I. Scope: Fingerprint powders and particulate developers are very fine particles with an affinity for moisture throughout a wide range of viscosity. Palmar sweat, grease, oil, and most contaminants that coat the surface of friction ridge skin possess sufficient moister and viscosity to attract and bind the fine particles together. Contact between friction ridge skin and a non-porous surface will sometimes result in a transfer of the skin coating to that surface. The non-absorbency of the surface prevents penetration by the deposited moisture. All fingerprint powders and particulate developers are indiscriminate in adhesion to moisture. Surfaces coated with residue in addition to suspected latent prints will attract powders and particulate developers throughout the surface.

Dependent upon the composition of the residue, the deposited moisture will range from a most apparent appearance to the barely perceptible or invisible, even under oblique light. Powder or particulate application is the effort to produce or improve the appearance for preservation.

The most effective agent in terms of adherence to moisture, non-adherence to dry surfaces, particle size, shape, uniformity, and intensity of color is carbon. Black powders generally produce the best results. Other colored powders may be required due to the substrate encountered, but should be restricted to absolute necessity.

Magnetic powders are powder-coated, fine iron filings subject to magnetic attraction. These adhere to moisture to a lesser degree than carbon powders, but can be applied with less destructive force to the surface.

Particulate developers are substances which produce extremely fine particle residue upon burning. Materials with a high hydrocarbon content such as camphor, pine knots, or crumbled masking tape burn slowly and release soot in large quantities. Fine particulate carbon soot adheres extremely well to more viscous moisture while heat from the flame softens the residue. White or light colored soot may be produced by burning magnesium ribbon.

Most commercial black fingerprint powders have a high carbon base. According to the manufacturer's particular formula and production methods, the carbon base may be from a variety of sources, including lamp black, bone, or wood charcoal. Ground carbon alone cannot match the adhesion ability of fine particle carbon soot, but commercial powders contain milled carbon of highly uniform size and shape along with additional ingredients to preserve the milled condition and retard air moisture absorption.

II. References:

Cowger, James F. *Friction Ridge Skin Comparison and Identification of Fingerprints*; Boca Raton: CRC Press, 1993.
Lee, Henry C.; Gaensslen, R. E., eds. *Advances in Fingerprint Technology*; Elsevier Science Publishers, NY, 1991.
Olson, Robert *Scott's Fingerprint Mechanics*; Charles C. Thomas Publisher: Springfield, IL, 1978.
Waldoch, Terry L. "The Flame Method of Soot Deposition for the Development of Latent Prints on Non-porous Surfaces"; *Journal of Forensic Identification*, 1993, 43, 5, 463-465.

III. Apparatus/Reagents:

- Gloves
- Filter Masks
- No specific preparations are needed as the powders and materials being used are available commercially prepared.

IV. Safety Precautions: This procedure involves the use of hazardous materials. This procedure does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this procedure to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Proper caution should be exercised and the use of personal protective equipment should be utilized to avoid exposure to dangerous chemicals. Consult the appropriate MSDS for each chemical prior to use.

Traditionally, fingerprint powders have been used with little regard for safety. Many commercial powders do pose a potential health risk. Some powders have been found to contain fluorathene and pyrene, polynuclear aromatic hydrocarbons known to be carcinogens. Lead, manganese, nickel, aluminum, iron and actinium have all been found in commercial preparations. The affects of these chemicals range from carcinogenic and/or affecting the central nervous system to being radioactive. Powders applied in a laboratory environment or in the field require appropriate safety precautions. Ventilation systems, filter masks or respirators are essential.

The examiner should contact the manufacturer for the MSDS or chemical make up of the specific powder they are using and take appropriate safety precautions when using that powder.

V. Procedures:

Standard Powders:

Powders may be applied by various means, with the preferred method being use of a brush. Powders are more effective if applied in very small amounts. Only the ends of the brush bristles should be coated with the powder, and the brush should be gently tapped several times to remove all but a minimum amount.

With the brush handle in a nearly perpendicular position to the surface, the bristle ends should be lightly moved over the surface of the item being “dusted”. Discoloration of the latent print residue will usually appear immediately. The impression will develop in density with each light pass. Care should be taken to observe closely as the impression develops - even slightly excess amounts of powder will cause a fill to occur between ridges. This fill can be removed with continued empty brush strokes. Except on highly polished surfaces, excessive brushing is rare. However, at the first indication that the impression is being removed, all further brushing should cease.

Extraneous residue on the surface may cause a general painting effect which obscures friction ridge detail. A lift made of the area can sometimes remove the extraneous material and permit a second application of powder. This second application may offer better contrast between latent impression deposit and the background.

Magnetic Powders:

Magnetic powder must be applied with a magnetic application device. Wands which contain a movable magnet are the easiest and most widely used devices. Surface areas examined generally must be processed more slowly with magnetic powders, and great care must be exercised to prevent contact between the end of the wand and the surface of the evidence.

Particulate/Soot Powders:
Particulate developers such as camphor are ignited so that the surface of the area being process is exposed to the rising soot. The surface must not be placed in the flame and should be moved back and forth to insure an even distribution of the powder. When the surface contains and adequate, even layer of soot, the surface should be lightly brushed with a brush dedicated for use with particulate developers, until the non-adhering soot is removed This technique can only be applied to surfaces that will not be affected by the heat. Surfaces such as plastics should not be processed using this technique due to the extreme heat produced. Record any viable impressions.

VI. Quality Assurance/Quality Control: Powder and Particulate developed latent impressions must be properly preserved. Experiments have revealed that the developed latent impressions have weaker adhesion to the surface than undeveloped, and, as a result, are more susceptible to damage from accidental contact.

When using powders and particulate it is important to insure that they are in proper condition. Powders should not be exposed to high humidity or moisture. Powders may clump if exposed to excessive moisture. Moisture content and contaminates may be minimized by storing the stock in a tightly closed container. “Working” powder can be kept in smaller containers. This will minimize the exposure to moisture, as well as reduce any contamination of the stock container from evidence being processed.