

**TABLE OF CONTENTS**  
**PHYSICAL MATCH**  
**LAST REVIEW DATE: 03/01/2022**

Foreword

Introduction

I. Physical Match..... I-A

**APPENDICES**

Report Wording ..... App I

Minimum Standards & Controls..... App II

References..... App III

## FOREWORD

This manual is the property of the Illinois State Police with all rights reserved. No portion of this manual may be reproduced without written permission of the Illinois State Police.

The body of knowledge which comprises forensic science is a compilation of procedures adapted from other disciplines that encompass many of the physical and natural sciences. During the history of forensic science, a multitude of scientists have greatly contributed to the protocols, methods, and procedures that have become a routine part of analysis. Every effort has been made in this manual to give proper recognition to the authors of specific procedures; however, in some instances, the original sources of forensic procedures have been lost in antiquity. For others, the general procedures belong to the public domain and are recorded in many basic references concerning forensic science. In addition, many of the procedures described in this manual have been adapted from standard laboratory practices and the citation of thousands of references which deserve credit for aiding in the development of these procedures is neither practical nor possible. To all those scientists who have contributed to the knowledge of forensic science contained herein, we do extend collective recognition and gratitude.

Procedures manuals which offer reliable information that is then combined with corresponding training manuals serve as the foundation for effective quality management of analyses. Extensive effort has been made to ensure that the routine procedures described herein will produce accurate and valid analytical results. **However, not all possible analyses that may be encountered in casework can be appropriately covered in a procedures manual, nor can all possible variations to a described procedure be included. Therefore, this manual is written with the understanding that minor variations that do not significantly alter the described procedure may be used.** An analyst may use a non-routine procedure not specifically stated in this manual, provided all the following conditions are met:

1. The procedure used is based upon documented and scientifically accepted practice.
2. A notation is made on the worksheet indicating the procedure followed is not specified in the procedures manual.
3. The analyst also indicates on the worksheet why the particular procedure was selected over a procedure contained in this manual. Rationale must be detailed sufficiently to withstand close scrutiny by independent examiners.
4. The analyst provides documentation showing that the non-routine procedure had been tested prior to application with evidence. Test criteria shall include test samples that approximate the characteristics of the evidence, the results obtained with the routine procedure, and the results obtained with the non-routine procedure. Documentation will also include related data concerning the non-routine procedure's sensitivity, precision, and possible sources of error.
5. The non-routine procedure used will be recorded to a standard such that another scientist of similar skills and experience can understand fully the procedure used and the results obtained.

03/01/2022

Additionally, there may be procedures which pertain to all sections. Such is the case with laboratory reagents. In order to standardize the testing and monitor the shelf life of reagents used by analytical sections, the Forensic Sciences Command has developed protocols which are universal for all sections. These protocols regarding reagent expiration and testing are found in the Command Quality Manual.

03/01/2022

## INTRODUCTION

The total or partial reconstruction of fragmented or separated objects that were subjected to accidental or deliberate force is the successful work product of a physical match examination. Distinguishable features are revealed through the methodology of preparation of the item, examination to extract information, and analysis of the information to arrive at a conclusion. While general procedures in physical match examinations are usually straightforward, non-standard procedures may be needed and are addressed in the Foreword of this manual.

The forensic purpose of a physical match is to establish that two or more separated objects were, at one time, part of another fragment, or a contiguous entity in a unique arrangement. A successful physical match is proof of the correlation that exists between the two objects. A physical match can be made because of the correlation between two objects that became separated due to varying degrees of force resulting in a random fracturing process.

As the process and analysis of a physical match unfold and become more than general concepts, it becomes obvious that the material is incidental to the examination and conclusion. The physical match examination can be performed on any material but most commonly occurs with broken glass, plastic, metal, paper, currency, checks and wood. Cases have also been resolved using broken teeth and bones of humans and animals. Tears in textile material, a variety of tape, foil, and plastic bags can also be received from contributors for analysis. Plastic bags and films of all variety have become common place in submissions to laboratories as physical match items.

