

Standard Guide for Fire Debris Report Writing

1. SCOPE

1.1 This standard is intended to serve as a guide in report writing for forensic cases involving the analysis of fire debris for the identification of ignitable liquids.

1.2 This standard applies to the writing of fire debris reports, which are not normally written in a full formal scientific format, but rather in a condensed format.

2. REFERENCE DOCUMENTS

2.1 ASTM Standards

E 1386 Practice for the Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction

E 1387 Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography

E 1388 Practice for Sampling of Headspace Vapors from Fire Debris Samples

E 1412 Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration with Activated Charcoal

E 1413 Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration

E 1492 Practice for Receiving, Documenting, Storing and Retrieving Evidence in a Forensic Science Laboratory

E 1618 Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography - Mass Spectrometry

E 2154 Practice for the Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration with Solid Phase Microextraction (SPME)

3. REPORT CONTENT

3.1 Laboratory reports must contain the following information.

- Unique identifying laboratory number
- Identification of the laboratory issuing the report
- Report date
- Identification of requesting/submitting agency, or person
- An itemized list describing the evidence
- Results/conclusions
- Name and signature of the author(s)

3.2 Reports should include the following information.

- A title describing the type of report
- Disposition of evidence
- Date and manner of submission
- Requesting/submitting agency's unique identifier
- A description of the method(s) used

3.3 Reports may include the following information:

- Subject matter
- Qualifier
- Opinion
- Additional Information

4. REQUIRED INFORMATION

4.1 Unique laboratory identifier

The report must include a unique identifier for each forensic report. This number may include the year and the sequential ordered number in which the particular case was received.

4.2 Identification of the laboratory issuing the report

The report must contain the name of the laboratory, and may include the address and phone number. This information may appear in the letterhead.

4.3 Report date

The report must include a date related to completion of the work, completion of the report, or issuance of the report.

4.4 Identification of requesting/submitting agency or person

The report must include one of the following: the person requesting the analysis; the person submitting the evidence; an investigator or investigating agency; or any customer (client) requesting the laboratory report.

4.5 An itemized list describing the evidence

The report must include an itemized list describing the evidence received. Each item must be uniquely identified and include a brief description of the contents of each container. It is important that the evidence is described accurately, not simply as it was identified by the submitting agency. The description may also include the condition of the seal, the container, and the container's labeling. For example:

A sealed one-gallon metal can containing...

The report should describe the contents as seen, or as the contents would appear to the court. For example: "broken glass and burned carpet", "charred, unidentified debris", or "clear yellow liquid." It may be possible by visual inspection to determine if the description provided by the submitting agency is inaccurate. In this situation the sample must be described based only upon the analyst's observations.

The submitter's description of the evidence may be included in the report to assist in the identification of the evidence. This information provides a clear association of the evidence as documented by the analyst with the description provided by the submitter. Since it is not always possible for the analyst to verify the location of collection, it would be necessary to precede the submitter's description with a term such as "identified as", "reported as", "submitted as", or "labeled as." Quotation marks should be put around the submitter's description when it is taken directly from the submission document(s) or the container. For example:

A sealed four-liter metal can containing broken glass and burned carpet identified as "possible Molotov and carpeting from living room floor inside front window."

An analyst's observations should be easily distinguishable from the information supplied by a submitter. An alternative would be to use the phrase "reported to be" or the word "reportedly" to allow the report writer the freedom to make changes to the submitter's description so that poor grammar or spelling does not have to be quoted. For example:

A sealed one-gallon metal can containing broken glass and burned carpet reportedly from a Molotov cocktail and carpeting from the living room floor.

4.6 Results/conclusions

There is no universal reporting format; however, it must contain results/conclusions. The results must be scientifically accurate and should be written in terms understandable to a layperson. The results/conclusions typically state whether or not an ignitable liquid was identified.

