

Proficiency Testing in Ignitable Liquid Residue Analysis

Technical/Scientific Working Group for Fire and Explosions Analysis (T/SWGFEX) Position
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Proficiency testing is a vital component of proper quality control in forensic science. Proficiency samples for fire debris analysis in particular have proven to be problematic. Therefore, there is a need for consistent and reliable proficiency testing. The intent of this position paper is to provide guidance and technical advice concerning fire debris analysis proficiency testing in order to improve the reliability of the recovery, analysis, and interpretation of results to meet the needs of the forensic laboratory community.

In light of the National Academy of Sciences report,¹ laboratory accreditation requirements,^{2,3} court scrutiny of forensic science practice,^{4,5,6,7} and the fundamental need for accurate test results and to demonstrate competency, the importance of a properly designed proficiency test cannot be underestimated. Recognized organizations have guidelines that should be followed when creating proficiency tests.^{8, 9, 10}

The inconsistency of recent fire debris/ignitable liquid proficiency test results have highlighted the need for proficiency test providers to be more attuned to the needs of the forensic community. Specifically, fire debris proficiency tests should address the following criteria.¹¹

- Test the ability to recover, analyze, and/or interpret gas chromatograph – mass spectrometer data for the presence of ignitable liquid residues (ILR). Tests may be designed such that the emphasis of an individual test may focus on the proficiency to prepare, recover, analyze, and/or interpret the analytical data.
- Accurate test results should be attainable using accepted methods (e.g. ASTM consensus documents).^{12,13,14,15,16}
- The testing should be conducted in the same manner as casework.

This Position Paper has been compiled with the valuable contributions of the members of the Technical/Scientific Working Group for Fire and Explosions Analysis (T/SWGFEX) Laboratory Fire Standard Protocols Committee and the T/SWGFEX Executive Committee. The Mission of the Fire Standard Protocols Committee is “To advance the practices of forensic laboratories in the examination and analysis of evidentiary samples associated with fire investigations.”

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- Test samples should be representative of those routinely encountered in casework, for example, burned and unburned matrix with and without ILR. Matrices may include those commonly encountered at a fire scene (e.g. wood, carpet, tile, fabric, shoes, and plastics). Matrix samples must be extensively characterized in the unburned and burned state prior to use in a test sample. ILR interactions including interferences as a result of contact with the matrix must be documented prior to the distribution of test samples.
- Each test should include a comparison matrix sample with the test samples.
- The types of ignitable liquids used in tests should be readily available and commonly encountered in casework such as found in the Ignitable Liquid Reference Collection (ILRC).¹⁷ Ignitable liquids selected as test samples must be analyzed and classified with unequivocal consensus between at least two referee laboratories or directly comparable to an ignitable liquid in the ILRC.
- Tests should use products in various stages of evaporation.
- The test should measure the ability of the analyst to identify ILR patterns in the presence of combustion and pyrolysis components, and to classify the ILR according to the current ASTM E1618 classification scheme.¹⁶
- Prior to distribution, sample sets must be tested by at least two referee laboratories to verify that consistent and expected results can be obtained. Any inconsistencies must be addressed prior to the distribution of test samples.
- After distribution, and upon collection and compilation of proficiency test results, the test provider must publish participant test methods and results. Details on preparation of the test samples, as well as referee laboratory methods and test results must also be included.
- Test results should be provided to the laboratory examiners who participated in the test.

Following the publication of a test provider's results, it is the responsibility of the forensic science community to evaluate the summarized test results and to annually publish the evaluation. Through the collaborative effort of forensic science practitioners, accrediting agencies, and the proficiency test providers, the quality of forensic services will be improved.

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