

# Guide for Casting Footwear and Tire Impression Evidence

## 1. Scope

- 1.1 This Guide provides procedures that should be used for the casting of footwear and tire impression evidence.
- 1.2 The particular procedures and methods employed in a given case will depend on the evidence.
- 1.3 This Guide may not cover all aspects of unusual or uncommon conditions.
- 1.4 This Guide does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this Guide to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
- 1.5 This Guide is not intended as a substitute for training in the casting of footwear and tire impression evidence. Completion of a training program and experience in these skills is essential to understanding and applying the principles outlined in this Guide.
- 1.6 This Guide relates to the casting of footwear and tire impressions as part of the collection of impression evidence for examination in the laboratory.

## 2. Terminology

*Dental Stone*: a gypsum product used to cast impressions

*Fixative*: any product that will stabilize the substrate prior to casting

*Impression*: the product of direct physical contact of an item resulting in the transfer and retention of characteristics of that item

*Release Agent*: any product that prevents soil from adhering to the cast

*Snow Print Wax™*: an aerosol wax used to coat the surface of snow impressions prior to casting

*Sulfur*: a yellow non-metallic powder used for casting snow impressions

### **3. Significance and Use**

- 3.1** The procedures outlined here are grounded in the generally accepted body of knowledge and experience in the casting of footwear and tire impression evidence. By following these procedures, impressions can be properly cast.
- 3.2** Footwear and tire impressions are cast for the purpose of collecting impression evidence for subsequent examination in the laboratory.

### **4. Interferences**

- 4.1** Footwear and tire impression evidence may have inherent limitations that can interfere with the procedures in this Guide. Limitations, when known, should be noted and recorded.
- 4.2** Limitations can be due to substrate features, environmental conditions, quality and quantity of original impressions, casting techniques and casting materials.

### **5. Equipment and Requirements**

- 5.1** Casting materials, i.e., dental stone and sulfur
- 5.2** Zip-lock bags and mixing containers
- 5.3** Water
- 5.4** Measuring cups
- 5.5** Sufficient time to complete all applicable procedures
- 5.6** Stirring spoon or stick
- 5.7** Stove or hot plate for melting sulfur
- 5.8** Potassium Sulfate
- 5.9** Snow Print Wax™
- 5.10** Grey primer or aerosol paint
- 5.11** Release agents and fixatives, i.e., hairspray or similar sprays
- 5.12** Scale for weighing casting materials

## 6. Procedures

- 6.1 The following procedures may be used as appropriate depending on the composition of the impression evidence and the substrate material. The order of the following collection methods may vary from scene to scene.
- 6.2 Document and/or photograph (as set forth in the “Guide for the Forensic Documentation and Photography of Footwear and Tire Impressions at the Crime Scene”) impressions prior to any procedure.
- 6.3 Casting impressions with dental stone in soil and sand.
  - 6.3.1 If necessary, prepare impressions for casting
    - 6.3.1.1 When casting a fragile impression, it may be necessary to apply a fixative. Care should be exercised when applying fixatives to minimize any possibility of damage to the impression.
    - 6.3.1.2 When casting in dense soils, it may be necessary to apply a release agent. Care should be exercised when applying release agents to minimize any possibility of damage to the impression.
  - 6.3.2 Add appropriate amount of water to pre-measured amount of dental stone. The average footwear impression requires approximately two (2) pounds of dental stone and approximately ten (10) ounces of water. The amount of water required may vary depending on the casting product. The resulting mixture should have the viscosity of heavy cream. The viscosity of the mixture may need to be adjusted based upon the nature of the impression.
  - 6.3.3 Mix continuously for a minimum of 3-5 minutes so that the powder can thoroughly absorb the water.
  - 6.3.4 Pour casting material carefully outside the perimeter of the impression and direct the flow into the impression. Ensure the impression is completely filled and/or covered evenly. In the event that the casting material does not flow completely into the impression, the top surface of the casting material can be agitated to help it flow. Casts should be of sufficient thickness to avoid breakage. If necessary, additional casting material may be poured over the top of the original cast to complete the cast and/or add thickness.

- 6.3.4.1** For fragile and shallow impressions, pour casting material from outside the perimeter so that it rapidly flows over the impression. A thinner mixture of casting material is necessary for this technique. Avoid pouring directly onto the uncovered impression.
- 6.3.4.2** Larger quantities of dental stone can be mixed in a bucket to cast large segments of tire impressions. 36" segments are optimal for examination. Shorter segments may also be of value.
- 6.3.4.3** Impressions underwater may be cast using dental stone and specialized techniques.

#### **6.4** Casting impressions with dental stone and sulfur in snow.

- 6.4.1** If necessary prepare impressions for casting. It is noted that snow varies considerably in texture and type. Application of highlighting materials (such as Snow Print Wax™ or aerosol paints) may be advantageous during photography. These materials may or may not be necessary for the casting process.
  - 6.4.1.1** A thin application of highlighting spray may be directed at the impression from an oblique angle to increase the contrast of the detail. The application of highlighting sprays to the snow impression may increase melting, therefore the impression may need to be shielded from the sun until it can be photographed and cast.
  - 6.4.1.2** A thick application of Snow Print Wax™ may then be applied to create a shell for the dental stone casting material.
- 6.4.2** Casting with dental stone.
  - 6.4.2.1** Add a heaping tablespoon of Potassium Sulfate to the pre-weighed bag of dental stone.
  - 6.4.2.2** Add snow to the water source and place the bags of dental stone in the snow to pre-cool the ingredients.
  - 6.4.2.3** Add the appropriate amount of water to the pre-measured dental stone. A thicker mixture should be used for snow.

**6.4.2.4** Pour the casting material from outside the perimeter and direct the flow into the impression. The surface of the casting material can be agitated to help it flow.

### **6.4.3** Casting with sulfur

**Caution:** This technique requires that the user be familiar with safety issues regarding the use of sulfur. Manufacturer's safety information and warnings should be consulted before using this material.

**6.4.3.1** Melt the sulfur and cool to an opaque, partially crystallized state before pouring into the impression.

**6.4.3.2** Pour from the perimeter, allowing the melted sulfur to flow into the impression.

**6.4.3.3** Due to the extremely brittle nature of sulfur casts, dental stone may be poured over the back of the cooled sulfur cast to reinforce it prior to lifting.

## **6.5** Marking and handling the cast impressions

**6.5.1** Casts should be marked prior to removal. Markings should include identifier numbers which link the casts to diagrams and/or photographs; date and initials; and any other pertinent information such as case number.

**6.5.2** Allow casting material to thoroughly harden prior to removal.

**6.5.3** Carefully remove cast impression from substrate. It may be necessary to excavate the cast to avoid breakage.

**6.5.4** Allow dental stone casts to thoroughly dry for 48 hours prior to any attempts to clean the cast.

**6.5.5** Casts must be thoroughly dry before storage or packaging.

**6.5.6** Casts should be adequately packaged to avoid breakage during storage or shipping.

## **6.6** Cleaning dental stone casts

**6.6.1** When possible, casts should be cleaned in the laboratory by the examiner.

**6.6.2** If necessary, prior to cleaning, preserve any soil or other evidence attached to the cast.

**6.6.3** Soil and sand can be cleaned from casts using water and a soft brush.

## **7. Report**

**7.1** Procedures utilized and evidence collected should be documented and may also appear in a report.

## **8. Bibliography**

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