3.2 Fabric Impressions

3.2.1 Introduction

Among the types of physical evidence that may connect a suspect to a crime scene are fabric impressions. Although not normally as conclusive as a fingerprint, it may provide investigative information that, combined with other evidence, can be sufficient to aid in the successful prosecution of a criminal case. Such evidence properly collected and submitted to the laboratory, will be helpful in an investigation - whether a vehicle/pedestrian accident, burglary, or homicide. These impressions might be on paint, metal, glass, plastic, dust, soil, or in blood.

Training requirements: Analysts who have become familiar with textiles, their construction and the impressions they can leave, through their fiber analysis training and experience, are qualified to conduct this analysis. In addition, training and experience in documentation and collection of questioned impressions (such as fabric and/or footwear & tire), along with training and experience in making known impressions for comparison is required.

3.2.2 Types of Fabric Impression Examinations:

- Examination of evidence to determine if a fabric impression exists and is it suitable for comparison with suspects or victim's clothing.
- Elimination of the standard as having made a particular fabric impression.
- If a fabric impression exhibits similar class characteristics as the standard.
- If a fabric impression was positively made by the standard.

Fabric impression comparison involves the physical similarity between the unknown and known based upon the probability of random occurrence of individual characteristics. Such characteristics are formed during the use of the item.

Characteristics may be divided into two general categories: (1) overall design which limits origin to the same class group and (2) specific details which eliminate others in the same class group. The degree of elimination is dependent upon the nature of the individual characteristics and their quality. No minimum number of characteristic agreements is required to effect an identification.

Formation of the individual characteristics created by use are generally the result of cuts, rips, burns, or tears to the fabric. The shape and size of the accidental damage are dependent upon surfaces and objects encountered during wear.

In general, fabric impressions are hard to observe and once detected should not be disturbed except for photographing for record shots. These impressions are either two-dimensional impressions on hard substrates or three-dimensional impressions in softer substrates. The impression should be preserved

and submitted to the laboratory because minute fibers may be present and can easily be lost due to any processing at the scene. Casting at the scene may be necessary on three-dimensional impressions.

Fabric impression comparison is a procedure requiring observation of characteristics according to size, shape, and spatial relationship. The evaluation of any impression is the determination of class and individual characteristics which are present. Due to a variety of overall design, fabric impressions suitable for comparison include those which may eliminate only or possess similarity only. The presence of class characteristics alone is sufficient to render an impression suitable for comparison purposes.

Comparison requires a known standard which is restricted to the victim's/suspect's clothes or other fabric. The most useful test impressions are those which attempt to duplicate the conditions of the contact transference. These conditions include the amount of force of the impact, possible distortion of the fabric, folds in the fabric, if the impression was left by rolling the fabric, the nature of the substrate, and environmental conditions at time of contact. As a general guide, however, prolonged wear will diminish the likelihood of conclusive examination results.

Casts, lifts, and test impressions produced in the course of examination may be returned to the submitting agency as opposed to being retained at the laboratory.

3.2.3 Safety Considerations

Standard Laboratory Precautions

3.2.4 Preparations

See below for different items needed based on selected technique.

3.2.5 Minimum Standards & Controls

Collection and preservation of any fibers that adhere to the impressions substrate must be performed before any fabric impression examination is begun. Adequate exemplars of the fabric must be made while attempting to duplicate any distortion due to force.

3.2.6 Instrumentation

Photography equipment

Image enhancement equipment

3.2.7 Procedure or Analysis

The scene impression should be first examined for any adhering fibers, and, if present, they should be removed for further examination and comparison. Questioned impressions will be evaluated to determine suitability for comparison purposes. Standard impressions are then compared with the question fabric impressions utilizing measurement and/or overlays, specifically searching for a correspondence in class characteristics and individual characteristics. The impression should also be examined for weave/knit pattern, thread direction and any indication of folds or distortion. Any unexplained differences between the impression and the fabric at this point would eliminate that fabric as making that impression.

