Standards, Codes and Fire Testing Door Assemblies

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Codes and standards of all kinds regulate what happens when different varieties of laboratory testing are conducted. Fire testing of building products is no exception. I am a member of a test lab’s quality assurance team. The lab specializes in the fire testing of building products. The team is responsible for designing and managing programs that meet technical and managerial requirements for conducting the lab’s activities.

Part of the team’s job is reading, interpreting and understanding standards and codes that contain requirements that must be met during the testing/evaluating of a product. The following recap provides answers to some of the most frequently asked questions about the processes and procedures used to meet such requirements. To illustrate what happens, we will use a fire door assembly test specimen to illustrate requirements that must be considered throughout the process and the procedures used to accomplish process goals.

Understanding Accreditation

Accreditation Standards are standards issued by the International Organization for Standardization (ISO). They define the technical and managerial requirements that must be met by laboratories before accreditation can be issued to them. The ISO Accreditation Standards that can be used for testing, inspecting, and listing and labeling a fire door assembly are:

• 17020 – Inspections. One of the things this covers is surveillance of production to ensure product conformity to the successfully tested specimen throughout its sales life.

• 17025 – Testing. This covers the conduct of all lab "activities" necessary in laboratory testing. A revised version of this standard was issued in November of 2017. It replaces the 2005 version.


Accreditation Bodies (ABs) are the organizations that perform annual conformity assessments at clients’ laboratories to ensure compliance with ISO standards. ABs may be government or independent bodies. In the U.S., the following are independent ABs:

• American Association for Laboratory Accreditation (A2LA)
• American National Standards Institute National Accreditation Board (ANAB)
• International Accreditation Service (IAS)
• Perry Johnson Laboratory Accreditation (PJLA)
• National Voluntary Laboratory Accreditation Program (NVLAB is government directed)

Assessments by accreditation bodies can lead to nonconformities being cited. Accreditation is confirmed with a certificate and the scope of testing permitted with the accreditation. These documents are not issued until all nonconformities have been addressed to the satisfaction of the AB Assessor(s).
The way in which ISO standards are written and then interpreted by AB Management for their assessors may lead to some unforeseen consequences during an annual assessment of a client. To illustrate this point, there are some anomalies in the replacement of ISO 17025 with ISO 17025:2017, the standard for test lab accreditation. The anomalies are illustrated by the requirements applicable to building product assemblies and the destructive nature of testing them. The wording of 17025:2017 does not include exceptions that exist due to the different requirements of testing categories.

Here is an illustration of what may happen when exceptions to general requirements for the majority of lab activities do not footnote exceptions to them. Section 3.6 of 17025-2017 defines “laboratory” and adds a new activity to the definition of what a “laboratory” is accredited to do.

The definition of a laboratory is a “body that performs one or more of the following activities”:

- testing
- calibration
- sampling associated with subsequent testing and calibration.

The importance of the activities list is that of the three activities; only the last two most frequently use metrology as the basis for the category of testing called “quantitative.” Testing includes fire testing of building product assemblies. As the following anomalies indicate, there are important exceptions to the application of the general requirements for quantitative testing.

The activity of “testing” cannot be totally governed by the requirements of quantitative testing. Testing of building products, including fire door assemblies, has requirements that preclude quantitative testing. The requirements define its category as qualitative testing. This point will be illustrated below in the discussion of anomalies presented by the requirements as stated in 17025:2017.

Another quote from ISO 17025 adds to the problem of emphasis on metrology as the basis for laboratory accreditation:

Section 2, Normative references in 17025 states that the document ISO/IEC Guide 99, International Vocabulary of Metrology–Basic and General Concepts, is a reference. It also says that the way in which the reference is made to Guide 99 indicates that some or all of its content constitutes the requirements in 17025. With this wording which says “or all,” metrology becomes a requirement for all three lab activities as cited in 3.6 of 17025. No exceptions are mentioned.

The international consumer is dependent on an accurate assessment of how a product will perform after a purchase is made. Accreditation bodies use ISO standards for accrediting labs. Precise definitions for technical and management requirements without at least footnoting any exceptions may lead to incomplete conclusions.

Something else that should be kept in mind when considering the choice of words for ISO standards is that they are written by committees made up of multi-lingual members who are stakeholders from a variety of fields– code bodies, test standard writers, laboratories, insurance companies, etc. For those interested in this process, more information on translations is available in ISO 17100:2015 Requirements for Translation Services.

Categories of Testing: Qualitative vs Quantitative

Qualitative testing (usually destructive) covers the technical requirements for accredited fire testing of building products such as door assemblies. The fact that the test specimen is an assembly made up of component parts means it has to be tested on a basis outside of metrology and quantitative testing. Each component can be measured and tested with metrology, but the results when other components are added can affect results. The test standards used for building products such as fire door assemblies contain requirements that must be met to achieve valid results and the following circumstances must be part of testing:

a. The specimen must be tested as it will be installed in a time-rated wall assembly.

b. An acceptable national or international standard such as UL 10B has to be the normative reference for test equipment, test methodology and the interpretation of results.
c UL 10B is a timed fire endurance test conducted on a pass/fail basis.
d The International Building Code (IBC) requirements must be met.
Note: Quantitative testing does not allow for pass/fail results.

Another example of qualitative testing is ASTM E84. The test standard is an accepted normative reference for flame spread testing. A formula for time and distance is used for indices result ratings expressed numerically or as Class A, B or C. Quantitative testing requirements do not include or recognize indices results.

