I. SCOPE

To compare portions of pipes, tools, tapes, glass, fabrics, papers, and other items of evidence to determine whether those portions were once a part of or have been separated from, a particular source. This is done through a comparison of fractures and other surface profiles. If significant alignment of unique features can be established, a positive association can be made between two or more fragments/pieces and will prove they were once joined together to form a single object.

II. REFERENCES

1. "Crime Investigation" Paul Kirk, Chapters 9, 17, and 20
2. Agron, Nick, Schecter, Bernie: "Physical Comparisons and Some Characteristics of Electrical Tape" AFTE Journal (Volume 18, Number 3) July 1986
3 Dixon, Kent C.:"Positive Identification of Torn Burned Matches with Emphasis on Crosscut and Torn Fiber Comparison," J. Forensic Science, Vol. 28. Mp.1 (1983), pp 351
4. "Forensic Science, An Introduction to Criminalistics", Peter R. DeForest, R.E. Gaensslen, Henry C. Lee, Chapter 11
5. ASTM "Standard Guide for Physical Match of Paper Cuts, Tears, and Perforations in Forensic Document Examinations" – E 2288-03
6. Thornton, J. I., "Fractal Surfaces as Models of Physical Matches", J. Forensic Science, Vol. 31, No. 4,(1986), pp 1450-1454.
7. "Empirical proof of physical match: systematic research with tensile machine:, T Sach, Weisner and Shor.
8. "Fracture matching and repetitive experiments: a contribution of validation" – Horst and Katterwe.
9. "Fracture matching: review of essential concepts of physical matching in criminalistics" – Bisbing, Stolorow, and McKasson.
10. "Logical conclusions from pattern analysis: matches, non-matches and exclusions" – Houck.
11. "The philosophy of physical matching" - Molchanko

Validation

The techniques described below for examination of physical matches are well known and scientifically accepted in the forensic science community and in private industry (fracture mechanics, engineering, and metallurgy to name a few). Relevant examples of related literature can be found in Section II (References).

III. SAFETY PRECAUTIONS

1. Use appropriate safety garments and apparatus (glasses, gloves, lab coat)
2. Care should be taken when handling exhibits with sharp edges

IV. APPARATUS/REAGENTS

Stereo and comparison microscope(s)
micrometers, calipers, rulers
casting media
photographic equipment.

Performance Checks and Calibrations

Microscopes and/or micrometer/measuring devices should be properly calibrated and/or adjusted when necessary according to protocols for each instrument.

V. PROCEDURES

1. Examine physical properties of item(s) to be compared (e.g. color, material type, dimensions, surface features)
2. Determine type of separation if possible (e.g. sheared, cracked, torn, cut)
3. Determine that class characteristics of items are compatible.
4. Evaluate the shape of separation and check for any surface features that may be continuous on both sides of the separation. The elasticity of the object should be taken into consideration especially in areas where the stretching due to separation may cause distortion in the physical fit.
5. If item is of suitable thickness, examine the surface of the face of the separation to determine if the edge features are consistent.
6. If the class characteristics of separated pieces are compatible and if the pieces fit together in <u>one or more</u> of the following ways, it can be determined that two items were at one time joined together to form a single continuous piece:
   - Along an irregular edge-to-edge border like a jigsaw puzzle matched over a reasonable length.
   - Verified by continuous surface markings (or internal features)
   - Verified by three-dimensional fit

Sampling / Sample Selection

Because broken / separated pieces cannot be assumed to be from the same source, sample selection should be utilized when reporting probative physical matches. Each physical match should be examined and compared independently and probative results in reports should reflect

this.

VI. QUALITY ASSURANCE / QUALITY CONTROLS

All probative physical matches that may provide an association between a suspect and a scene or a suspect and a victim (e.g. a roll of tape from a suspect's residence physically matched to a piece of tape on a pipe bomb) must be examined by another qualified examiner (seconded) and they must reach an independent opinion as to whether or not a physical match can be made. The results of this examination must be recorded in the notes by the handwritten signature or initials of the seconding examiner.