4.6.1 Ignitable Liquid Identified

There are many appropriate phrases that may be used to describe the presence of an ignitable liquid in a sample. Some possible phrases include: "was present in", "was detected in", "was identified in", "was recovered from", and "was found in". The reporting of a positive result for an ignitable liquid does not preclude the presence of other materials such as interfering products. In general, the source of the ignitable liquid cannot be determined and therefore should not be stated. Examples of appropriate results/conclusions are:

A medium petroleum distillate like that found in some paint thinners and some charcoal lighter fluids was present in item #1.

A medium petroleum distillate (MPD) was identified in Exhibit 1. Examples of MPDs include....

A medium petroleum product was detected in Item 1. Examples include....

Gasoline was present in Item 1.

Exhibit 1 contains a heavy isoparaffinic product. Examples of this type of isoparaffinic product include....

A light range petroleum distillate like that in some cigarette lighter fluids was present in the sample, # 1.

4.6.1.1 Gasoline

Gasoline is a unique product and therefore should be named as such in the report.

4.6.1.2 Petroleum Distillates

Many ignitable liquids are distilled from petroleum (crude oil) and are consequently named petroleum distillates. When a petroleum distillate is identified, it must be further characterized by its boiling range or n-alkane range. This is typically expressed by adding an adjective such as light, medium, or heavy prior to the phrase "petroleum distillate". If the range does not fit clearly into a single category, it may be necessary to characterize the ignitable liquid as "light to medium" or "medium to heavy." Finally, list examples of commercial products and/or substrates that might contain such liquids in the proper boiling range. For example:

A medium petroleum distillate in the range of C8 to C11 was detected in Item 7. Examples of commercially available products containing distillates of this type include charcoal starters, paint thinners, and dry cleaning solvents. Medium petroleum distillates are also found in some shoe polish, wood staining products, insecticides, and automotive cleaner products.

A mid-range petroleum distillate like that found in paint thinner and some charcoal lighter fluids was present in Item 3.

Exhibit 2 contains a medium petroleum distillate (MPD). Examples of MPDs include, but are not limited to, some charcoal lighter fluids, paint thinners, and dry cleaning solvents.

4.6.1.3 Other Ignitable Liquids

Some commercial products contain ignitable liquids that are variations of petroleum products or are derived from non-petroleum sources. These include: isoparaffinic products, aromatic products, naphthenic-paraffinic products, normal-alkane products, de-aromatized distillates, some oxygenated products, and other miscellaneous products. These products should also be reported by assigning a description of boiling range, such as light, medium, or heavy. For example:

A mid-range naphthenic-paraffinic product like that found in some charcoal lighter fluids and lamp oils was present in item #3.

4.6.1.4 Residues

In many cases some of the components of an ignitable liquid may be reduced or lost due to evaporation or other environmental conditions such as microbial degradation. Terms such as "residue," "weathered," or "evaporated" may be used at the laboratory's discretion to refer to recovered products. However a term such as "fire-aged" should not be used because it implies

that fire was the only reason for the condition of the ignitable liquid.

4.6.1.5 Special Materials

4.6.1.5.1 Turpentine

The identification of terpenes in fire debris creates a unique situation when reporting results. Terpenes occur naturally in softwoods but the same terpenes can be found in the commercial product turpentine. If the laboratory elects to report the presence of terpenes in a given sample, the results must reflect the nature of terpenes in fire debris. For example:

Terpenes were present in sample #1, which may be a natural product of the wood.

If the wood identified is a hardwood or there is no wood in the sample the following result may be appropriate:

Terpenes like those in turpentine were present in sample #5.

Caution should be used when reporting the use of store bought turpentine as an ignitable liquid because there is a strong chance that terpenes found in a debris sample permeated into the sample from nearby burning softwoods.

If the wood is identified, the following report wording would be appropriate:

The wood in #1 was identified by microscopy as a yellow pine.

