Training Outline for the Examination of Paint

1.0 Purpose – This document provides an outline for training in the collection, preservation, and examination of paint evidence, including the requisite competency testing.

2.0 Scope – This training outline shall be followed by all trainees in the examination of paint, regardless of experience level.

3.0 Module 1 – Preparation for Analysis

3.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills in:

3.1.1 The history of paint/polymers/coatings.

3.1.2 The chemical composition of paint/polymers/coatings.

3.1.3 The painting processes.

3.1.4 Evidence handling, evidence collection (samples and standards), recognition and preservation of other items of potential evidentiary value, evidence packaging, and chain of custody for paint-related evidence.

3.1.5 The methods used to analyze paint evidence.

3.2 Reading Assignments

3.2.1 ASTM E1610: Standard Guide for Forensic Paint Analysis and Comparison.

3.2.2 Bentley, John. "Composition, manufacture and use of paint." *Forensic Examination of Glass and Paint Analysis and Interpretation, Caddy, Brian, ed.* Ney York: Taylor and Francis, 2001. Chapter 7, pp. 123-141.

3.2.3 Crown, David A. *The Forensic Examination of Paints and Pigments.* Springfield, IL: Charles C. Thomas, 1968.

3.2.4 FBI Laboratory. "Forensic Analysis of Paints" workshop. (Introductory sections)

3.2.5 Gothard, J.A. "Evaluation of Automobile Paint Flakes as Evidence." *Journal of Forensic Sciences* 21.3 (1976): 636-641.

3.2.6 North Carolina State Crime Laboratory Policy and Procedure for Evidence Submissions. (Paint section)

3.2.7 Saferstein, Richard, ed. *Forensic Science Handbook.* Volume II. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1988. Chapter 4, pp. 161-208.

3.2.8 North Carolina State Crime Laboratory Technical Procedure for the Analysis of Paints and Polymers.

3.2.9 University of Missouri-Rolla Coatings Institute. "Basic Composition of Coatings." Training Materials.

3.3 Exercises

3.3.1 Read literature pertaining to this module.

3.3.2 Begin casework with a qualified Forensic Scientist to gain knowledge in evidence handling, note-taking, sample collection, sample selection, and sample preparation.

3.3.3 Acquire and catalog a minimum of 50 paint samples from various sources, to include the following:

3.3.3.1 A minimum of 30 automotive samples.

3.3.3.2 A minimum of 10 architectural paint samples (indoor and outdoor).

3.3.3.3 A minimum of 1 bicycle paint sample.

3.3.3.4 A minimum of 5 nail polish paint samples.

3.3.3.5 A minimum of 2 tool paint samples.

3.3.3.6 A minimum of 2 spray paint samples.

3.3.4 Given three scenarios, explain the appropriate samples and standards that are necessary for a paint analysis.

3.4 Evaluation

3.4.1 Successfully complete a written test covering the reading assignments and exercises.

4.0 Module 2 – Basic Microscopy and Search Techniques

4.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

4.1.1 Apply and explain the following areas of microscopy:

4.1.1.1 Identify the parts of a microscope and explain their function.

4.1.1.2 Explain the theory of polarized light microscopy.

4.1.1.3 Correctly use a polarized light microscope, reflected light microscope, and stereomicroscope to examine evidence.

4.1.2 Apply the various search techniques to include the following:

4.1.2.1 Visual (with or without the aid of lighting techniques).

4.1.2.2 Scraping.

4.2 Reading Assignments

4.2.1 Abramowitz, M. *Microscope: Basics and Beyond.* Lake Success, NY: Olympus Corporation, 1985.

4.2.2 Becker E. *Fluorescence Microscopy: Principles, Instruments, and Applications.* Leitz Brochure Code – No. 923 038.

4.2.3 DeForest, P.R., "Foundations of Forensic Microscopy." Saferstein, R., ed., *Forensic Science Handbook.* Volume 1. 2nd edition. New Jersey: Pearson Education, Inc., 2002. pp. 215-319.