The analyst or examiner must have attained sufficient skills to develop an understanding of the applications of the scientific method, to recognize and compare both class and individual characteristics, and arrive at a documented analytical conclusion through the examination process. These skills surpass the observation and description abilities of the casual or average observer. For example, an average observer may see the damage but the scientist will find that a tear is force, applied down the plane of an item, leaving a trail of debris in its wake. The scientist will also note that a break from force results in striations and hackle marks.

Class characteristics of an item place the item into a broad category or group. The features that associate an item with a group never link it to a single source. The shoes are Adidas brand, they are size ten, they have blue leather uppers, and have white shoe laces are all features that describe an item. But, none of these features can separate the shoes from the hundreds or even thousands that were manufactured. Is the item made of brittle material, does it flex, does it stretch? All of these are class-related features. For example, the examination of black electrical tape cut with a very sharp blade may result in a statement addressing only the class characteristics of the items.

Individual characteristics are those features, either deliberate, caused from the manufacturing process or accidentally caused by damage or wear, that provide information that associate an item with a single source. As an example, additives like clay, talc, and sand in the manufacturing process of low-density polyethylene serve to accelerate wear on manufacturing equipment, adding unique marks in the manufacturing process. Other examples would be the individual characteristics used in the examination of firearms, tool marks, latent prints, footwear, and tire tracks. Identifications

cannot be made in the absence of individual characteristics.

The types of physical matches are found in four main areas. Two-dimensional separations are available in the examinations of material like glass, plastic, knife blades, tools, and paint chips. Three-dimensional separations are also found in upturned edges of some of these same materials with additional items not being limited to broken auto accessories and emblems, cut hoses, and paper matches. A third source of information is found in overlaid objects that may have established a unique pattern at their former interface. A fourth source is that of special cases in which contiguous edges may be missing as from a ream or tablet of paper, saw kerf, wood grain, polish or grinding stria in materials, and fingernail ridges.

Care should be exercised by the examiner concerning the interference their examination can have on subsequent Forensic Biology and DNA examinations. The best option is for the Forensic Biology section to receive any multi-section items first, asking for the input from the physical match examiner during the initial visual inspection. The main reasons for this are as follows:

1. An item must first pass through Forensic Biology for stain identification before being submitted to DNA. Handling the item can potentially interfere with the visual screening necessary to locate a bloodstain prior to DNA analysis.
2. The Forensic Biologist must sometimes use a stereo microscope to locate trace amounts of bloodstains. The mere handling of an item can unknowingly cause the destruction of this type of stain.
3. Due to the increased sensitivity of DNA profiling technology, laboratories now have dedicated Forensic Biology/DNA sections. By receiving multi-section items first, the Forensic Biologist can locate and remove any stains and properly collect and note any trace evidence observed, limiting the possibility of contamination or extraneous deposits.

Note: The use of standard laboratory clean technique protocols is strongly recommended for evidence handling in physical match cases that are not initially a multi-discipline case.

Other considerations that should receive attention will be the need for subsequent examinations in addition to Forensic Biology and DNA. Some items of evidence may present the need for the collection of trace material, latent print examination, footwear examination, tool mark examination, or perhaps tire track examination. The initial observation of the items could indicate the need for an examiner or analyst in another laboratory discipline to visually examine the evidence prior to the preparation phase of the workflow.

Before beginning any physical match comparison, for any materials analysis involving comparison of a known to an unknown, the unknown sample will be examined/reviewed to determine enough information is detected in the unknown to justify a comparison to known standards. Methods of conducting a physical match examination are based upon visual examinations. The visual examination is directed toward the details from manual edge-to-edge realignment, surface markings

(markings from all sources, patterns and designs, or wear and accidental damage), measurements and pattern counts, microscopic and photographic assistance, detail in two and three-dimensional separations, and other side by side direct examinations taking into account the right to left reversal and positive and negative corresponding details.