4.6.1.5.2 Pure Compounds

Ignitable liquids consisting of single compounds or simple mixtures of compounds should be reported based upon identification rather than classification.

Appropriate examples include:

Gas chromatography and mass spectrometry were used to analyze the sample in #1. Toluene was present in the sample.

Item 2 contained methyl ethyl ketone.

Acetone was present in item #3.

It should be noted that many of these compounds are often the result of background interference, pyrolysis, or incomplete combustion of various materials. Therefore, these compounds should not be reported when they are likely due to the sample matrix unless a qualifier is added.

Toluene was identified in item 4, it should be noted that toluene is commonly used in the manufacturing of shoes.

4.6.2 No Ignitable Liquid Identified or Detected

Several phrases can be used when no ignitable liquid was identified in the sample. The analyst may choose to use different words to describe different negative results so that the report describes the chromatographic data. For example, the word “detected” could be used to describe no response great enough to be identified on the gas chromatogram, while the word “identified” could be used when chemicals were detected by gas chromatography but they did not correspond to any known ignitable liquids and most likely correspond to interfering products. Examples of these results/conclusions include:

No ignitable liquids were detected in the extract from item #1.

No ignitable liquid residues were identified in item #2.

No ignitable liquids, or their residues, were identified in Exhibit #2.

No ignitable liquids were detected or identified in item 2.

The phrase “no ignitable liquids were present” in the sample should be avoided because an ignitable liquid could be present below the detectable limits of the method.

In some circumstances the analyst may wish to reveal to the submitter that something other than an ignitable liquid was detected and identified. For example:

Test results for the volatile fraction of item #1 are consistent with the presence of interfering products found in a variety of synthetic materials.

No identifiable ignitable liquids were recovered from item 2.

4.6.3 Other Considerations

4.6.3.1 Inconclusive results

Occasionally, it is not possible to report a conclusive result due to the condition of the sample or the presence of interfering by-products. For example:

There are indications for the presence of a medium petroleum distillate in item #1; however, the presence of interfering thermal degradation products prevents a conclusive identification.

Volatile components common to some ignitable liquids were identified in item 2; however, the components detected may also arise from the heating or burning of materials. Therefore, a positive conclusion regarding the presence or absence of ignitable liquids cannot be made.

4.6.3.2 Misleading terminology

Care should be taken to ensure that results are not misleading. The use of certain words that suggest, or that could be misinterpreted as indicating the presence of an ignitable liquid, shall not be used when the data does not support a conclusive result. Examples of results that must not be used are:

Exhibit 1 contained hydrocarbons in the range of gasoline.

Item 1 contained hydrocarbons from an unknown source.

Flammable hydrocarbons were found in Exhibit 1.

Some components of gasoline were found in Item 1.

Compounds in the boiling range of diesel fuel were found in Item 1.

A chromatographic pattern characteristic of a petroleum product was found in Item 1.

The analyst cannot determine the intended use of an ignitable liquid or its residue. For this reason, ignitable liquids and ignitable liquid residues must not be characterized as “accelerants” by the analyst.

4.6.3.3 Additional samples

If additional samples could assist in the interpretation of the results, a request for comparison samples or liquid exemplars may be included in this section of the report; however, it is recommended that the investigator be contacted directly for such a request. Examples of a request for an additional sample are as follows:

Further analysis can be performed when comparison samples of the living room carpet and padding are submitted.

Test results for item #2 may be compared to exemplar products should they become available.

The submitting agency should be notified if an unidentified but suspected ignitable liquid was discovered in the fire debris. Additional submissions of exemplars can be compared to the original chromatographic data.

4.6.3.4 Interfering Products

Common interfering products resulting from pyrolysis, combustion, and/or distillation of a substrate at the fire scene are not normally reported except when a significant amount of unexplainable product is detected. For example, styrene is a common pyrolysis product and would not normally be reported.