4.2.4 FBI Laboratory. "Forensic Analysis of Paints." workshop. (PLM section)

4.2.5 McCrone, et al., *Polarized Light Microscopy*. McCrone Research Institute, Chicago, IL, 1984.

4.2.6 North Carolina State Crime Laboratory Technical Procedure for the Collection and Preservation of Evidence.

4.2.7 Palenik, S., "Microscopy and Microchemistry of Physical Evidence." Saferstein, R., ed., *Forensic Science Handbook.* Volume 2. 2nd edition. New Jersey: Pearson Education, Inc., 2005. pp. 161-203.

4.3 Exercises

4.3.1 Read literature pertaining to this module.

4.3.2 Observe and demonstrate the proper use of the stereomicroscope, polarizing light microscope, reflected light microscope, and comparison microscope (including fluorescence).

4.3.3 Observe and demonstrate the proper set up of a stereomicroscope (to avoid eye strain).

4.3.4 Observe and demonstrate basic cleaning and maintenance of the microscope (body and optics).

4.3.5 Observe and demonstrate the different methods for collecting paint from articles of clothing.

4.3.6 Perform search techniques on casework with qualified Forensic Scientists.

4.4 Evaluation

4.4.1 Successfully complete a written test covering the reading assignments and exercises.

5.0 Module 3 – Microscopy of Paint

5.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

5.1.1 Use a stereomicroscope properly to determine the physical properties of paints and/or polymers including color, texture, thickness, layer sequence, metallic / nonmetallic / pearlescent, and any other surface characteristics.

5.1.2 Use good particle manipulation skills to work with limited sample sizes.

5.1.3 Compare colors of different samples using the comparison microscope.

5.1.4 Distinguish OEM finishes from repaints.

5.1.5 Recognize and recover paint from debris, a smear on clothing and a tool.

5.1.6 Take appropriate notes.

5.2 Reading Assignments

5.2.1 Saferstein, Richard, ed. *Forensic Science Handbook.* Volume 1, 2nd edition. New Jersey: Pearson Education, Inc., 2002. (Chapter 8).

5.3 Exercises

5.3.1 Read literature pertaining to this module.

5.3.2 Using a stereomicroscope, examine debris from an article of clothing. Locate any paint or polymers within the debris.

5.3.3 Observe and demonstrate good particle manipulation skills to expose the paint layer structure to include peeling and cross-sectioning.

5.3.4 Observe and demonstrate/discuss color, texture and layer structure.

5.3.5 Discuss how to take appropriate notes.

5.3.6 Given several large paint samples, demonstrate particle manipulation using the stereomicroscope.

5.3.7 Examine and describe, in writing, the physical characteristics of a minimum of 30 automotive paint chips (previously collected) to include the number of layers present, color (each layer and overall), relative thickness of each layer, texture of each layer (e.g., hard, soft, smooth, glossy, rubbery, gritty, flakey, brittle), as well as any other distinguishing features (e.g., orange peel surface, delamination, air bubbles, flat, heavily flaked, mica flakes, metallic flakes, pearlescent flakes).

5.3.7.1 Make an assessment as to whether each sample is an OEM or a refinish.

5.3.8 Examine and describe, in writing, the physical characteristics of a minimum of 15 samples of non-automotive paint (previously collected).

5.3.9 Given a paint smear(s) on clothing and paint on a tool, collect appropriate samples for analysis. This may be accomplished through simulated case samples or by performing casework with qualified Forensic Scientists.

5.3.10 Mount samples of similarly-colored paints and compare using the comparison microscope, including fluorescence.

5.4 Evaluation

5.4.1 Given two tins of debris with a known number of paint particles, search the debris for the paint particles, examine and document each paint particle found (paint particles that are physically consistent may be grouped) and determine whether the particles appear to be automotive or architectural in origin.

6.0 Module 4 – Microspectrophotometry

6.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

6.1.1 Explain the theory of microspectrophotometer.

6.1.2 Prepare samples for analysis using the hand-peel method as well as embedding in epoxy and using the microtome method.