The techniques used in physical match examination are based on visual acuity and interpretation of the results of examinations through analytical decision making. The laboratory instrumentation used during the examination include, but are not limited to, standard low power magnifiers, microscopes, casting materials, photography and imaging to include analog and digital, and any number of forensic light sources such as ultraviolet lamps, polarized light, lasers, and alternate light sources. Some traditional techniques and tools used to measure refractive and reflective indexes as well as gradient density produce data that are indicative of class characteristics. There may be other laboratory techniques and instruments available that have application to physical match examinations and should not be ignored if their use will contribute to the end product - information.

The recommended report wording appears in Appendix I. The selected text that reports the findings of a fracture match examination are not all inclusive. There will be occasions when the wording is a guideline that serves as the building blocks for the findings.

There are three statements that can be made in the conclusion of a physical match. First, the items were at one time a single entity. All the pieces fit. Second, that the examination and analysis are inconclusive. One or more joining pieces were not collected or the pieces were too badly stretched or damaged. The third statement would be that the items were not at one time a single entity. The pieces do not fit and do not share the same class characteristics.

# ILLINOIS STATE POLICE

## PHYSICAL MATCH PROCEDURES MANUAL

**PROTOCOL:** Physical Match

**METHOD:** Physical Match

**PROCEDURE:** PHYSICAL MATCH

---

Reviewed by:

---

Forensic Scientist Adrienne Bickel

Approved by:

---

Bureau Chief Timothy A. Tripp  
Forensic Sciences Command

Accepted Date: January 4, 2021

Physical Match Procedures Manual

PM I-A  
Page 1 of 3  
Version 2021.01.04

Procedure: Physical Match

Materials contained in this document are protected under federal law and may not be disseminated or reproduced without the express written permission of the Illinois State Police.

## **INTRODUCTION**

The forensic purpose of a physical match is to establish that two or more separated objects were, at one time, part of another object or fragment as a contiguous entity in a unique arrangement. The materials to be examined are incidental to the examination and conclusion of a physical match. A physical match examination can be performed with any material but most commonly occurs with broken glass, plastic, metal, textile material, paper, a variety of tape, plastic bags, paper matches and foil. A physical match can be made because of the correlation between two objects that became separated due to varying forces that produce a random fracturing process.

### **OTHER RELATED PROCEDURES:**

None

## **SAFETY CONSIDERATIONS**

Standard Laboratory Precautions

## **PREPARATIONS**

Standard Laboratory Preparations

## **INSTRUMENTATION**

None may be needed. When the aid of instrumentation is needed, it may include standard low power magnifiers, photography and imaging, various microscopes, casting material, light sources with an application to the examination, or other instruments and equipment as the submitted items of evidence may present.

## **PROCEDURE OR ANALYSIS**

Make an examination to determine the items are broken or separated and to distinguish between class and individual characteristics. Compare any class and individual characteristics in a side-by-side examination. Make a conclusion from analysis of the examinations.

- I. Criteria for Physical Match
  - A. Broken, torn or separated
  - B. Capable of being physically realigned
  - C. Fit together as a "Lock and Key"
    1. Along an edge-to-edge border
    2. Surface and other markings
  - D. Pieces are unique and not interchangeable with similar pieces elsewhere
  
- II. Class Characteristics - including but not limited to:

- A. Dimensions
- B. Type, method, and material of construction
- C. Color, clarity, and surface texture
- D. Coatings and dip lines
- E. Markings, placards, and designs
- F. Folds and perforations by type, location, and dimension
- G. Fluorescence in ultraviolet light
- H. Machined areas including holes and grooves

- III. Individual Characteristics - including but not limited to:
  - A. Fracture contours, edges - two and three dimensional
  - B. Hackle and feathering marks
  - C. Surface markings
  - D. Adhesive or attachment patterns
  - E. Cuts, tears, stretch marks, and stains
  - F. Scratches, dents, and tool markings
  - G. Inclusions, punches, and perforations
  - H. Flaws and discoloration
  - I. Grain and annual growth rings (of wood)
  - J. Missing portions such as saw kerf and missing pages

#### IV. Make a Conclusion

### **REPORT WORDING**

See Appendix I.

