

General Approach for Paint and Coating Casework

1 Introduction

The most common types of coating evidence analyzed in crime laboratories are automotive and architectural (e.g., house, do-it-yourself (DIY)) paints. Cosmetic nail polish, tool, industrial, and non-automotive vehicle paints are also encountered.

Forensic paint examinations involve either (1) determining if a material is a coating/paint, (2) comparing two (or more) coating samples to determine if they can be differentiated, or (3) developing a probable source of an original equipment manufacturer (OEM) automotive coating.

2 Scope

This procedure describes general guidelines Chemistry Unit caseworking personnel who analyze paint and coating evidence submitted to the FBI Laboratory. Separate, detailed standard operating procedures exist that cover sample processing and acquisition of both physical and chemical compositional data on paint and coating evidence.

3 Equipment/Materials/Reagents

Not applicable.

4 Standards and Controls

Not applicable.

5 Collection and Preservation Considerations

The proper selection, collection, preservation, and packaging of paint evidence are of paramount importance in a forensic examination. The potential for a physical match between the broken edges of a known and questioned sample should be considered before selecting a collection method. Care must be taken to keep these edges intact.

Sources of questioned paint specimens include manageable objects such as clothing, tools, or bicycles, and less manageable objects such as motor vehicles, walls, sidewalks, roadways, etc. Whenever possible, items with potential paint transfer or smeared paint transfer should be submitted for examination in their entirety. Items of clothing should be packaged separately in paper bags. When paint evidence is suspected on an item such as a person, floor, or roadway, every effort should be made to manually remove it from that object. If the investigation involves a motor vehicle, the recommended practice is to place brown kraft paper under the area where paint transfer is suspected and then section, scrape, or cut the area of interest from the vehicle.

This paper should be saved and submitted along with the collected paint sample.

In order to account for any possible variation in layer structure across a painted surface, “control” (or known) samples should be taken from an area close to (but not within) any damaged area. If no damage is obvious, controls should be taken from several areas of the suspected substrate. In the case of motor vehicles, various layer systems and paint chemistries can be present on a single vehicle depending on factors such as different substrates (sheet metal or composite materials), horizontal versus vertical surfaces, stone chip susceptibility, and assembly plant spot repair. Aftermarket refinishes/repairs and weathering can also influence the paint system. “Control” specimens should comprise all of the layers of paint down to the parent substrate. This can be accomplished by a number of methods: sectioning an area of the painted surface, cutting a paint sample from the parent substrate using a clean blade or knife, lifting or prying loosely attached chips, or dislodging by gently impacting the opposite side of the painted surface.

Paint chips should be confined between two glass microscope slides, contained in pharmacy folded paper, or packaged in covered containers (e.g., pillboxes, glass or plastic vials). Plastic bags, cotton, and envelopes should not be used as the initial packaging for paint specimens. Other items, such as tools or sections of automotive parts, should be safely packaged (i.e., to minimize injury or compromising of the packaging due to sharp edges) separately and precautions taken to minimize the potential for dislodging the suspected paint transfer during transport to the FBI Laboratory.

6 Consideration for Other Forensic Examinations

Process clothing for trace evidence and/or paint transfer prior to any fabric impression or DNA examinations. Regardless of which unit receives the evidence first, Paints and Polymers (P&P) personnel will then visually and/or microscopically examine the items and any associated debris for paint evidence.

If latent fingerprint and/or toolmark examinations are requested on an item (e.g., a tool), the item should be examined for paint evidence first. The paint can be removed from the item with tweezers or a relatively soft, pliable material such as wood or Teflon™. Metal probes and blades must not be used on the working end of a tool as they can alter the surface, thereby interfering with subsequent toolmark examinations. Ensure appropriate laboratory precautions are observed when working with latent print evidence.

7 Procedures

Conduct a critical review of the contributor’s request and the item(s) received. As applicable, recommend additional examinations that could be probative and determine the logical sequence for the requested forensic examinations.

