



EVIDENCE HANDLING AND LABORATORY CAPABILITIES GUIDE TRACE EVIDENCE FIRE DEBRIS

CONTACT INFORMATION

If you have any questions concerning the Trace Evidence laboratory examination capabilities or evidence handling procedures, please call the Forensic Training Section or the Trace Evidence Section at the Forensic Laboratory that services your area.

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OVERVIEW

Fires often involve the use of an ignitable liquid as an accelerant, which is a material used to spread and increase the rate and intensity of burning. Fire debris and other associated evidence are examined for the presence of ignitable liquids. The ignitable liquids identified are often petroleum products such as gasoline, kerosene, or charcoal starter fluids. They may also be nonpetroleum-based ignitable liquids such as alcohols, acetone, or fatty acid-based products (e.g., vegetable oil). The results of laboratory examinations serve to assist the investigator in determining whether a fire may have been caused by arson or by incidental means.

Additional information, Section Procedures, and Training Manuals can be found on the DFS [website](#).

CAPABILITIES AND SERVICES

ANALYSIS

The Trace Evidence Section analyzes evidence submitted by law enforcement agencies for the identification of ignitable liquids in whole liquid samples and fire debris.

In the laboratory, evidence is evaluated and extracted, as necessary. Extracts and whole liquid samples are analyzed by using Gas Chromatography-Mass Spectrometry (GC-MS).

TRAINING

The Trace Evidence Section also provides training for user agencies. This includes training law enforcement officers, fire investigators, and evidence collectors about trace evidence and how to recognize, collect, properly preserve, and submit various types of evidence to DFS for analysis. The

Section also has the unique opportunity to provide an understanding of the types of examinations the forensic laboratory can perform to assist fire investigations or other customized training courses, as requested.

COLLECTION GUIDELINES

NEVER air-dry evidence for fire debris analysis. This type of evidence is volatile, meaning it evaporates. The sooner the evidence is placed in an airtight metal paint can, the greater the chance of recovery of ignitable liquid residues. Once a can has been sealed, do not open the can before submitting it to the laboratory. Ignitable liquid vapors may be released each time the can is opened.

If possible, refrigerate all fire debris evidence prior to analysis to prevent degradation of any ignitable liquids that are present. Microbial organisms and mold are known to cause degradation of ignitable liquids over time. Refrigeration will slow the degradation of ignitable liquids in debris samples. Fire debris evidence is refrigerated once submitted to the laboratory.

Recommended packaging for evidence is clean, unused, metal paint cans with a friction lid. Ensure the lids are securely fastened. While both lined and unlined cans are acceptable, whenever possible, gray epoxy-lined cans are recommended, especially for wet evidence as moisture can cause unlined cans to rust more quickly. Metal cans containing rubber septa (see image) **will not be accepted for analysis** as these types of cans can lead to contamination and/or loss of evidence. Gold-colored epoxy lined cans are also unsuitable for use.



https://forensicsource.com/cdn/shop/products/FS_ar-116-metal-arson-cans-l_600x600.jpg?v=1594232628



<https://forensi-tech.com/wp-content/uploads/2018/07/1753-Solid-Material-Collection-Container-1-gal.-3.9L-AEC02.jpg>

Store unused metal paint cans in a clean, dry area away from potential sources of contamination and with the lids on prior to evidence collection. Label and organize cans by batch/lot number to facilitate proper control can submission (see below for more information on control cans).

PACKAGING

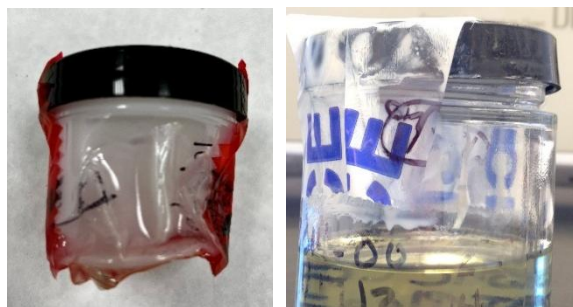
ITEM – SUSPECTED IGNITABLE LIQUIDS (GASOLINE, KEROSENE, CHARCOAL STARTER FLUIDS, ALCOHOLS, ETC.)