### **MINIMUM STANDARDS AND CONTROLS**

See Appendix II.

### **REFERENCES**

See Appendix III.

# ILLINOIS STATE POLICE

## PHYSICAL MATCH PROCEDURES MANUAL

### APPENDIX I: REPORT WORDING

---

Reviewed by:

---

Forensic Scientist Adrienne Bickel

Approved by:

---

Bureau Chief Timothy A. Tripp  
Forensic Sciences Command

## **PHYSICAL MATCH REPORT WORDING GUIDELINES**

### **I. CASE INFORMATION**

Agency name, name of investigating officer, laboratory case number, CSSC case number (when applicable), agency case number, victim, offense, and suspect(s).

### **II. EVIDENCE SUBMITTED**

A listing and description of items as received from agency, evidence storage area, or mail. A description of the packaging is not appropriate unless an item is not examined.

### **III. EXAMINATION AND RESULTS (OR FINDINGS)**

Statement of the results of examinations (processing, evaluations, and comparisons) performed on the items submitted.

### **IV. REQUEST FOR ADDITIONAL SUBMISSIONS**

Agency is requested to submit additional items of evidence in order that all fragments can be identified or eliminated. This paragraph may be omitted if the need for additional items of evidence are specified in the comparison findings or if additional items are not needed for examination. Evidence disposition may be added in this section.

CRITERIA:

A surface to surface examination and analysis of the information reveals the items **were at one time a single entity**.

EXAMPLES:

Items (list items) constitute a physical match and at one time formed a single object.

Items (list items) and Items (list items) came from the same object.

CRITERIA:

A surface to surface examination and analysis of the information reveals **an inconclusive finding**.

EXAMPLES:

It was not determined if Items (list items) constitute a physical match.

Although similarities were noted between Item (list item) and Item (list item) extensive distortion in the material precludes a definite conclusion.

Item (list item) and Item (list item) have the same class characteristics. Class characteristics are observable details such as colors, composition, texture, and measurements; however, no individual characteristics (or, identifying features) were noted.

CRITERIA:

A surface to surface examination and analysis of the information reveals the items **were not at one time a single entity**.

EXAMPLES:

Items (list items) do not constitute a physical match and did not at one time form a single object.

Item (list item) can be eliminated as the source of Item (list item).

Item (list item) could not have come from Item (list item).

# ILLINOIS STATE POLICE

## PHYSICAL MATCH PROCEDURES MANUAL

### APPENDIX II: MINIMUM STANDARDS AND CONTROLS

---

Reviewed by:

---

Forensic Scientist Adrienne Bickel

Approved by:

---

Bureau Chief Timothy A. Tripp  
Forensic Sciences Command

# MINIMUM STANDARDS AND CONTROLS

## INTRODUCTION

The examiner must possess the ability to distinguish between class and individual characteristics. The evidence submitted must possess class characteristics for evaluation and individual characteristics sufficient for individualization. An identification cannot be made in the absence of some individual characteristics.

- I. Physical Match - Class Characteristics
  - A. Standard - One or more class characteristics must be presented by the items before an examination can begin.
  - B. Control - The analyst or examiner will ensure that one or more class characteristics are apparent prior to beginning a side by side comparison for a physical match.
- II. Physical Match - Individual Characteristics
  - A. Standard - General. The items of evidence submitted must have been broken, torn or separated as the result of force. A side-by-side comparison should reveal class characteristics and that the items can be realigned and fit together as a “lock and key” or by other surface markings that are disclosed in the examination. The pieces must be unique and may not fit with other pieces under examination.
  - B. Control - General. The analyst or examiner will determine that the items submitted for physical match comparison were broken, torn, or otherwise separated by force. An examination will reveal that the items have class characteristics before commencing a side-by-side comparison. Prior to arriving at the conclusion of a physical match, the analyst or examiner will find that the items are capable of being realigned, that they fit together as a “lock and key,” that the pieces do not fit with other pieces under examination, and that there are no unexplainable differences.