6.1.3 Analyze samples using the microspectrophotometer.

6.1.4 Interpret the resulting spectra.

6.1.5 Explain the Munsell Color System.

6.2 Reading Assignments

6.2.1 ASTM E2808: Standard Guide for Microspectrophotometry and Color Measurement in Forensic Paint Analysis.

6.2.2 Berns, Roy S. *Principles of Color Technology,* New York: John Wiley and Sons, 2000.

6.2.3 Caddy, Brian, ed. *Forensic Examination of Glass and Paint: Analysis and Interpretation.* New York: Taylor and Francis, 2001. (Chapter 8)

6.2.4 CRAIC Technologies. "UV-Visible-NIR Microspectroscopy - A Primer and a Review." Printed PowerPoint Presentation.

6.2.5 FBI Laboratory. "Forensic Analysis of Paints." Workshop. (Color section)

6.2.6 North Carolina State Crime Laboratory Technical Procedure for Microspectrophotometry.

6.2.7 Saferstein, Richard, ed. *Forensic Science Handbook.* Volume 1, 2nd edition. New Jersey: Pearson Education, Inc., 2002. (Chapter 6)

6.2.8 Wilkinson, J.M., J. Locke and D.K. Laing. "The Examination of Paints as Thin Sections Using Visible Microspectrophotometry and Fourier Transform Infrared Microscopy." *Forensic Science International* 38 (1988): 43-52.

6.3 Exercises

6.3.1 Read literature pertaining to this module.

6.3.2 After observing a demonstration on the embedding (in epoxy resin) and sectioning (by microtome) of a paint chip, embed 5 different paint chips (3 that are similar in color – not white, gray, or black) in a suitable media and microtome. Save some of the microtomed sections for use in SEM/EDX module.

6.3.3 Analyze a minimum of 3 paint samples that are similar in color on the microspectrophotometer in both transmission and reflectance modes.

6.3.4 Hand peel 2 of the 3 samples previously analyzed. Analyze these samples using the microspectrophotometer. Discuss how sample thickness affects the resulting spectra.

6.3.5 Discuss the criteria for comparing two spectra and what constitutes a color match.

6.4 Evaluation

6.4.1 Successfully complete a written test covering the reading assignments and exercises.

7.0 Module 5 – FT-IR

7.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

7.1.1 Explain the theory and operation of the FT-IR.

7.1.2 Analyze a variety of paint samples successfully.

7.1.3 Identify the common components of paint as seen in the FT-IR spectrum.

7.2 Reading Assignments

7.2.1 ASTM E2937: Standard Guide for Using Infrared Spectroscopy in Forensic Paint Examinations.

7.2.2 Caddy, Brian, ed. *Forensic Examination of Glass and Paint: Analysis and Interpretation*. New York: Taylor and Francis, 2001. (Chapter 10)

7.2.3 FBI Laboratory. "Forensic Analysis of Paints." workshop. (IR section)

7.2.4 Humecki, H.J., ed. *Practical guide to Infrared Microspectroscopy*. New York: Marcel Dekker Inc, 1995. (Chapter 6: Infrared Microspectroscopy of Forensic Paint Evidence)

7.2.5 North Carolina State Crime Laboratory Technical Procedure for Infrared Spectroscopy.

7.2.6 Rodgers, P.G., et al. "The Classification of Automobile Paint by Diamond Window Infrared Spectroscopy, Part I: Binders and Pigments." *Canadian Society of Forensic Science Journal* 9.1 (1976): 1-14.

7.2.7 Rodgers, P.G., et al. "The Classification of Automobile Paint by Diamond Window Infrared Spectroscopy, Part II: Automotive Topcoats and Undercoats." *Canadian Society of Forensic Science Journal* 9.2 (1976): 49-68.

7.2.8 Ryland, S.G. "Forensic Paint Examinations and Comparisons." workshop. (IR sections)

7.2.9 Ryland, S. "Paint Binder Classification by Infrared Spectrometry and Pyrolysis Gas Chromatography." workshop. (IR sections)

7.2.10 Suzuki, Edward M. "Identification of Automotive Paint Binders Using Infrared Spectroscopy." Printed Webinar Presentation.