METHOD - Place no more than 1 - 2 tablespoons of liquid directly into a small, clean, unused, metal paint can. In other words, there should be enough liquid to cover the bottom of the interior of the can. Alternatively, a glass jar or vial may be used as long as the cap/cap lining is

inert (Teflon, polyethylene, foil; NOT paper, cardboard, wax, rubber) and the glass jar or vial is protected from breakage by placing it into a clean, unused, metal paint can which has been filled with packing material. A polyethylene plastic bottle with a polyethylene cap would also be appropriate. If a jar or vial is used, ensure that the jar or vial can be removed from the can without needing to invert the can.

When submitting liquids from a labeled container, photocopy or photograph the labeling (front and back) and include the copies or photographs with the RFLE.

DISCUSSION - The laboratory only needs a small amount of liquid for analysis. Larger quantities of liquid are unnecessary and increase the risk of contamination or spillage. Glass jars or vials with inappropriate lids or plastic bottles other than polyethylene are not suitable as the ignitable liquid can soften these materials leading to contamination or loss of the evidence sample. Not all plastics are appropriate for use in evidence packaging. Careful selection of container material is essential to preserve the quality and reliability of the evidence.



ITEM – FUEL CONTAINERS

METHOD - Do not submit a fuel container that contains liquid. The liquid must be removed from the container prior to submission and packaged according to the guidelines for Suspected Ignitable Liquids. Unless there is a specific request for latent print processing or DNA analysis, submission of the entire fuel container is not necessary and should be avoided.

Empty fuel containers must either have their caps attached securely or have the container openings sealed shut. Multiple layers of plastic secured over the openings with tape are suitable for this purpose.

DISCUSSION - Fuel containers with liquid often leak or spill. Therefore, the liquid should be removed from the container prior to submission. If a fuel container is empty, it must be properly packaged and sealed to prevent contamination or sample loss. Properly covering any openings prevents the loss of any potential residue.



Multiple layers of plastic (a folded plastic bag) taped over the container opening.



The fuel container is packaged in three layers of plastic bags (see guidelines for Samples Too Large for a Paint Can).

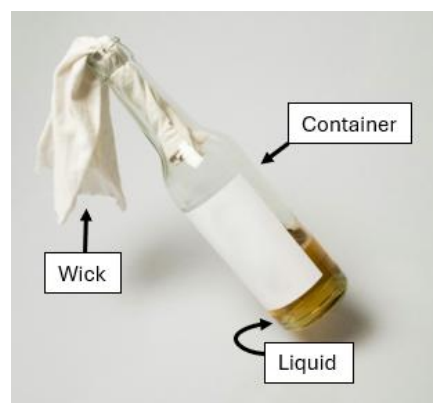
ITEM – MOLOTOV COCKTAILS

METHOD - Remove liquid from the container and package it according to the guidelines for Suspected Ignitable Liquids. Remove the wick and package in a separate clean, unused, metal paint can. After air drying, package the container to avoid the loss of possible latent fingerprints or DNA evidence. Air drying is only appropriate when the container has been separated from the wick and the liquid. If liquid is removed from the Molotov cocktail, the wick and container will generally not be examined for ignitable liquids.

If the container is broken, no liquid is present, and a wick is present: If the wick can be separated from the container remains, package it in a clean, unused, metal paint can. Package the container remains in a separate clean, unused, metal paint can.

If the container is broken, no liquid is present, and there is no wick: Package materials in a clean, unused, metal paint can.

DISCUSSION - Separating the individual components of a Molotov cocktail (i.e., the liquid, wick, and container) facilitates a broader range of forensic examinations, including latent fingerprint and DNA analysis. This approach not only maintains the quality of the evidence but also allows for faster processing and results.