### III. Documentation of Physical Match

- A. Standard - The characteristics of a physical match shall be documented in work notes. The notes will be supplemented with sketches, diagrams, and imaging or combinations of these recording methods for at least one match in the case.
- B. Control
  - 1. The analyst or examiner will ensure that an image is captured or that an accurate drawing or sketch of a physical match will be maintained in the case file. If the image does not record individual characteristics, then a drawing or sketch will supplement the image to denote obscure characteristics.
  - 2. The analyst or examiner recording the image or making the drawing will ensure that appropriate laboratory markings appear in or on the image or drawing.

### IV. Verification

- A. Standard - All positive conclusions of a physical match will be verified by another physical match analyst or examiner conducting independent physical match case work.
- B. Control - The analyst or examiner conducting the verification will mark the laboratory notes of the analyst or examiner of record with their name and the date that the verification was made with the phrase, "Verified by:     (name)     on     (date)    ," or words to that effect.

# ILLINOIS STATE POLICE

## PHYSICAL MATCH PROCEDURES MANUAL

### APPENDIX III: REFERENCES

---

Reviewed by:

---

Forensic Scientist Adrienne Bickel

Approved by:

---

Bureau Chief Timothy A. Tripp  
Forensic Sciences Command

## REFERENCES

### ARTICLES:

1. Agron, Nicki and Schecter, Bernie, "Physical Comparison and Some Characteristics of Electrical Tape," AFTE J., Vol. 18, No. 3, (1986), p. 53.
2. Bisbing, Richard E., Willmer, John H., LaVoy, Torrance A. and Bergland, James S., "A Fingernail Identification," AFTE J., (1980), p. 27.
3. Barnard, P., "Investigation of Fractures," Professional Protection, (July 1982), pp. 10-14.
4. Cockrell, R. P., "Physical Matching - Fitting the Pieces Together," RCMP Gazette, Vol. 44, No. 4, (1982), pp. 17-21.
5. Cronkhite, C. J. D., "Bagging a Pusher," RCMP Gazette, Vol. 36, No. 6, (1974), pp. 14-15.
6. Cronkrite, C. J. D., "Pieces of Hash," RCMP Gazette, Vol. 41, No. 4, (1979), p. 21.
7. Deinet, W., "Studies of Models of Striated Marks Generated by Random Processes," J. Forensic Sciences, Vol. 26, No. 1, (1981), pp. 35-50.
8. Dixon, Kent C., "Positive Identification of Torn Burned Matches with Emphasis on Crosscut and Torn Fiber Comparisons," J. Forensic Science, Vol. 28, No. 1, (1983), p. 351.
9. Ford, K. N., "The Physical Comparison of Polyethylene Film," J. of the Forensic Sciences Society, Vol. 15, No. 2, (1975), pp. 107-113.
10. Forrester, G. R., "Hides and Hair," RCMP Gazette, Vol. 35, No. 1, (1973), p. 13.
11. Funk, H. J., "Comparison of Paper Matches," J. Forensic Sciences, Vol. 13, No. 1, (1968), pp. 137-143.
12. Gault, Robert, Ph.D., "Discussion of: Fractal Surfaces as a Model of Physical Matches," J. Forensic Science, Vol. 32, No. 4, (1987), pp. 1435-1438.
13. Gaudette, B. D., B. Sc. (Hons.) And Binder, D. A., Ph.D., "Discussion of: Results of a Study to Determine the Probability of Chance Match Occurrences Between Fibers Known to be from Different Sources," J. Forensic Science, Vol. 32, No. 4, (1987), p. 607.