7.2.11 Wilkinson, J.M., J. Locke and D.K. Laing. "The Examination of Paints as Thin Sections Using Visible Microspectrophotometry and Fourier Transform Infrared Microscopy." *Forensic Science International* 38 (1988): 43-52.

7.3 Exercises

7.3.1 Read literature pertaining to this module.

7.3.2 Observe and demonstrate sample preparation techniques.

7.3.3 Prepare a minimum of 25 paint chips for FT-IR by hand cross-sectioning and by peeling. The samples shall include a minimum of 15 automotive paint samples, 1 bicycle paint sample, 4 architectural paint samples, 2 tool paint samples, 2 spray paint samples and 3 nail polish samples.

7.3.4 Learn the basic operation of the FT-IR.

7.3.5 Observe the performance of the monthly calibration.

7.3.6 Acquire suitable spectra for each layer in all of the prepared samples.

7.3.7 Interpret the acquired IR spectra.

7.3.7.1 Attend an instructional session by the trainer on identification of paint IR spectra.

7.3.7.2 Classify all spectra previously acquired, as well as any additional spectra provided.

7.3.8 Obtain and interpret IR spectra from a minimum of 2 paint smears.

7.4 Evaluation

7.4.1 Given 5 IR spectra, correctly identify and document the major components in each spectrum.

7.4.2 Successfully complete a written test covering the reading assignments and exercises.

8.0 Module 6 – SEM/EDX

8.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

8.1.1 Explain the theory of SEM-EDX analysis.

8.1.2 Prepare samples for SEM-EDX analysis.

8.1.3 Interpret the resulting spectra.

8.2 Reading Assignments

8.2.1 ASTM E2809 "Standard Guide for Using Scanning Electron Microscopy/X-Ray Spectrometry in Forensic Paint Examinations."

8.2.2 Caddy, Brian, ed. *Forensic Examination of Glass and Paint: Analysis and Interpretation.* New York: Taylor and Francis, 2001. (Chapter 11)

8.2.3 FBI Laboratory. "Forensic Analysis of Paints." workshop. (SEM section)

8.2.4 Technical Procedure for Scanning Electron Microscope/ Energy Dispersive X-Ray System (SEM/EDX) for non-GSR Casework

8.3 Exercises

8.3.1 Read literature pertaining to this module.

8.3.2 Observe and demonstrate sample preparation techniques.

8.3.3 Using two similar color paint chips (from microspectrophotometry samples), prepare for SEM/EDX analysis. Both samples should include individual layer hand peels, hand-peeled cross sections, and microtomed cross sections (from microspectrophotometer samples). Submit the samples to the SEM/EDX operator for analysis. The SEM/EDX operator will verify that all sample preparations are suitable for SEM/EDX analysis; however, only one of the preparations will be analyzed for each sample.

8.3.4 Observe an SEM-EDX operator analyze a minimum of 2 paint samples. SEM/EDX operator shall discuss the results and evaluate the quality of the submitted samples.

9.0 Module 7 – Microsolubility and Microchemical Testing

9.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

9.1.1 Prepare microsolubility and microchemical reagents.

9.1.2 Make observations of solubility and other reactions.

9.2 Reading Assignments

9.2.1 Crown, D.A. *The Forensic Examination of Paints and Pigments.* Springfield: C.C. Thomas, 1986. (p. 179-184).

9.2.2 North Carolina State Crime Laboratory Technical Procedure for the Analysis of Paints and Polymers. (Solubility and Chemical Testing section)

9.2.3 North Carolina State Crime Laboratory Technical Procedure for the Preparation of Spot Test Solutions.

9.2.4 Thornton, J.I., et al. "Solubility characterization of Automotive Paints." *Journal of Forensic Sciences* 28.4 (1983): 1004-1007.

9.3 Exercises

9.3.1 Read literature pertaining to this module.

9.3.2 Assemble the solvents and acids to prepare the necessary reagents.

9.3.3 Become familiar with the reagents and perform the appropriate QC checks.

9.3.4 Perform solvent tests on a minimum of 20 different paint samples, including automotive, architectural and nail polish samples. All samples shall be tested with acetone and diphenylamine. Observe any reactions with the paint sample (e.g., swelled, bubbled, bled blue/turned blue, bled red, immediately dissolved, partially dissolved). Record the results in writing.