ITEM – FIRE DEBRIS SAMPLES

METHOD - Collect porous materials from the area at the interface between heavily charred areas and areas of marginal burn near the area(s) of origin. Package samples in clean, unused, metal paint cans, filling each can no more than $\frac{3}{4}$ full to allow for proper laboratory analysis.

Swabbing a material generally does not collect an ignitable liquid that has been absorbed into that material. It is advisable to collect a portion of the substrate material instead of using an absorbent swab. Swabs should be used for liquid samples only. If a swab is used, do not wet the swab with any liquid prior to use.

For each type/size of metal paint can used to package evidence, submit a corresponding empty, unused control can.

DISCUSSION - Using metal paint cans helps preserve ignitable liquid residues by minimizing evaporation and contamination. Limiting the fill level to no more than $\frac{3}{4}$ full ensures there is adequate headspace for efficient extraction and analysis in the laboratory. However, collecting too little debris may limit the material available for testing, potentially affecting the ability to detect and identify ignitable liquids. It is important to balance sample sufficiency with proper packaging practices to ensure reliable results.

ITEM – COMPARISON SAMPLES

METHOD - Comparison samples consisting of materials consistent with those found in the fire debris sample (e.g., wood, carpet, tile) may be collected. A comparison sample should be collected from an area that is not suspected to contain a foreign ignitable liquid. For example, if the fire debris sample includes charred carpet and foam padding, the comparison sample should include carpet and foam padding from an area that is believed to be free of ignitable liquids.

Package comparison samples in clean, unused, metal paint cans, filling each no more than $\frac{3}{4}$ full.

For each type/size of metal paint can used to package evidence, submit a corresponding empty, unused control can.

DISCUSSION - Although not required, comparison samples may provide information regarding ignitable liquids inherent to the materials collected. Comparison samples may be helpful for materials such as stained exterior wood decking as wood stains often contain ignitable liquids. Comparison samples should be submitted as an Item and the results for a comparison sample will be reported in the same manner as all other items.

ITEM – CONTROL SAMPLES

METHOD - Any materials that are added by the investigator to a submitted sample should also have an unused portion of the material submitted as a control sample. For example, when using gauze to collect a liquid sample, an unused sample of the same type of gauze should also be submitted as a control sample.

Package control samples in clean, unused, metal paint cans.

For each type/size of metal paint can used to package evidence, submit a corresponding empty, unused control can.

DISCUSSION - It is recommended that absorbent materials (e.g., gauze) only be used when absolutely necessary. Often, a new, clean dropper can be used to collect liquid rather than an absorbent material. Some absorbent materials, such as non-stick gauze, contain petroleum-based products. Do not use cotton swabs such as those recommended for collecting suspected blood. These swabs contain adhesive material that may interfere with ignitable liquid analysis and have limited absorption capabilities due to their small size. Appropriate absorbent materials include some cotton balls and some gauze. "Haz-Mat" absorbent material must not be used and will not be analyzed. It is also not advisable to use newspaper, feminine hygiene products, paper towels, or toilet tissue as these materials may contain petroleum products or other materials that may interfere with the analysis.

ITEM – SAMPLES TOO LARGE FOR A PAINT CAN

METHOD - Cut or trim evidence, when appropriate, to fit into one or more clean, unused, metal paint can(s). Fill each can no more than $\frac{3}{4}$ full. On the Request for Laboratory Examination form (RFLE), clearly indicate that these items may be combined for analysis.

If the evidence cannot be made to fit into one or more clean, unused, metal paint can(s), wrap the evidence multiple times (3-4) in heavy plastic or package in multiple layers of plastic bags. Submit this evidence as soon as possible – preferably the same day or the next day. Contact the laboratory in advance to notify them that evidence packaged in this manner is being submitted.

Five-quart (imperial gallon) metal cans are commercially available and may be used to package items that are too tall for standard one-gallon cans (e.g., long-neck bottles or shoes).