Accepted Date: March 1, 2022

Physical Match Procedures Manual

PM APP-III  
Page 2 of 6  
Version 2022.03.01

Appendix III: References

14. Gehart, F. James, M.S., and Ward, Dennis C., B.S., "Paper Match Comparisons by Submersion," J. Forensic Science, Vol. 31, No. 4, (1986), pp. 1450-1454.
15. Gerakarsis, J., "Stereo Techniques to Enhance Scanning Photomacrography," J. Biological Photography, Vol. 54, No. 4, Oct. (1986), pp. 23-126.
16. Gupta, Sia Ram, "Matching of Fragments," International Criminal Police Review, 239 (1970), p. 1986.
17. Gupta, S. K., Rohilla, D. R. and Das Gupta, S. K., "Photographic Negatives as Evidence - A Case Report," J. Forensic Science Society, 21 (1981), p. 355.
18. Haq, T. U., Roche, G. W. and Parker, B., "The Theoretical Field Concepts in Forensic Science, I. Application to Recognition and Retrieval of Physical Evidence," J. Forensic Science, Vol. 23, No. 1, (1978), pp. 212-217.
19. Kennington, Robert H., "The Value of Photographs as Evidence: Part I," AFTE J., Vol. 19, No. 3, (1987), p. 320.
20. Kennington, Robert H., "The Value of Photographs as Evidence: Conclusion," AFTE J., Vol. 19, No. 4, (1987), p. 451.
21. Kingston, Charles, "A Perspective on Probability and Physical Evidence," J. Forensic Science, Vol. 34, No. 6, (1989), pp. 1336-1342.
22. Kopec, Robert J. and Meyers, Charles R., "Comparative Analysis of Trash Bags - A Case History," AFTE J., January (1980), p. 23.
23. Laux, Dale L., "Identification of Rope by Means of Physical Match Between the Cut Ends," J. Forensic Science, Vol. 29, No. 4, (1984), pp. 1246-1248.
24. Matricardi, V. R., Ph.D., Clark, M. S., M.S., and DeRonja, F.S., M.S., "The Comparison of Broken Surfaces: A Scanning Electron Microscopy Study," J. Forensic Science, Vol. 20, No. 3, (1975), p. 507.
25. Molchanko, V. S., "The Philosophy of Physical Matching," RCMP Gazette, 37 (1975), 8.1961.
26. Moran, Bruce, "Physical Match/Tool Mark Identification Involving Rubber Shoe Sole Fragments," AFTE J., Vol. 16, No. 3, (1984), p. 126.

Accepted Date: March 1, 2022

Physical Match Procedures Manual

PM APP-III  
Page 3 of 6  
Version 2022.03.01

Appendix III: References

27. Nelson, D. F., "Illustrating the Fit of Glass Fragments," J. Criminal Law, Criminology and Police Science, 50 (1959), p. 312.
28. Olsen, Robert D., Sr., "Need for Defining Nomenclature of Class and Individual Characteristics," paper written circa 1986.
29. O'Neill, M. Edwin, "Matching of a Torn One Dollar Note in a Robbery Case," J. Criminal Law, Criminology and Police Science, 30 (1940), p. 941.
30. Owens, Maureen Casey, A.B., "The Comparison of Round-Hole Perforations of Postage Stamps," J. Forensic Science, Vol. 30, No. 4, (1985), pp. 1272-1278.
31. Peace, L. L., "The Examination of Torn and Perforated Documents," Canadian Society Forensic Sciences Journal, Vol. 15, No. 314, (1982), pp. 116-132.
32. Perper, J., Prichard, W. and McCommons, P., "Matching the Lost Skin of A Homicide Suspect," Forensic Sciences International, 29 (1985), pp. 77-82.
33. Pierce, David S., "Identifiable Markings on Plastics," J. Forensic Identification, Vol. 40, No. 2, (1990), pp. 51-59.
34. Rhodes, E. F. and Thornton, J. I., "The Interpretation of Impact Fractures in Glassy Polymers," J. Forensic Sciences, Vol. 20, No. 2, (1975), pp. 274-282.
35. Ryland, S. G. and Kopec, R. J., "The Evidential Value of Automobile Paint Chips," J. Forensic Sciences, Vol. 24, No. 1, (1979), pp. 140-147.
36. Strauss, Mary Ann T., "The Law of Probability," The Microscope, Vol. 31, No. 2, (1983), pp. 115-128.
37. Striupaitus, Peter, "Physical Fit - Public Utility Cable," AFTE J., October (1981), p. 48.
38. Thornton, J. I., "Ensembles of Subclass Characteristics in Physical Evidence Examinations," J. Forensic Sciences, Vol. 31, No. 2, (1986), pp. 501-503.
39. Thornton, J. I., "Fractal Surfaces as Models of Physical Matches," J. Forensic Science, Vol. 31, No. 4, (1986), pp. 1435-1438.
40. Thornton, J. I., "Interpretation of Glass Fracture of Curved Surfaces," Crime Laboratory Digest, Vol. 12, No. 4, (1985), p. 82.