9.3.5 Discuss the meaning of microsolubility/microchemical tests in the examination of paint evidence.

9.4 Evaluation

9.4.1 Given four paint samples, perform the microsolubility/microchemical tests on each sample, record the results, and explain what the results mean about the paint sample.

9.4.2 Successfully complete a written test covering the reading assignments and exercises.

10.0 Module 8 - Pyrolysis GC-MS

10.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

10.1.1 Explain the theory of pyrolysis GC-MS analysis.

10.1.2 Prepare and analyze samples using pyrolysis GC-MS.

10.1.3 Interpret the resulting chromatograms.

10.2 Reading Assignments

10.2.1 Caddy, Brian, ed. *Forensic Examination of Glass and Paint: Analysis and Interpretation* New York: Taylor and Francis, 2001. (Chapter 19)

10.2.2 Cardosi, P.J. "Pyrolysis-Gas Chromatographic Examination of Paints." *Journal of Forensic Sciences* 27.3 (1982): 695-703.

10.2.3 FBI Laboratory. "Forensic Analysis of Paints." workshop. (Py-GC-MS section)

10.2.4 North Carolina State Crime Laboratory Technical Procedure for Pyrolysis-Gas Chromatography/Mass Spectrometry (Py-GC-MS).

10.2.5 Ryland, S. "Paint Binder Classification by Infrared Spectrometry and Pyrolysis Gas Chromatography." workshop. (Pyrolysis section)

10.2.6 SWGMAT "Standard Guide for Using Pyrolysis Gas Chromatography and Pyrolysis Gas Chromatography/Mass Spectrometry in Forensic Paint Examinations". *Journal of the American Society of Trace Evidence Examiners.*" 5.1 (2014): 22-33.

10.2.7 SWGMAT "Standard Guide for Using Pyrolysis Gas Chromatography and Pyrolysis Gas Chromatography/Mass Spectrometry in Forensic Tape Examinations". *Journal of the American Society of Trace Evidence Examiners.*" 5.1 (2014): 42-50.

10.2.8 Wampler, T.P., ed. *Applied Pyrolysis Handbook.* Boca Raton: CRC Press, 2007.

10.3 Exercises

10.3.1 Read literature pertaining to this module.

10.3.2 Observe and demonstrate sample preparation techniques.

10.3.3 Learn the basic operation of the pyrolysis GC-MS.

10.3.4 Prepare and analyze 5 samples for pyrolysis GC-MS analysis.

10.3.4.1 At a minimum, 2 replicates of each sample shall be analyzed. Additional runs may be necessary if the samples are not comparable (e.g., not similar in abundance, retention time shift, impartial burning, instrumental issues)

10.3.5 Compare and interpret the resulting chromatograms.

10.3.5.1 Attend an instructional session by the trainer on chromatogram comparisons.

10.3.5.2 Interpret the chromatograms and decide whether the paint samples are consistent, not consistent, or similar and why.

10.3.6 Perform the monthly verification.

10.4 Evaluation

10.4.1 Given 5 sets of chromatograms (not limited to paint), correctly interpret the chromatograms and decide whether the paint samples are consistent, not consistent, or similar and why.

10.4.2 Successfully complete a written test covering the reading assignments and exercises.

11.0 Module 9 – PDQ

11.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

11.1.1 Describe how samples are collected.

11.1.2 Describe what information is necessary for a paint sample's submission to the PDQ database.

Code IR spectra for search through the database.

11.1.3 Search a paint sample using PDQ (including both layer system and fill-in-the-blank queries), Color Books (e.g., PPG/DuPont) and internet searches.

