



WACEL

**FIRESTOPPING SPECIAL
INSPECTOR**

STUDY GUIDE

December 2016

STUDY GUIDE

Introduction: This study guide provides information and guidance for individuals who seek to be certified by WACEL as Firestopping Special Inspectors.

Background: Although the inspection of firestopping has always been eligible for acceptance testing, it was only with the adoption of the 2012 version of the International Building Code that such inspections became formally incorporated for certain facilities into the scope of the Code's Special Inspection Program (Chapter 17). Previously testing and observations were the responsibility of building officials, project architects, and some facility accrediting agencies. To meet this new need, WACEL felt it appropriate to add a Firestopping Inspector Program to its existing certification program which largely focuses on ensuring the knowledge and abilities of technicians who determine the compliance with approved construction documents of defined building components and systems as required by the Special Inspection Program.

Purpose: This study guide defines the references that a candidate should be familiar with to properly prepare for both the certification examination and to properly fulfill their responsibilities on project sites. It further lists a detailed series of learning objectives that are considered essential to properly prepare to be Firestopping Special Inspectors.

Although no specific prerequisites are prescribed, the criticality and complexity of this functional area assumes that candidates for certification are experienced inspectors with other advanced certifications relating to the Special Inspection program. Candidates must be recommended by a Professional Engineer associated with their employer.

Examination: The certification examination will consist of 75 multiple-choice questions. Up to 3 hours will be allotted for completion of the examination. A minimum score of 80 percent is required to pass.

- The examination will be open book. Candidates will be provided and can use all required references—to include this Study Guide. All provided material must be returned on completion of the examination.
- A basic, non-programmable calculator with no memory or printing capabilities is authorized.
- No mobile telephones or similar devices can be brought into the examination area.
- Scratch paper will be provided and must be turned in to the examination proctor prior to departure.

- Photograph identification is required by all examination candidates.
- Numerous examination question will be based on specific, randomly-selected firestopping systems tested and approved by an accredited testing agency such as Intertek, Factory Mutual, or Underwriters Laboratories, Inc. Candidates must be highly familiar with the use of such documents. Such test questions will be based on system documents that will be provided with the examination package.

References

- Required:
 1. "Inspector Pocket Guide," International Firestop Council, Fifth Edition, 2013.
 2. XHEZ.Guide Info, "Through-Penetration Firestop systems," Underwriters Laboratories, Inc., last updated 2016-01-27.
 3. XHDG.Guide Info, "Perimeter-Fire Containment Systems," Underwriters Laboratories, Inc., last updated 2015-04-17.
 4. XHBN.Guide Info, "Joint Systems," Underwriters Laboratories, Inc., last updated 2013-09-24.
 5. ASTM E2174-10a, "On-site Inspection of Installed Fire Stops."
 6. ASTM E2393-10a, On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers."
 7. Chapter 17, 2012 and 2015 "International Building Code," International Code Commission.
 8. "Inspection Guidelines," International Firestop Council, 4th Edition.
 9. WACEL Study Guide for "Firestopping Special Inspector," July 2016.
- Optional:
 1. The two websites listed below are excellent sources for information regarding the installation and inspection of firestopping systems. Both are highly recommended for individuals preparing for the certification:
 - Internal Firestop Council (IFC): www.firestop.org.
 - Firestop Contractors International Association (FCIA): www.fcia.org.
 2. Manufacturers of firestop components publish catalogs of their products that often include product data sheets, copies of rated systems that include their products, and instructional information as to the installation and inspection of systems. The websites of these manufacturers incorporate much of the same information. With no intent of endorsing any particular product line, the websites of the following, more-commonly-encountered manufacturers are suggested:
 - 3M.
 - Hilti, Inc.
 - Specified Technologies, Inc.
 - Rectorseal (Product Line Previously Distributed by W.R. Grace).
 3. FM "Approved Standard for Approval of Firestop Contractors," Class Number 4991, October 2013.

4. UL “Qualified Firestop Contractor Program Requirements,” Underwriters Laboratories, Inc., April 2012.
5. Underwriters Laboratories, Inc., “Fire Resistance Directory, Volumes 2A and 2B, 2015 (most content also available on-line).

Learning Objectives:

- General
 1. Understand the criticality of properly installed firestopping as an essential component of a building’s passive fire protection system.
 2. Can define and describe the three general categories of firestopping systems:
 - Through Penetration and Membrane Penetrations.
 - Joint Systems.
 - Perimeter Fire Containment Systems.
 3. Can recognize the names of some of the recognized independent laboratories who can evaluate and rate firestopping systems.
 4. Knows how to use and interpret the UL numbering system that can be used to categorize the various types of rated firestop systems. The numbering systems used by other independent testing laboratories are not addressed by this Study Guide.
 5. Knows and can define the different ratings that can be assigned to rated firestopping systems:
 1. F Rating.
 2. T Rating.
 3. L Rating.
 4. W Rating.
 5. Assembly Rating.
 6. Knows that ratings are only applicable to properly installed firestopping systems and not to any particular product or material required to meet the system’s requirements.
 7. Can define and describe the use of “Engineering Judgements” as they apply to **untested or** non-rated systems and can confirm the levels of approval necessary prior to such systems being installed.
 8. Can confirm that the inspection documents provided by the project owner or their authorized representative are both properly approved and are complete enough to support a complete and comprehensive inspection of all firestopping systems installed on a project. Required documents include design drawings showing system locations, copies of approved system designs, project specifications, and product data sheets.
 9. Knows that any substitution of products or materials specified for approved systems are ground for rejection. No variation of any type, unless specifically authorized in an approved system, is allowed.
 10. Knows that fluid firestopping materials (e.g., sealants or sprays) are often specified with as-applied or wet-film thicknesses. When appropriate and

when not described in system designs, adjustments based on anticipated shrinkage determined from product literature must be considered.