In a paint characterization, analyze the material in question using some or all of the methods outlined in Figure 1.

In a paint comparison examination, establish if any differences are detected between two (or more) samples after subjecting them to the same rigorous analytical testing. Figure 1 shows a flowchart that outlines the scheme for a paint comparison examination. A P&P Standard Operating Procedure (SOP) describes each analytical technique depicted in Figure 1 in detail.

If the paint sample is a factory-applied, original equipment manufacturer's (OEM) automotive finish, several reference collections and databases exist to aid in developing possible make, model, and model year information about the source vehicle. Figure 2 is a flowchart that outlines the analytical scheme for an automotive make-model-year search. A P&P SOP describes each analytical technique depicted in Figure 2 in detail.

8 Sample Selection

Due to the wide variety of examination requests, numbers of samples submitted, and conditions of the samples submitted, P&P examiner discretion will determine the appropriate sample(s) to examine on a case-by-case basis. For indistinguishable samples, as determined by a discretionary number of analytical examinations, an option is to take an individual sample, assign a new item identifier (e.g., Item1-1), specifically list the item in the item inventory, and discuss it independently in the report of examination. Record the decision criteria used for determining the sample(s) selected in the case notes. If the complexity of the case warrants discussion of the sample(s) selection with another P&P examiner, also record this discussion in the case notes.

9 Calculations

Not applicable.

10 Measurement Uncertainty

Not applicable.

11 Limitations

- a. Sample size and condition can preclude conducting certain examinations, including color assessment and layer structure.
- b. If the sample is a smear, layers can commingle and hinder attempts to isolate each for analysis.
- c. A factory-applied, OEM automotive finish is required for make-model-year determinations.

- d. Sourcing an evidentiary paint specimen to a single make, model, and year may not be feasible because several different vehicles can be manufactured at a single assembly plant and/or the same color of paint can be utilized on different vehicle models over a period of time.

12 Safety

Take standard precautions for the handling and disposal of chemicals and sharps. Use universal precautions when handling potentially biohazardous materials. Refer to the most current revision of the *FBI Laboratory Safety Manual* and appropriate Safety Data Sheets for further details.

13 References

ASTM E1610, Standard Guide for Forensic Paint Analysis and Comparison. ASTM International, West Conshohocken, PA

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Neilsen, H.K. Forensic analysis of coatings. *J. Coatings Tech.*, 1984; 56(718): 21-32.

Ryland, S.G. Infrared microspectroscopy of forensic paint evidence. Chapter 6 in *Practical Guide to Infrared Microspectroscopy*. (ed. H.J. Humecki) NY: Marcel Dekker, Inc., 1995.

Ryland, S.G. and Suzuki, E.M. Analysis of paint evidence. Chapter 5 in *Forensic Chemistry Handbook*. (ed. L.F. Kobilinsky) NJ: John Wiley and Sons, Inc. 2012.