11.1.4 Write effective conclusions and use qualifying statements appropriately.

11.1.5 Understand the significance of the findings.

11.2 Reading Assignments

11.2.1 FBI Laboratory. "Forensic Analysis of Paints." workshop. (PDQ section)

11.2.2 North Carolina State Crime Laboratory Technical Procedure for the Analysis of Paints and Polymers. (Vehicle Make/Model Search)

11.2.3 PDQ Users Manual.

11.2.4 PDQ Step-by-Step Guide.

11.3 Exercises

11.3.1 Read literature pertaining to this module.

11.3.2 Observe and demonstrate sample entry into the PDQ database.

11.3.3 Observe and demonstrate how to use PPG and DuPont Color Books to determine the color code.

11.3.4 Observe and demonstrate internet searches (e.g., manufacturer, plant, make, model, color).

11.3.5 Discuss results that can be obtained using the PDQ database, color books and internet searches.

11.3.6 Given 5 sets of IR spectra, code and search the database. Report the results in writing.

11.3.7 Perform casework with a qualified Forensic Scientist.

11.4 Evaluation

11.4.1 Given one paint sample, describe, analyze using IR and SEM, code IR spectra, and search through the database. Report the results in writing.

11.4.2 Successfully complete a written test covering the reading assignments and exercises.

12.0 Module 10 – Casework

12.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

12.1.1 Determine which tests are appropriate for each case.

12.1.2 Write effective conclusions and use qualifying statements appropriately.

12.1.3 Understand the significance of the findings.

12.2 Reading Assignments

12.2.1 Caddy, Brian, ed. *Forensic Examination of Glass and Paint: Analysis and Interpretation.* New York: Taylor and Francis, 2001. (Chapter 12)

12.2.2 Marsh, L. "What's on the Highway? Frequency of Occurrence of Paint Chips Amongst Debris Collected from Road Surfaces." Presented at the Trace Evidence Symposium, 2009.

12.2.3 North Carolina State Crime Laboratory Technical Procedure for the Analysis of Paints and Polymers. (Guidelines for Paint or Polymer Analysis Result and Conclusion Statements)

12.2.4 Ryland, S.G. and R.J. Kopec. "The Evidential Value of Automobile Paint Chips." *Journal of Forensic Sciences* 24.1 (1979): 140-147.

12.2.5 Ryland, S.G., et al. "The Evidential Value of Automobile Paint, Part IIL: Frequency of

Occurrence of Topcoat Colors." *Journal of Forensic Sciences* 26.1(1981): 64-74.

12.3 Exercises

12.3.1 Read literature pertaining to this module.

12.3.2 Discuss the interpretation of paint evidence and its relevance and weight in conclusions. Discuss when to apply appropriate qualifying statements.

12.3.3 Given five complete paint case files, write appropriate conclusions and explain the significance of the findings.

12.3.4 Under the direct supervision of a qualified Forensic Scientist, the trainee will process cases. The following aspects of casework will be covered:

- Determination of the appropriate type of analysis based upon the circumstances of the incident.
- Initial intake and evidence handling procedures.
- Note taking.
- Results of analysis and report writing.

12.4 Evaluation

12.4.1 Given two (2) mock cases, analyze the items of evidence and prepare reports based upon the analysis.

13.0 Module 11 - Final Evaluation and Preparation for Court

13.1 Objectives: Through completion of this module, the trainee shall have developed and demonstrated the theoretical knowledge and/or practical skills to:

13.1.1 Demonstrate courtroom procedures.

13.1.2 Present the results of a paint examination in court effectively.

13.1.3 Describe the legal and ethical obligations of an expert witness.

13.1.4 Describe the admissibility standards set by *Daubert* and *Frye*.

13.2 Reading Assignments

13.2.1 CVs or Statements of Qualifications of other Forensic Scientists.

13.2.2 *Daubert v. Merrill Dow Pharmaceuticals*, 509 U.S. 579 (1993).

13.2.3 Feder, H.A. and M.M. Houck. *Succeeding as an Expert Witness*. 4th ed. Boca Raton: CRC Press, 2008.

13.2.4 *Frye v. United States*, 293 F. 1013 (DC Cir. 1923).

13.2.5 Kogan, J.D. "On Being a Good Expert Witness in a Criminal Case." *Journal of Forensic Sciences* 23.1(1978): 190-200.

13.2.6 Philipps, K.A. "The Nuts and Bolts of Testifying as a Forensic Scientist." *Journal of Forensic Sciences* 22.2 (1977): 457-463.