Here’s a list of distinguishing characteristics for building product specimens, their make-up and testing procedures:

a Make-up: The test specimen is an assembly made up of component parts (component parts may be tested separately; however, that test result may change when the specimen becomes part of an assembly and interacts with other components).
b Procedure: Test specimen must be tested as it would be used in the field.
c Procedure: Test specimen must be mounted as it will be mounted in the field.
d The International Building Code’s (IBC) requirements must be considered when testing or field labeling for fire door assemblies is being conducted.
e Procedure: Test is destructive.
f Test results are reported on a pass/fail basis; testing does not meet requirements for quantitative testing. The foregoing requirements for qualitative testing preclude the use of metrology/quantitative testing.

Test Standards
The testing of building products such as fire door assemblies and the reporting of test results use a test standard such as UL 10B with a hose stream test, ASTM E2226, as normative documents to be followed strictly. Test results are reported on a pass/fail basis. An assessor from an Accreditation Body uses the ISO accreditation standard 17025:2017 to establish that the test activity has met the technical requirements contained in the test standard for equipment, methods, procedures, reporting results and the training/experience of technical personnel. The present wording of ISO 17025:2017 does not allude to possible exceptions to test results that do not meet requirements of quantitative testing.

The fire testing standards used for building product such as opening protectives are the ones required for use by the IBC. Anomalies appear when calibration and sampling activities that meet the requirements of 17025:2017 are contrasted to requirements of the IBC:

a Calibration and sampling as activities based on metrology would not meet the technical requirements for qualitative testing for the fire door assembly or other building product assemblies.
b Qualitative testing does not meet the 17025 standard’s requirement for “uncertainty” measurement; however, per ASTM E2536, clause 1.4, “Uncertainty” is not applicable to pass/fail or indices test results. That is because the results reported are qualitative as required by the test standard methodology and this is acceptable as defined in ASTM E2536.

Note: See 17025, Sections 7.6 through 7.6.3, “Evaluation of Measurement” for “uncertainty.” Nothing in this section mentions the exception cited in ASTM E2536.
c Proficiency Testing, see Section 7.7 through 7.7.3 of 17025, "Ensuring the validity of results." There are PT providers who set up testing for single product specimens that are produced by multiple labs with the same measurements and materials; the exact duplication allows for comparison testing, and results will show where significant differences occur. With a building product assembly as the specimen, exact duplication cannot be guaranteed; to ensure lab activity is consistent, proficiency of equipment and personnel is permissible with intra-lab duplication of a test specimen tested to the same standard as reported in an issued test report; the standard does address this exception.

Quantitative Testing Description

The use of metrology in quantitative testing is concerned with the application of measurement to manufacturing and other processes and their use in society. Metrology ensures the suitability of measurement instruments, their calibration and quality control. Producing good measurements is important in industry as it has an impact on the value and quality of the end product, and an impact on production costs.

Although the emphasis is on the measurements themselves, traceability of the measuring instrument calibration is necessary to ensure confidence in the measurement. Recognition of metrological competence in industry can be achieved through accreditation to the technical and management requirements in 17025. Although this definition appears to be limited to calibration activities, sampling and small-scale testing also meet the requirements.

Quantitative testing also uses The International System of Units (SI): Seven base units - length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity are included. By convention, each of these units is considered to be mutually independent of each other; however, in reality, they are interdependent given some definitions contain other base SI Units. All other SI units are derived from the seven base units.

Note: See ISO Guide 99 2007, reviewed in 2015 for definitions, terms and general concepts of metrology. Simply put, the following activities defined as being laboratory activities in ISO 17025 2017 use a series of metrological hypotheses with a defined population of specimens to arrive at a test result based on measurement procedures.

Oversight of Accreditation Bodies by International Organizations

International agencies oversee the activities of ABs in assessing their clients' adherence to ISO standards. These organizations issue Mutual Recognition Arrangements (MRAs) and the ABs as signatory members of the MRA agree to recognize the accreditations of other signatory members. The MRAs reduce expenses in a global economy. The same quality standards do not change from one country to another, and acceptance crosses borders without duplicating services. The international agencies are:
- International Laboratory Accreditation Cooperation (ILAC) oversees member compliance in assessing their client's adherence to ISO 17020 and 17025 for nations in Europe, North America, South America and Africa;
- Asian Pacific Laboratory Accreditation Cooperation (APLAC) oversees member compliance in assessing their client's adherence to ISO 17020 and 17025 for Asia and the Pacific Rim;
- International Accreditation Forum (IAF) oversees peer review process for signatory members of their Mutual Lateral Cooperation (MLA) for compliance to assessing their client's adherence to 17065.

Summary

Accreditation may be sought by a variety of industries, including service, natural resources and others. The points we are making here are concerned with the accreditation of labs whose testing activities deal with the manufactured products from the building industry—specifically those which are assemblies made up of component parts.
The activity of testing may be conducted for R&D purposes, for test results alone or for product certification. Testing for the latter purpose adds an additional process and related procedures to meet the requirements of ISO 17025. Also, ISO 17020 is used for continued surveillance requirements of a product as it is manufactured to ensure conformity to the successfully tested specimen.

Throughout the newly issued standard, technical requirements are couched in terms mainly applicable to quantitative testing. The test specimens are single products manufactured with the same “measurable” equipment, material and procedures.

A Word about Management Requirements in ISO 17025:2017

Identifying risks to impartiality forms the basis for management requirements in all three standards that enter into the picture when the test is performed for listing and labeling. The overall management requirements emphasize identifying the causes for any risks to laboratory quality management in the testing, evaluation and review of test specimens as discussed in this article. The cause, the rate of probability of occurrence and putting measures into place to identify and prevent a risk from becoming a reality are part of risk management. Trace ability of all activities also is emphasized.

It would be a welcome occurrence if building products and their place in the world of laboratories and test activities were recognized as being somewhat different when the writing of accreditation standards is taking place. The differences could use a little recognition when it comes to a few requirements unsuited to their functions in the real world of fire protection assemblies.

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