The two-dimensional crime scene impression is a reverse positive image of the fabric. Comparing the crime scene impression directly to the fabric is difficult. Not only will accidental characteristics be reversed, many minute characteristics which might be recorded will not be visible. The test impression provides a medium which may be compared against the crime scene impression.

Every effort should be made to obtain an impression which closely resembles the crime scene impression. This can be usually accomplished by: (1) taking a number of test impressions, and (2) duplicating the way the scene impression was made.

There are a number of ways to make a test impression. Where one method might work well on one case, another method may have to be used on the next case. The fabric impression examiner should be familiar with these different techniques. When appropriate, the examiner should consider limiting the potential of damaging the fabric in the selection of the method to be used.

Procedures listed in Footwear Impression Evidence, by William Bodziak will be considered as standard for fabric impressions unless and until specific exceptions are listed in this section. One exception is the iodine-sensitized paper method which should not be used.

3.2.8 Visible Fabric Impressions

Visible fabric impressions must be examined to determine if they are suitable for comparison or elimination purposes. The impressions should either be examined directly or photographically (1:1 reproductions).

- Fabric impressions must contain sufficient discernible class characteristics to affect a comparison.
- Fabric standards must be submitted to the laboratory to affect a complete comparison.

3.2.9 Submitted Photographs of Fabric Impressions

Photographs which are submitted as the evidence which records the questioned fabric impressions are visually examined to determine if they are suitable for comparison or elimination purposes.

In most cases, the photographs of the fabric impressions must be 1:1 reproductions or a digital image that must have the capability of being photographically printed 1:1. (There are instances when photographs are not 1:1 reproductions; however, they contain a sufficient amount of class characteristics, therefore they may be utilized for elimination purposes.)

The photographs must also contain sufficient discernible class characteristics to effect a comparison.

Standard fabric must be submitted to the laboratory to effect a fabric comparison.

The absence of a scaling device which makes a 1:1 reproduction impossible usually renders a photograph unsuitable for a complete and accurate comparison.

3.2.10 Cast Impressions

Unknown cast impressions are examined and processed in the following manner:

- Casts are carefully cleaned in an attempt to remove excess soil and dirt (soil may be retained and transferred to the proper section for examination as case circumstances dictate).
- Casts are visually examined to determine the suitability for comparison and identification purposes. This examination can include:

Determination of fabric construction design
Determination of spacing of the weave or knit yarns
Determination of defects
Determination of wear characteristics
Determination of individual characteristics

- Casts which contain a sufficient amount of class and individual characteristics and are deemed suitable will be examined and compared with known fabric submitted by the requesting agency.

3.2.11 Other Test Impression Methods

3.2.11.1 Fingerprint ink and paper

Spread a small amount of fingerprint ink over a piece of glass with an ink roller. Press the fabric against the inked glass. Press the fabric against white bond paper supported by sheets of newspaper or butcher

paper. Fingerprint ink may cause very minute characteristics to become filled in and not be observed clearly.

3.2.11.2 Talc powder - carbon paper - fingerprint powder

- Talcum powder is spread over a surface such as a sheet of butcher paper. The talc is then shaken off the paper leaving a very fine coating. A sheet of carbon paper is placed on a few sheets of newspaper or butcher paper which are placed underneath to prevent extraneous particles recording false details. Press the fabric against the talc covered paper and then onto the carbon paper, a test impression recording minute detail is visible.
- Another version of this method is to dust the fabric with a fine coat of gray fingerprint powder then press the fabric on a piece of carbon paper supported by a few sheets of newspaper or butcher paper. The results will be similar to B.1.

As a receiving surface, carbon paper presents one problem; it may develop crease marks or wrinkles.

3.2.11.3 Fingerprint powder - plastic - glass - talc powder

This procedure is similar to method number B.2., except that glass does not require support. Plastic will require some protective base to prevent extraneous debris from causing false detail. The advantage of glass or plastic over carbon paper is that creases will not form and the impression can be made either black or white through photography depending on the background and lighting procedures. A black background will show white powder in its natural state. Using a back light (impression lit from the rear) and a white background, the white powder will appear black. This form of test impression is very fragile and should be photographed immediately.