13.2.7 Ron Smith and Associates, Inc. "Courtroom Testimony Techniques: Success Instead of Survival." Collinsville, Mississippi.

13.2.8 Tanton, R.L. "Jury Preconceptions and Their Effect on Expert Scientific Testimony." *Journal of Forensic Sciences* 24.3 (1979): 681-691.

13.3 Exercises

13.3.1 Read literature pertaining to this module.

13.3.2 Prepare or update a CV or Statement of Qualifications reflective of experience in paint examination.

13.3.3 Prepare a series of qualifying questions and answers to those questions for use in a voir dire.

13.3.4 Observe pretrial conferences and courtroom testimony of qualified Forensic Scientist, if possible.

13.4 Evaluation

13.4.1 Using one of the mock cases, successfully complete a moot court or roundtable discussion.

13.4.2 Successfully complete a final competency test covering all training materials.

14.0 Records

- Training file
- Training checklist

15.0 Attachments – N/A

Revision History		
Effective Date	Version Number	Reason
09/17/2012	1	Original ISO Document
10/18/2013	2	Added issuing authority to header
08/29/2014	3	Updated header to Physical Evidence Section – Trace Unit, issuing authority to Physical Evidence Section Forensic Scientist Manager.

09/22/2017	4	Throughout: updated all ASTM references; removed locations/dates of workshops from reading materials; updated SCL Evidence Guide references; removed SWGMAT documents where there was a corresponding ASTM reference; New 3.2.8 3.3.1 – removed "topics covered" 3.3.3.1 – removed pre-1980 samples 3.3.3.2 – changed 15 to 10 New 3.3.3.4, 3.3.3.5, 3.3.3.6 Moved old 3.4.1 to new 3.3.4 4.2 – put into alphabetical order New 4.2.2, 4.2.6, 4.2.7 4.3.1 – remove compile and "topics covered" 4.3.2 – add including fluorescence 4.3.6 – remove actual 5.0 – Change to Microscopy 5.1.3 – add using comparison microscope 5.3.1 – remove and compile and topics covered 5.3.7 – remove pictorial representation, added examples 5.3.8 – remove pictorial representation 5.3.9 – remove actual New 5.3.10 5.4.1 – increase to two tins, clarify wording Old 8.0 moved to 6.0 6.1.2 – added embedding in epoxy 6.2 – put into alphabetical order New 6.2.1, 6.2.4, 6.2.6 6.3.2 – add observe embedding and sectioning, change 10 to 5, change 5 to 3 6.3.3, 6.3.4 – change 5 to 3 7.2 – put into alphabetical order New 7.2.1, 7.2.5, 7.2.10, 7.3.1, 7.3.5 7.3.3 – change 20 to 25; 5 to 4; added tool, spray, and nail polish samples. Remove old 7.3.5.2, 7.4.1 Old 10.0 is new 8.0 New 8.2.1, 8.2.4, 8.3.2 8.3.3 – clarify wording 8.3.4 – change 1 to 2 Old 6.0 is new 9.0 New 9.2.2, 9.2.3 9.3.1 – remove "topics covered" 9.3.4 – removed pre-1980 and added automotive, architectural and nail polish. Add observe reactions and examples. Changed how results are recorded 10.1.2 – add analyze, reworded 10.2 – put into alphabetical order New 10.2.4, 10.2.6, 10.2.7, 10.3.2, 10.3.3, 10.3.4.1, 10.3.5, 10.3.5.1, 10.3.5.2, 10.3.6 10.3.4 – add analyze; change 10 to 5 Remove old 9.3.3 10.4.1 – add not limited to paint New 11.1.4 – added old 11.1.3 to 11.1.4; added color books and internet searches 11.2 – put into alphabetical order New 11.2.2, 11.3.2, 11.3.3, 11.3.4, 11.3.5 11.3.6 – changed 2 to 5 Remove old 12.0 in its entirety

		12.2 – put into alphabetical order New 12.2.3 Remove old 13.4.2 13.2 – put into alphabetical order 13.4.1 – added one of