I. Fire Debris Evidence

One aspect of trace evidence analysis is the examination of debris and materials associated with suspected arson. Fire debris evidence is examined for the presence of an ignitable liquid. Collect fire debris samples as quickly as possible after the fire is extinguished and it is safe as ignitable liquids are volatile and will evaporate.

A. There are three types of containers recommended for packaging fire debris:

1. Clean, unused lined or unlined paint cans (gallon size recommended, quart size is acceptable).

2. Kapak fire debris plastic bags.

3. Nylon fire debris plastic bags.

B. There are several points to consider when packaging fire debris evidence:

1. DO NOT use regular zip lock plastic bags or paper bags because they are permeable and will allow ignitable liquids to escape. Evidence will not be analyzed if it is not packaged in a vapor tight container.

2. Do not fill the containers (cans or bags) more than 3/4ths full.

3. DO NOT DRY the fire debris samples before submitting because ignitable liquids will evaporate.

4. Seal the lids on paint cans tightly.

5. Leave space (1.5 in X 1.5 in) on the lid of cans that is free from labeling or seals so the contents may be sampled through the lid.

6. Kapak or nylon bags may be heat sealed or sealed with tape (we recommend Scotch Brand 3M 2” Commercial Grade (3750) packaging tape - cheaper brands do not work).

7. The seals may be checked by carefully pressing on bags and checking if air escapes.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL’S QUALTRAX

8. If you use bags, watch for sharp items such as broken glass, nails, wood fragments, etc. that may puncture bag. Cans may be better for samples with sharp objects.

9. Remember to initial across seals onto the container.

10. Freeze samples containing soil as soon as possible to prevent breakdown of possible ignitable liquids due to microbial action.

C. Liquid samples of ignitable liquids require different packaging.

1. Clan Lab sampling kits which contain an outer plastic bottle with lid that contain an inner glass vial with a tight fitting Teflon lined lid are the best type of packaging for liquids.

2. Ignitable liquids, such as gasoline, will dissolve paper liners in most lids and will also dissolve some plastic bottles, plastic cap liners and aluminum cap liners. The best are Teflon lined caps.

3. Do not use any type of bag for liquid samples. Do not use a plastic vial - they will melt.

4. 5ml of sample or less is sufficient for analysis.

D. Whenever possible, please send comparison samples of the materials (i.e. carpet, wood flooring, floor tile, etc.) submitted for analysis. Comparison samples are used for comparison with what is extracted from the submitted samples to see what may have come from the sample itself and what may be an ignitable liquid.

The most common ignitable liquid is gasoline. Other common ignitable liquids are charcoal lighter fluids, mineral spirits and paint thinners. Ignitable liquids other than gasoline are divided into seven categories. Each category is divided into light, medium and heavy. The categories and some examples of each are listed below:

<u>Petroleum Distillates:</u>

Light petroleum distillate ignitable liquid. Examples of light petroleum distillates are petroleum ether, some cigarette lighter fluids and some camping fluids.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

Medium petroleum distillate ignitable liquid. Examples of medium petroleum distillates are some charcoal starters, some paint thinners, some mineral spirits and some dry cleaning solvents.

Heavy petroleum distillate ignitable liquid. Examples of heavy petroleum distillates are kerosene, diesel fuel, some jet fuels, some charcoal starters and some automotive fuel system cleaners and treatments.

Isoparaffinic Products:

Light isoparaffinic product ignitable liquid. Examples of light isoparaffinic products are some specialty solvents and aviation gas.

Medium isoparaffinic product ignitable liquid. Examples of medium isoparaffinic products are some charcoal starters, some paint thinners and some copier toners.

Heavy isoparaffinic product ignitable liquid. Examples of heavy isoparaffinic products are some commercial specialty solvents.

Aromatic Products:

Light aromatic product ignitable liquid. Examples of light aromatic products are some paint and varnish removers, some automotive parts cleaners, xylenes and toluene-based products.

Medium aromatic product ignitable liquid. Examples of medium aromatic products are some automotive parts cleaners, some specialty cleaning solvents, some insecticide vehicles and some fuel additives.

Heavy aromatic product ignitable liquid. Examples of heavy aromatic products are some insecticide vehicles and some industrial cleaning solvents.

Naphthenic-Paraffinic Products:

Light naphthenic-paraffinic product ignitable liquid. Examples of light naphthenic-paraffinic products are cyclohexane based solvents and products.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

Medium naphthenic-paraffinic product ignitable liquid. Examples of medium naphthenic-paraffinic products are some charcoal starters, some insecticide vehicles and some lamp oils.

Heavy naphthenic-paraffinic product ignitable liquid. Examples of heavy naphthenic-paraffinic products are some insecticide vehicles, some lamp oils, and some industrial solvents.

Normal Alkane Products:

Light normal alkane product ignitable liquid. Examples of light normal alkane products are some solvents (pentane, hexane and heptane).

Medium normal alkane product ignitable liquid. Examples of medium normal alkane products are some candle oils and some copier toners.

Heavy normal alkane product ignitable liquid. Examples of heavy normal alkane products are some candle oils, carbonless forms and some copier toners.

Oxygenated Solvents:

Light oxygenated solvents ignitable liquid. Examples of light oxygenated solvents are alcohols, ketones, some lacquer thinners, some fuel additives and surface preparation solvents.

