5.1.1 Fire Debris Analysis – Analytical Approach

5.1.1.1 Sample handling and initial examination

- When possible, each evidentiary sample will be inspected for proper packaging and seals when received into the laboratory and prior to storage. Where necessary, improper packaging and/or seals will be remedied prior to processing.

- Soil samples - Due to possible bacterial degradation of ignitable liquid residues in soil samples, these types of samples should be refrigerated or frozen upon receipt into the laboratory, or analyzed promptly. This temperature is not critical and does not need to be monitored or recorded.

- Biological samples - Should be refrigerated or frozen upon receipt into the laboratory, and analyzed promptly. This temperature is not critical and does not need to be monitored or recorded.

- It is recommended that the appearance/contents of each evidence item be described in the notes. Briefly open each container, make a gross visual inspection, and record a description of the contents.

- Attention should be given to other possible evidence types that may be within the evidence samples. These might include:

  - latent prints or DNA on containers (ex. gasoline containers) of surfaces of molotov cocktails

  - fibers, hairs or DNA found on cloth items, especially those used for wicks in molotov cocktails

  - physical match of things like torn cloth from molotov cocktails or other incendiary device items

  - explosive or incendiary device residues

  - wax, fuse materials or other items possibly used for a delay mechanism

- Do not intentionally smell the contents of the container while observing the contents but do make a notation of any unavoidable odor from the contents.
- If a nonaqueous liquid is present, if desired, test to confirm it is nonaqueous nature. A nonaqueous liquid will be immiscible with water and will be noted on the worksheet. A nonaqueous liquid or appropriate water miscible liquid (e.g., alcohols) may be injected directly into the gas chromatograph - mass spectrometer (GC-MS). An aqueous liquid should be analyzed by the Passive Adsorption-Elution procedure, Headspace analysis or by the Solvent Extraction procedure. A direct sampling (liquid sample) can be collected from an aqueous sample, however if the sample is negative or is being examined in an extraction-only lab, the previous methods mentioned should be utilized.

Evidence Packaging Preparation for Sampling - (Passive Adsorption-Elution) The submitted container (nylon bag or metal can) or the sample itself (ex: debris itself) will be placed inside a laboratory

heatsealed clean/unused nylon bag for the extraction time frame (when practical). This will apply to both oven or room temperature extractions. This will ensure knowledge of the integrity of the outer packaging, providing an airtight seal and prevent cross contamination.

Samples Submitted as "Comparison Samples": With the exception of liquid samples, samples submitted as Comparison Samples (example: carpet, linoleum, etc.) will be extracted and analyzed in the same manner as the evidence they are being compared to. These solid substrate Comparison Samples may also be burned to ascertain their potential pyrolysis products. Liquid samples submitted for comparison may be directly sampled to examine/determine their composition.

5.1.1.2 Environmental Conditions

Sample preparation must be performed in an area that is free from extraneous organic fumes that may be adsorbed onto the charcoal.

5.1.1.3 Safety

Refer to the FSD Health & Safety Manual.

This procedure involves hazardous materials, operations, and equipment. It is the responsibility of the analyst to abide by the established safety and health practices and procedures. Proper caution should be exercised at all times. The analyst should consult and be familiar with the appropriate Safety Data Sheets (SDS) for each chemical utilized in analysis prior to use. The vapor densities of solvents used in fire debris analysis procedures are found in literature. Remember, a vapor density greater than one will result in vapor concentration near the work surface. Also, any solvent with a high flammability or health rating (greater than two) should be used in the fume hood with adequate ventilation.

It is required to use CS_2 in a properly functioning fumehood. Intentional inhalation of the odor of the contents of items for fire debris analysis is prohibited due to the potential health concerns related to this activity.

5.1.1.4 Minimum Standards and Controls

Also refer to the specific methods for further minimum standards and controls pertaining to that technique.

- When a new container of solvent is opened, a GC-MS run should be performed to check for contaminants before it is placed into use. Approximately 5 ml of the new solvent is evaporated to a few drops. 1 µl of this evaporated solvent is injected into the GC-MS. If the resulting data has no significant peaks which interfere with the analysis, then the solvent is available for use in casework. The data is labeled with the date, initials, manufacturer, and lot number, and placed in a file at the laboratory utilizing that solvent.

- If utilizing an internal standard, each new test solution made (internal control mixed with solvent) must be tested before being utilized. The data is labeled with the date, initials, manufacturer, and lot number, and placed in a file at the laboratory utilizing that internal standard.

- Activated charcoal strips come packaged in an airtight package and are accompanied by paperwork showing Lot Number and quality control testing data by the manufacturer. This information shall be kept at the laboratory where the strips are being used for extractions.

- When the activated charcoal or activated charcoal strips are received, the following testing shall be performed:

    - a sampling of the charcoal or a sample strip eluted and run on GC/MS to test the batch (Lot Number) for any contamination.

    - an extraction efficacy check of the charcoal or a sample strip. Place two ul of a 1:1 gasoline:diesel fuel mix placed on laboratory paper product (e.g.: Kimwipe) inside of a nylon bag, and extract for the usual time/temp, eluted with CS2 and run on GC/MS to test the batch.

    - Note: No casework sampling shall be performed until the batch is tested. The GC/MS data from this "new batch" is labeled with the date, initials, manufacturer, and lot number, and will be maintained in the laboratory where it is being utilized.

- The temperature setting (as viewed on a thermometer or thermometer LED readout) of ovens utilized for heating samples is recorded in the case notes.

- Ovens shall be checked on a yearly basis with another thermometer to confirm they are functioning properly. A record of this check will be maintained in laboratory.