Five-gallon metal pails should be avoided as collection containers as they frequently contain interfering compounds and are not airtight.

For each type/size of metal paint can used to package evidence, submit a corresponding empty, unused control can.



DISCUSSION - Due to the volatile nature of fire debris evidence, it is critical to notify the laboratory when evidence cannot be packaged in a metal paint can. Prompt notification allows for expedited analysis, helping to minimize the potential loss of ignitable liquid residues.

Examples of materials submitted that are too big for a paint can and cannot be cut easily include a metal shovel head, a metal bucket, some fuel containers, etc.

NOTE - The laboratory cannot utilize the most sensitive extraction technique available if the material is not packaged in a metal paint can.

ITEM – SUSPECTED IGNITION SOURCES (CANDLES, MATCHES, FUSES, OR FIREWORKS)

METHOD - Candles and matches should not be submitted. Unless tampered with in order to release the liquid, a cigarette lighter should also not be submitted for ignitable liquid analysis.

DISCUSSION - Candles and matches are not analyzed as a part of fire debris examinations. Fuses and fireworks are classified as explosives evidence and should be submitted for explosives examination.

ITEM – HAZARDOUS MATERIALS OR “DUMPING” SAMPLES

METHOD - If the sample is liquid, follow the guidelines for Suspected Ignitable Liquids. For non-liquids, package the material in a clean, unused, metal paint can. Fill the can no more than $\frac{3}{4}$ full of the material.

For each type/size of metal paint can used to package evidence, submit a corresponding empty, unused control can.

DISCUSSION - The only samples accepted will be those that require only the identification of an ignitable liquid. For instance, the Trace Evidence Section does not conduct flash point examinations or the analysis of Polychlorinated Biphenyls (PCBs) in oil. These types of analyses should be referred to the [Division of Consolidated Laboratory Services](#). Please call the Trace Evidence Section with questions regarding these types of samples.

SUBMISSION GUIDELINES

REQUEST FOR LABORATORY EXAMINATION

See the [General Submission of Evidence Section](#) for general information and pictures. Indicate the following on the RFLE as applicable:

- If separate containers of fire debris from the same location may be combined.
- If there is a suspected ignitable liquid that has been used. This is particularly important in the case of vegetable oils.
- If ignitable liquids that evaporate quickly are suspected (e.g., alcohol, acetone, cigarette lighter fluids, brush cleaners).
- If chemical incendiaries are suspected.
- If no control can is available.

CONTROL CANS

Metal paint cans suitable for packaging fire debris samples can sometimes contain ignitable liquids from the manufacturing process or products that interfere with the instrumental analysis of the evidentiary samples; for that reason, control can samples are required to be submitted along with the evidence. For each type/size of metal paint can used to package evidence, a corresponding empty, unused paint can must be submitted as a control can sample. The control can must be from the same lot/batch as the cans used to package the evidence and, therefore, it should have the same physical characteristics (e.g., lining, size, shape, handle attachment, lid type, etc.) as the cans used to collect the evidence. See our [policy notice](#) for more information.

SUBMISSION REMINDERS

Fill cans no more than $\frac{3}{4}$ full of fire debris. However, collecting too small an amount of debris may limit the material available for testing.

For every type and size of metal paint can used to package evidentiary samples, a corresponding control can must be submitted.

Metal cans should be wiped off following evidence collection to prevent rusting of the outer portion of the container. Additionally, it is good practice to set the can on a clean paper or area when collecting a sample and not on fire debris.



Whenever possible, gray epoxy-lined cans are recommended, especially for wet evidence as moisture can cause unlined cans to rust more quickly.

When submitting liquids, put no more than 1 - 2 tablespoons in a paint can or glass jar or vial. If using a glass jar or vial, the lid must be appropriate (as described above), the jar or vial must be placed in a paint can, and packing material must be included in the paint can protect the jar or vial from breakage.