11. Based on the manufacturer of the firestopping materials being used, knows the various devices, appliance, and accessories that may be used if authorized required by the rated system being installed.
 12. Is aware of the inspection difference that could result from a general contractor having each subcontractor install their own firestopping systems rather than engaging a single, specialized firestopping contractor to install systems for all trades. Variations can include:
 - Different rated systems and products.
 - Different skill and knowledge issues.
 - Scheduling and installation variations.
 - Quality control differences.
 13. Is familiar with and can confirm the firestop installer qualification requirements that contract documents may require (FM “Approval,” UL “Qualified,” or manufacturer’s accreditation).
 14. Knows to contact the manufacturer’s technical representative for clarification and guidance if there is any doubt as to the proper installation of an approved system.
 15. Is aware that some projects require labeling of each firestopping installation with such information as system identification, date installed, name of the installer, name of the inspector, and date inspected.
- Through-Penetration Systems:
 1. Understands that the selection and use of rated firestop systems is highly dependent on the type of assembly being penetrated as well as the number, type, and spacing of the penetrating item(s).
 2. Knows that annular space requirements apply to both the distance between penetrating items as well as the distance between any penetrating item and the edge of the opening.
 3. Is aware that some rated systems allow the penetrant to touch (“Point of Contact” or “Continuous Point of Contact”) the edge of the opening. Knows that a bead of an approved sealant is required at the point of contact in these instances.
 4. Understands that a membrane penetration is an opening through only one side of a wall or floor assembly such as for electric outlets or vent lines.
 5. Understands what “percent fill” (typically found in systems containing cables) is, how it is computed, and how it applies to certain types of penetrants in rated systems.

Percent Fill = $A_w/A_o \times 100$; Where:

 - A_w = Area of Wire = $[\pi r^2] \times N$ (including insulation, in²).
 - A_o = Area of Opening in².

- N = Number of Wires.
6. Is aware that rated systems may require supplementary accessories such as sleeves, collars, and mounting hardware.
 7. Knows that the use of an approved system's ratings must equal or exceed the rating of the assembly being penetrated.
 8. If 100 percent inspection or other specified frequency is not required by project requirements, knows the minimum inspection requirements required by ASTM E2174:
 - 10 percent of each type of firestop system per floor randomly observed during installation.
 - Post-installation, destructive-type verification of 2 percent-but not less than 1-of each type of firestop of each 10,000 ft² of each floor.
 9. Knows that each non-complying installation will require repair or replacement and re-inspection plus one full inspection of another of that type of system.
 10. Is aware that inspections should cease if 10 percent or more of like firestop systems are considered unacceptable. The installer should take appropriate corrective action(s) before inspections are re-initiated.
 11. Understands that proper inspections should also include the determination of locations where approved systems have been omitted.
 12. Knows that the inspector is not authorized to accept or approve any variations to the requirements of an approved, rated system.
- Joint Systems and Perimeter Systems:
 1. Is aware that perimeter systems are typically more complex than joint systems and will normally require a greater amount of time for both the preparation needed to properly inspect the installation and the conduct of the inspection itself.
 2. Knows the difference between a static and dynamic joint systems.
 3. If rated joint system requires the use of mineral wool or other approved insulation material that the orientation of the fibers must be perpendicular to the direction of compression.
 4. Can compute the thickness of uncompressed material necessary for an actual joint thickness and a specific compression percentage using the formula in UL XHBN GuideInfo (required reference No. 4).

$$T_{UNCOMP} = (W_{NOM} \times 100) / (100 - I_{COMP}); \text{ Where:}$$
 - T_{UNCOMP} = Uncompressed Thickness Necessary, in.
 - I_{COMP} = Specified Compression Percentage percent.
 - W_{NOM} – Nominal Width of Joint, in.
 5. If 100 percent inspection or other specified frequency is not required by project requirements, knows the minimum inspection requirements required by ASTM E2393:
 - 5 percent of total linear feet of each type of joint system per floor randomly observed during installation.
 - Post-installation, destructive-type verification at the rate of 1 sample for each 500 linear feet of each type of joint system per floor.

6. Knows that each non-complying installation will require repair or replacement and re-inspection plus one full additional inspection of that type of fire resistive joint system.
 7. Is aware that inspections should cease if 10 percent or more of like fire resistive joint systems are considered unacceptable. The installer should take appropriate corrective action(s) before inspections are re-initiated.
 8. Understand that proper inspections should also include the determination of locations where approved systems have been omitted.
- Special Inspections Program:
 1. Understands the difference between periodic and continuous inspections.
 2. Knows the specific firestopping inspection requirements of the International Building Code.
 3. Is aware of the purpose, the submission requirements, and the general content of a schedule of special inspections.
 4. Is aware of whom the Special Inspectors must be employed by and who must approve their qualifications.
 5. Knows when Special Inspections are required.
 6. Is aware of the reporting and notification requirements of the Special Inspection Program.