4.6.3.5 Exemplars

A liquid sample should not be considered an exemplar (known) for comparison unless it is a verified, store bought, unopened item. Liquid in an unsealed container recovered from the fire scene may be compared to ignitable liquids found in fire debris, but should be considered an unknown sample even if the container is commercially labeled.

4.7 Name and signature of the author(s)

The report must contain the name and signature of the author(s). Either handwritten or secure electronic signatures can be used. The title and professional qualifications of each author may

be included. The signature of the peer-reviewer may also be included in the report.

5. RECOMMENDED INFORMATION

5.1 A title describing the type of report

The report should contain a title describing the type of report. Possible examples could include:

Ignitable Liquid Tests

Chemical Analysis Report

Fire Debris Report

Fire Debris Analysis Report

Results of Fire Debris Analysis

5.2 Disposition of evidence

The report should contain the disposition of the evidence. Examples of disposition are “returned to submitter”, “preserved”, “destroyed”, and “destroyed in 30 days unless contrary instructions are received.”

5.3 Date and manner of submission

The report should contain the date of submission. Other dates that may be referenced in the report include the date of the sample delivery to the laboratory, the date received by the analyst, the date opened by the analyst, or the date of the incident. The report should also indicate the manner of submission, for example, hand delivery by the investigator or the courier used to deliver the samples.

5.4 Requesting agency/submitting agency’s file number

The report should contain the requesting agency/submitting agency’s unique file identifier.

5.5 A description of the method(s) used

The report should contain a description of the method(s) used or cite the appropriate ASTM standard. Methods may be described within the text of the results or in another designated area of the report. Examples of test method descriptions are:

The volatile contents of each item were concentrated using a static heated headspace adsorption/elution recovery method and analyzed by capillary gas chromatography/mass spectrometry.

Gas chromatography and mass spectrometry were used to analyze the sample in item 1.

Gas chromatographic/mass spectrometric (GC/MS) analysis of concentrated headspace vapors from item 1 revealed...

Items 1 and 2 were extracted using approximately 30 ml of diethyl ether using a procedure based upon ASTM E1386. The diethyl ether extracts were then reconcentrated down to approximately 1 ml. The extracts were then analyzed by gas chromatography-mass spectrometry using a procedure based upon ASTM E1618.

Item 3 was extracted by passive headspace adsorption using an activated charcoal strip following a procedure based upon ASTM E1412. The strip was desorbed in 0.5 ml of carbon disulfide and the extract was analyzed...

6. OPTIONAL INFORMATION

6.1 Subject Matter

Reports may include reference to a subject, job name, and/or other reference to the case or incident. This may be the property owner's name, a business name, or the address where the fire occurred. This information allows the submitting agency to identify the case.

6.2 Qualifier

The laboratory may elect to include an appropriate note, qualifier, or disclaimer to the report. If an ignitable liquid was identified, it may be appropriate to add a qualifier like:

The identification of an ignitable liquid residue in a fire scene does not necessarily lead to the conclusion that a fire was incendiary in nature. Further investigation may reveal a legitimate reason for the presence of ignitable liquid residues.

Conversely, if a negative result was obtained, a qualifier may help to prevent the reader from misunderstanding the report. An example is:

Negative results do not preclude the possibility that ignitable liquids were present at the fire scene.

6.3 Opinion

The results/conclusion section may serve as the opinion in the report. An opinion section may be used; however, restating the findings in an opinion section is not necessary.

6.4 Additional Information

Additional information may be included in a report for further clarification. For example, if the chemicals methyl alcohol, acetone, methylene chloride, and toluene were identified in a sample, the following additional information could be given:

Examples of commercial products that may contain methyl alcohol, acetone, methylene chloride, and toluene include some paint and varnish removers and some specialty solvents.

If a brand name container of a product is submitted then one might say:

The composition of the mixture detected in item 6 is consistent with the product labeling on the container.

It may also be appropriate in this section to give contact information for the analyst or a website or reference site where clarification of the report or the products may be found.