INTERNATIONAL FIRESTOP COUNCIL
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IFC Recommended Guidelines for Performing Destructive Testing for Installed Penetration Firestop Systems, Fire-Resistive Joint Systems, or Perimeter Fire Barrier Systems

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The International Firestop Council (IFC) is a not-for-profit association of manufacturers and users of fire protective materials and systems. IFC's mission is to promote the technology of fire containment in modern building construction through research, educational programs, and the development of safety standards and code provisions.

These recommended guidelines are presented as part of IFC's educational information program, to assist in achieving consistency of destructive testing during firestop system inspections. Questions regarding individual product performance should be directed to the individual firestop product manufacturer.

IFC Recommended Procedures for Destructive Testing

Destructive testing of firestop systems shall be conducted in the following manner:

1. Multiple locations shall be measured within a given application to provide evidence of compliance.

2. For verification of sealant depth, measurements shall be made at all points of adhesion rather than towards the center of the seal.

3. For systems incorporating integral packing or forming materials, verify proper type, density, compression, orientation of fiber, and depth.

4. For sealants or coatings applied in joint systems and perimeter fire barrier systems, take measurements within a 12 inch (305 mm) sample for every 500 lineal feet (152 m), or as

dictated by project specifications or client request. Within the 12 inch (305 mm) sample section, measure the thickness in eight (8) places. Measure the points of adhesion on each end of the sample and also on 4 inch (102 mm) centers. See Figure 1.

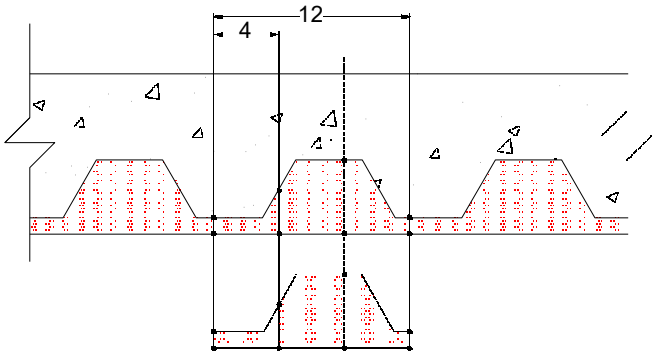

Figure 1

5. For sealants or coatings applied in penetration firestop systems, perform measurements on a given penetration system as follows:

   Penetrations that are nominal 6 inches (152 mm) in diameter and larger shall be measured in four quadrants, to give eight independent thickness measurements. See Figure 2.

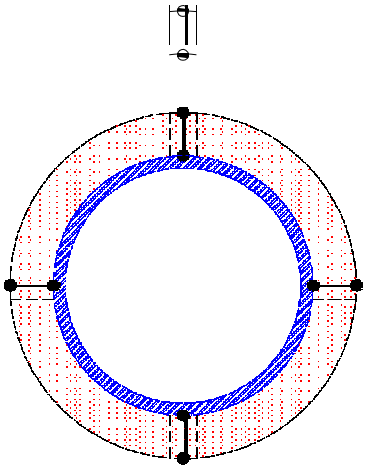

Figure 2

- Penetrations that are nominal less than 6 inches (152 mm) but greater than 2 inches (51 mm) in diameter shall be measured in three quadrants, to give six independent thickness measurements. See Figure 3.

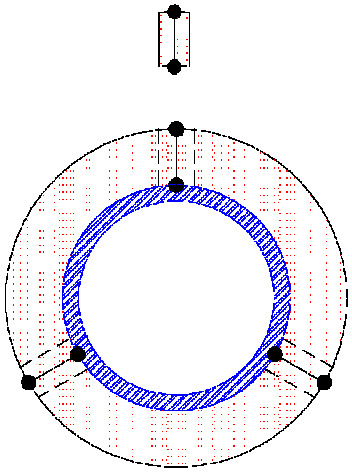

Figure 3

- Penetrations that are nominal 2 inches (51 mm) or less in diameter shall be measured in two quadrants, to give four independent thickness measurements. See Figure 4.

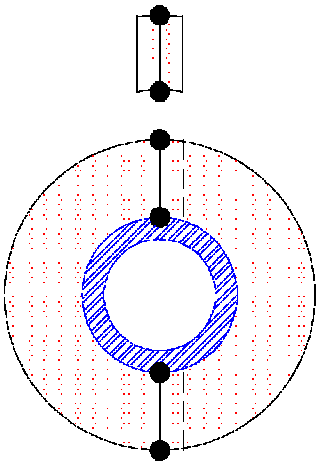

Figure 4

6. For third-party listed and labeled pre-formed firestop devices, factors including appropriate fasteners, rigid attachments, and visual verification of fully-intact device may be necessary at the discretion of the inspector.

In accordance with ASTM E2174 and ASTM E2393 conflict-of-interest guidelines, inspections, including destructive testing, shall not be performed by installers, manufacturers, or suppliers, or competitors of any of these entities, of the material being inspected.

Background Information

Proper installation of firestop systems for penetrations, joints, and perimeter fire barrier systems is essential for life safety and property protection. Verification of proper installation is invaluable to ensure correctness of installation, and therefore compliance with applicable code requirements. Two standards were developed and published by ASTM to provide guidance relative to proper inspection of firestop systems. The standards are ASTM E2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" and ASTM E2393, "Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers." The outlined inspection protocol within each standard includes sampling options that allow the alternatives of witnessing installation of the firestop systems, or destructive testing of previously installed firestop systems. Often times, due to sequencing on construction projects, destructive testing is the only viable choice.

While the ASTM inspection standards provide an overview as to the minimum sampling rate for destructive testing, they fail to provide adequate detail concerning how destructive testing should be performed. Consequently, there have been numerous inconsistencies in how individual inspectors have performed destructive testing and verified compliance. For instance, the inspection standards explicitly require the inspector to compare the as-measured thickness to the specified thickness shown in the individual test or third-party firestop listing. The as-measured thickness represents a dry/cured or partially dry/cured thickness, whereas the tests or listings normally report a wet thickness, which is the required minimum thickness at time of installation. Under this arrangement, differences in the installed and measured thickness values are expected due to the inherent drying characteristics of most sealant-type firestop products. For example, all liquid-applied, water-based caulks or sealants will exhibit a degree of shrinkage. The degree of shrinkage will vary from product-to-product. The degree of shrinkage for a given product would even vary slightly according to the type of environment in which the product is installed. For example, arid environments may produce more pronounced shrinkage, and more humid environments less. However, with the difference in sealant shrinkage between climactic zones being only a few percent, the difference does not translate to any meaningful difference in the applied thickness of firestopping, where typical thicknesses are ¼ to ½ inch.

The geometry of the resulting seal can also impact the observed amount of shrinkage. Surface tension effects will often produce a seal that is thicker towards the bond lines (i.e. points of adhesion) and thinner towards the middle.

Since fire testing of firestop systems is conducted on assemblies with fully dried and/or cured firestop systems, any product shrinkage has essentially been accounted for in the testing. The assemblies are never tested with undried and/or uncured sealants. However, since a destructive measurement of installed sealant is impossible for a sample that is going to be fire tested, the only sealant depth that can be reported in system listings is the wet sealant depth. To allow that wet sealant depth to be translated into a dry sealant depth that can be used as a benchmark for inspection of field installations, individual manufacturers typically report shrinkage information in published technical documents. For the example provided of water-based sealants, this test method is ASTM C1241, "Standard Test Method for Volume Shrinkage of Latex Sealants During Cure". A number of third-party agencies, including Underwriters Laboratories, Inc. (UL), report the volume shrinkage within the listing cards for the individual products.