3.2.11.4 Margarine and Magna brush

A minute amount of margarine is rubbed into the palm of the hand and then against the fabric. A test impression is obtained by pressing against a piece of glass, good quality white bond paper or clear plastic supported by paper. The receiving medium is then dusted with a Magna brush developing a clear image. Spray PAM can be substituted for the margarine.

3.2.11.5 Fingerprint lifting tape - fingerprint powder

A further method: dust the fabric with the desired color of fingerprint powder and lift the impression with fingerprint tape. In this procedure apply the tape by hand or roller. In order to maintain proper laterality and not obtain a mirror image, place the lifted impression on a clear acetate sheet and view it from the reverse side. This method is impractical for full size clothing but may be useful when trying to record a specific area. (Source: Michael Cassidy, Royal Canadian Mounted Police) For impressions that are three-dimensional, the test impressions can be made in clay, a lead sheet or other suitable materials. Force can be applied for making test impressions on material that is not fragile by using a rubber mallet and wood against the fabric. Measurements of the impressions can be made using a linen tester (thread counter) and vernier caliber.

3.2.12 Further considerations

Finally, it must be remembered in comparing fabric and fabric impressions that there are many standard types of weaves and knits, and that the duplication of a fabric impression is in itself not proof that the standard fabric made the impression because many pieces of fabric have the same method of construction. The presence of a fabric impression on hard paint of an automobile is almost conclusive proof that the vehicle has struck fabric forcibly. Do not forget that an impression in dust or grease may not have been made forcibly created.

3.2.13 Conclusions and Opinions - Report Content (non-footwear/tire impressions or shapes)

Report Conclusion Requirements:

- If a comparison is made, the association scale below shall be placed into the body of the laboratory report sent to the submitting agency.
- Inclusion of reasoning, specific to each comparison made, as to why a conclusion was drawn.
- When an association is made, proper qualifying statements shall be included.

Association Scale for Patterned or Shaped Impressions

The following descriptions are meant to provide context to the levels of opinions reached in patterned or shaped impression comparisons. Each level may not include every variable in every case.

Lacks sufficient detail – No comparison was conducted: the examiner determined there were no discernible questioned patterned or shaped impressions or features present.

Or – A comparison was conducted: the examiner determined that there was insufficient detail in the questioned impression for a meaningful conclusion. This opinion only applies to the known item that was examined and does not necessarily preclude future examinations with other items.

Exclusion – This is the highest degree of non-association expressed in patterned or shaped impression examinations. Sufficient differences were noted in the comparison of class and/or randomly acquired characteristics between the questioned impression and the known item.

Indications of non-association – The questioned impression exhibits dissimilarities when compared to the known item; however, the details or features were not sufficiently clear to permit an exclusion.

Limited association of class characteristics – Some similar class characteristics were present; however, there were significant limiting factors in the questioned impression that did not permit a stronger association between the questioned impression and the known item. These factors may include but were not limited to: insufficient detail, lack of scale, improper position of scale, improper photographic techniques, distortion or significant lengths of time between the date of the occurrence and when the item

was recovered that could account for a different degree of condition. No confirmable differences were observed that could exclude the item.

Association of class characteristics – The class characteristics of both design and physical size must correspond between the questioned impression and the known item. Correspondence of general condition may also be present.

High degree of association – The questioned impression and known item must correspond in the class characteristics of design and physical size. For this degree of association there must also exist: (1) condition that, by virtue of its specific location, degree and orientation make it unusual and/or (2) one or more randomly acquired characteristics.

Identification – This is the highest degree of association expressed by a patterned or shaped impression examiner. The questioned impression and the known item share agreement of class and randomly acquired characteristics of sufficient quality and quantity.

3.2.14 References

Any good textile book dealing with the construction of fabrics

Bodziak, W. J. Footwear Impression Evidence; Elsevier: New York, 1990

Cassidy, M. J. Footwear Identification; Canadian Gov. Printing Centre: Quebec, Canada,1980

Pizzuto, J. 101 Weaves in 101 Fabrics; Textile: Pelham, NY, 1961

Pizzuto, J. Fabric Science; Fairchild: New York, 1974