Figure 1: Analytical Scheme for a Paint Comparison Examination

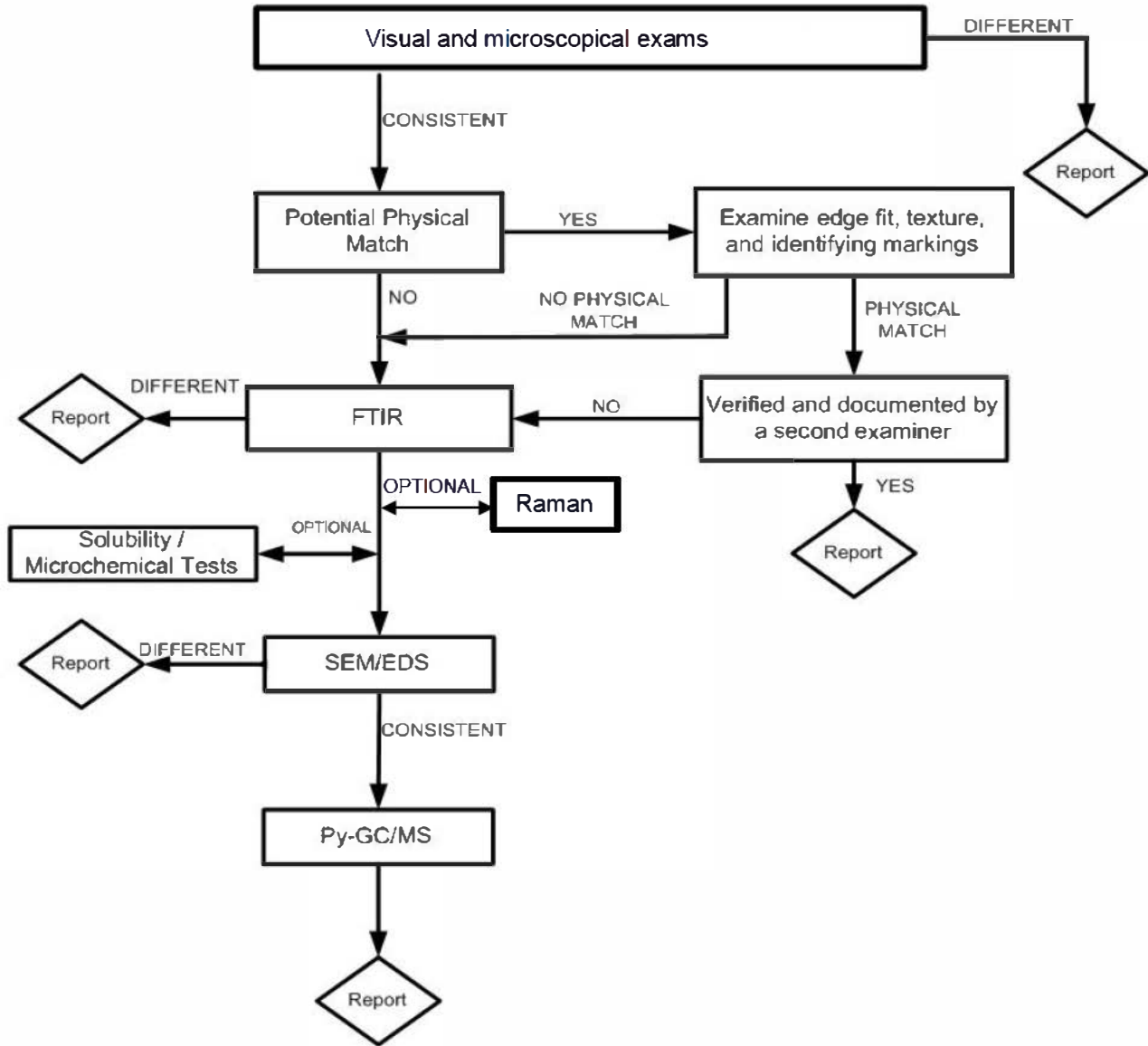
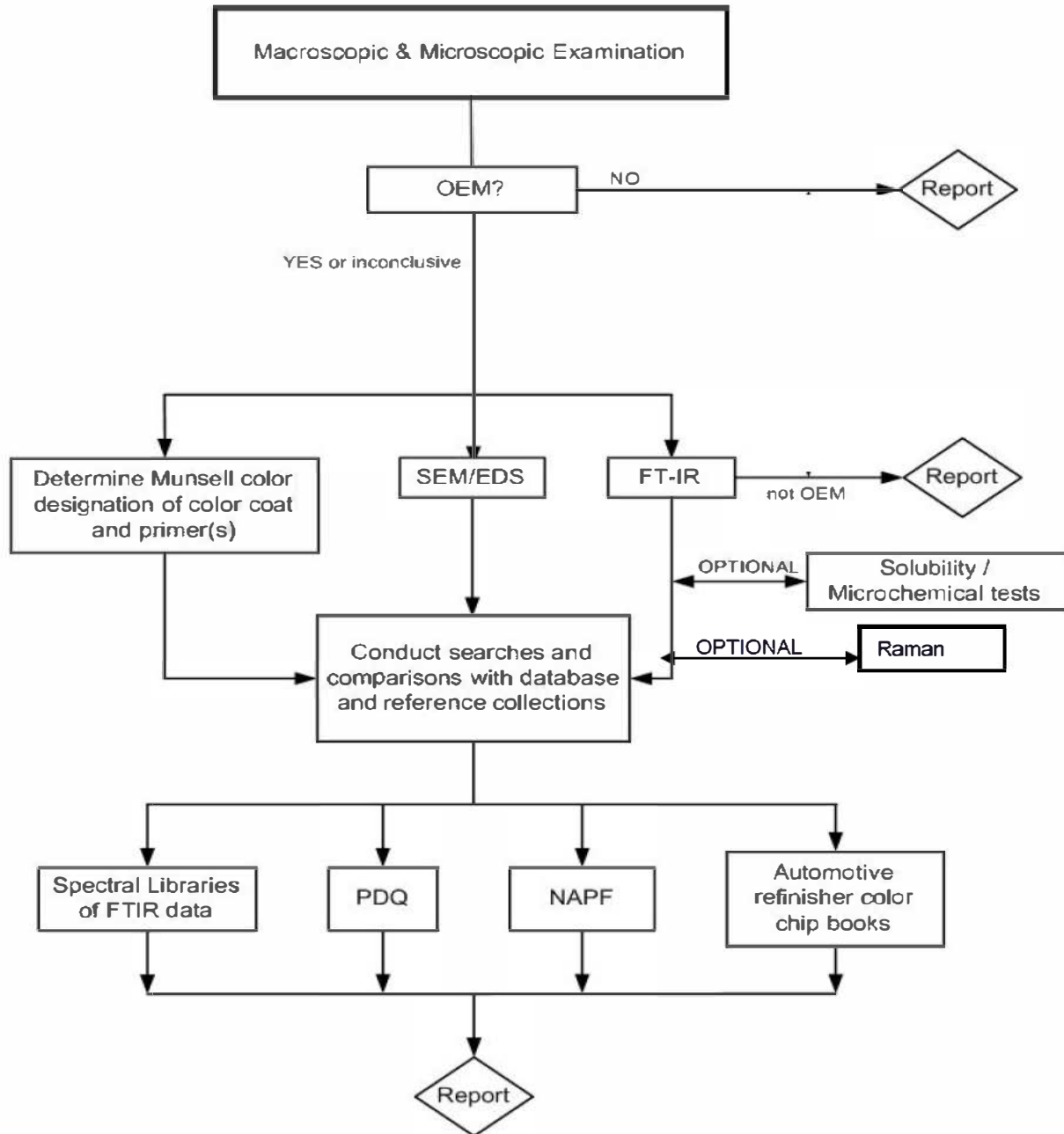


Figure 2: Analytical Scheme for Make-Model-Year Search of Automotive Paint



Rev. #	Issue Date	History
0	06/21/06	New document that replaces previous document also titled <i>General Approach for Paint and Coating Casework</i> .
1	09/30/09	Added a section to describe the sampling plan and added ASTM reference. Revised Figures 1 and 2.
2	03/14/12	Changed “sampling” to “sample selection” in Section 10. Updated references in section 15.
3	02/03/14	Changed “must” to “should” in Section 7 in describing ideal control paint sample, updated item designator example in Section 10 to reflect new QA policies, and made minor grammatical changes.
4	09/18/18	Updated Section 1, Introduction and revised Scope to describe who document applies to; Removed Calibration and Types of Paint Evidence sections as they did not describe procedural content and renumbered. Updated Sections 5, 6, 7 and 8 for clarity. Updated references and added Raman to Figures 1 and 2.

Approval

Redacted - Signatures on File

Paints and Polymers
 Technical Leader:

Date: 09/17/2018

Chemistry Unit Chief:

Date: 09/17/2018

QA Approval

Quality Manager:

Date: 09/17/2018