Accepted Date: March 1, 2022

Physical Match Procedures Manual

PM APP-III

Page 4 of 6

Version 2022.03.01

Appendix III: References

41. Thornton, J. I. And Cashman, P. J., "Glass Fracture Mechanism - A Rethinking," J. Forensic Sciences, Vol. 31, No. 2, (1986), pp. 818-824.
42. Von Breman, U., "Laser Excited Luminescence of Inclusions and Fibers in Paper Matches," J. Forensic Sciences, Vol. 31, No. 2, (1986), pp. 455-463.
43. Von Bremen, U., "Shadowgraphs of Bulbs, Bottles and Panes," J. Forensic Science, Vol. unknown, No. unknown, (1975), p. 507.
44. Von Bremen, U. G. and Blunt, Lorne K. R., "Physical Comparison of Plastic Garbage Bags and Sandwich Bags," J. Forensic Science, Vol. 28, No. 3, (1983), p. 644.
45. White, Robert, D/Sgt. and Arrowood, Michael, D/Sgt., "Ultraviolet Fluorescence and a Physical Match," AFTE J., (1975), p. 195.
46. Zugibe, F. and Costello, J., "The Jig-saw Puzzle Identification of a Hit and Run Automobile," J. Forensic Sciences, Vol. 31, No. 1, (1986), pp. 329-332.

#### PAPERS:

1. Bisbing, Richard E., Stolorow, Mark and McKasson, Steve, "Physical Match," Proposal for Uniformity, 1982.
2. Bisbing, Richard E., Stolorow, Mark and McKasson, Steve, "Fracture Matching: Review of the Essential Concepts of Physical Matching in Criminalistics," Paper presented at the American Academy of Forensic Sciences, Philadelphia, PA, 1988.

#### TEXTS:

1. Harris, George E., A Treatise on the Law of Identification: A Separate Branch of the Law of Evidence, Albany, H. B. Parsons, 1982.
2. Kind, S. and Overman, M., Science Against Crime, Aldus Books, London, 1972.
3. Federal Rules of Evidence Service, Edited by Pike and Fischer, Inc., Callaghan, Wilmette, IL, c1979.
4. Association of Firearm and Toolmark Examiners Glossary, First Edition, 1980.

Accepted Date: March 1, 2022

Physical Match Procedures Manual

PM APP-III  
Page 5 of 6  
Version 2022.03.01

Appendix III: References

5. Graham, Michael H., Handbook of Federal Evidence, West Publishing Co., St. Paul MN, 1986.
6. McKasson, Stephen C. and Richards, Carol A., Speaking as an Expert: A Guide for the Identification Sciences From the Laboratory to the Courtroom, Charles C. Thomas, Springfield, IL, 1998.
7. Curran, James M., Hicks, Tacha N., and Buckleton, John S., Forensic Interpretation of Glass, CRC Press, Boca Raton, FL, 2000.
8. Kirk, Paul A., Crime Investigation, John Wiley & Sons, Inc., New York, NY., 1974.