Medium oxygenated solvents ignitable liquid. Examples of medium oxygenated solvents are some lacquer thinners, some industrial solvents, some metal cleaners, and some gloss removers.

Others-Miscellaneous:

Light others-miscellaneous ignitable liquid. Examples of light others-miscellaneous are some single component products, some blended products and some enamel reducers.

Medium others-miscellaneous ignitable liquid. Examples of medium others-miscellaneous are some turpentine products, some blended products and some specialty products.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

Heavy others-miscellaneous ignitable liquid. Examples of heavy others-miscellaneous are some blended products and some specialty products.

For an ignitable liquid to be identified, it must stand out from the background of combustion products, pyrolysis products and substrate background of the sample. This will vary for each sample submitted.

There are a number of solid materials that can be used as incendiaries such as sugar-chlorate, thermite, white phosphorus and many more. The identification of these materials can be performed and is similar to the examinations for explosives.

II. Explosives Evidence

Explosives may be divided into two classes - low order explosives and high order explosives. Generally low order explosives must be confined and deflagrate (confined burning), reacting at less than the speed of sound. Examples are black powder and flash powder. High explosives do not need to be confined and detonate, undergoing reactions greater than the speed of sound. Examples include dynamite and C4. High explosives are not examined at this laboratory.

A. Some types of explosive samples that may be encountered in the Crime Laboratory are:

<u>Black powder</u>

Black powder is usually a mixture of potassium nitrate, charcoal (carbon) and sulfur.

<u>Black Powder Substitutes</u>

Pyrodex is an example of a black powder substitute. It contains potassium nitrate, sulfur, charcoal, potassium perchlorate, potassium benzoate and dicyanamide.

<u>Flash powder</u>

Flash powder is usually a mixture of aluminum, potassium perchlorate and sulfur

<u>Pyrotechnics - Fireworks</u>

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

Fireworks may contain black powder, flash powder and/or other inorganic materials.

Smokeless gunpowder

Smokeless gunpowder is used to load and reload ammunition. The major types are single base - nitrocelluse and double base - nitrocellulose and nitroglycerin. Triple base smokeless gunpowder, containing nitrocellulose, nitroglycerin and nitroguanidine, is mainly used for large caliber ammunitions, such as those used for military artillery and navy ships.

Chemical Reaction "MacGyver" and Pressure Bombs

Chemical reaction bombs work on a chemical reaction, either acidic or basic, producing a gas which will build up and eventually rupture the container. A variation is the use of dry ice or liquid nitrogen to create the over-pressure device. Chemical reaction and pressure bomb containers are typically plastic drink bottles. The dry ice bomb will usually leave no evidence, other than the debris may be cold if the investigators arrive just after the explosion. The carbon dioxide or nitrogen that caused the container to rupture dissipates into the air.

The liquid, foil, and container may be submitted to the lab for analysis. DO NOT put liquid from chemical reaction bombs in bottles with metal lined lids. If possible, separate the components from each other so the reaction does not continue.

B. Evidence which will be of value in an explosives case may include:

1. All pipe or exploded container fragments.

2. Soils from the immediate area of an explosion.

3. Unexplained debris such as match heads, gray or black residues, any residue that is physically different from its surroundings.

4. Any wires, batteries, fuses, timing devices, delay mechanisms, and switches.

C. Collection and Packaging of Explosives Evidence:

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

1. Suspected Explosive Powders:

   a. Maximum amount of explosive powder allowed for submittal is 1 ounces or less.

   b. Suspected explosive powders should be placed in anti-static zip-lock bags that are available. SUSPECTED EXPLOSIVE POWDER SHOULD NOT BE PLACED IN REGULAR PLASTIC BAGS, SUCH AS ZIP-LOCK BAGS.

   c. Suspected explosive powders may be placed in sealed clean, unused metal cans. Flash powder should not be placed in a metal can.

   d. Suspected explosive powders may be placed in a sealed envelope or a sealed paper bag.

   e. Liquids may be placed in a glass vial with a Teflon lined cap.

2. Explosive Residues and Samples:

   Explosive residues and samples from the area of the blast may be placed in clean, unused metal cans. If metal cans are not available, paper bags may be used.

   Explosive residues will be examined for unconsumed explosives. If no intact explosives are detected, testing will stop. Post blast debris that does not contain unconsumed explosive particles will not be analyzed by this laboratory.

3. Live Explosive Devices:

   THE LABORATORY DOES NOT ACCEPT LIVE EXPLOSIVE DEVICES. THEY SHALL BE RENDERED SAFE BEFORE SUBMITTING TO THE LAB. RENDERED SAFE – DEVICE DISMANTLED, POWDER NO LONGER CONFINED.

If latent fingerprint tests or DNA tests are to be performed on any of the samples, be sure to indicate it on the submittal AND on the evidence packaging so there is no possibility of damaging this evidence during other analyses.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX

If you have ANY QUESTIONS, CONCERNS or DOUBTS as to how to handle a sample, please CALL THE LABORATORY for guidance. It is better to take a few extra moments to be sure you are doing something properly, rather than potentially compromising a sample.

THIS DOCUMENT IS UNCONTROLLED IF IT APPEARS OUTSIDE OF NSPCL'S QUALTRAX