALS (TFIFRM). OBSERVATIONS, TESTING & INSPECTIONS

SKILL	
General Knowledge of Sprayed Fire-Resistive Materials	
1. Knows the purpose of field applied fire-resistive materials.	X
2. Understands the organization of and use of the UL Fire Resistive Directories.	X
3. Can describe the different types of field applied fire-resistive materials.	X
4. Demonstrates an ability to review SFRM and TFIFRM specifications to extract pertinent testing information and/or to identify issues that must be addressed by the architect.	X
5. Can discuss the various safety considerations that must be addressed when inspecting field applied fire-resistive materials.	X
6. Can review and extract required testing and observation information from approved submittals.	X
7. Can discuss the differences between restrained and unrestrained assemblies.	X

Field Testing and Observations of SFRM	
8. Knows how to properly measure the thickness of SFRM in accordance with ASTM E 605 and Technical Manual 12-A.	X
9. Is familiar with the wide range of testing frequency requirements that may be found in applicable publications.	X
10. Understands the differences in the testing frequencies and acceptance criteria specified by the applicable ASTMs, building code documents, and standards specifications for thickness, density and adhesion.	X
11. Can describe the correct thickness testing procedures for standard structural elements	X

12. Understands the two different methods of SFRM density testing allowed by ASTM E 605.	X
13. Can properly describe how to take and record a SFRM sample for density testing per ASTM E 605.	X
14. Understands how to properly conduct bond strength (adhesion/cohesion) test in accordance with ASTM E 736.	X
15. Knows how to determine and report deficient test results	X
16. Understands the purpose of and can correctly use reduced tip thickness results when authorized.	X
17. Understands the various aspects of complete and proper application of SFRM (e.g., temperature, substrate condition, air exchanges, mixing, application, patching, painted or primed members, undersides of roof decks, etc.)	X
Field Testing and Observations of TFIFRM	
1. Knows how to check proper application and thickness of intumescent mastic.	X
2. Can determine from manufacturer's literature technical requirements such as mixing, temperature limitations, maximum humidity, and substrate condition.	X
3. Is highly familiar with the procedural and testing standards specified in Technical Manual 12-B.	X