Latent Print Section

Casting Impressions

1. **Scope**

This document describes the different methods used for casting impressions. Visible and/or developed two-dimensional impressions and three-dimensional impressions can be collected by casting. A cast is a way to obtain a life-size mold or lift of the impression. A proper cast will take on and retain the three-dimensional characteristics left by an item such as footwear, tires, or friction ridge impressions. The casting materials used will have the capability of reproducing very fine detail, revealing characteristics such as the unevenness of the surface and variance in the depth of the impression and other characteristics.

2. Safety

Avoid inhaling the dust or breathing fumes from sprays utilized. Avoid getting the casting material in the eyes, if contact occurs, flush with water.

3. Casting Procedure

3.1 Scene orientation documentation and comparison quality photographs should ALWAYS be taken prior to casting an impression.

3.2 Debris that may have settled into or onto the impression after it was made may be removed if it will not disturb the impression. Any debris that was part of the impression, or was present when the impression was made, should not be removed.

3.3 When casting, care should be exercised as to minimize any potential damage to the impression. For fragile impressions observed in fine substrates (e.g., flour, sand, loose soil, etc.) an aerosol fixative (e.g., max hold hair spray) may be applied by misting over the impression and allowing the fixative to fall into the impression.

3.4 A releasing agent (e.g., talcum powder, spray oil) can be used to prevent the substrate (e.g., soil, sand and shale) from adhering to the surface of the cast, or the cast from adhering to a substrate (e.g., counter top, asphalt).

3.5 Make up the casting material according to the manufacturer's guidelines.

3.6 Ensure the casting material is thoroughly mixed and free of lumps that could damage the impression when pouring.

3.7 Place a form or a dam around the impression to be cast if necessary. This depends on the surface and depth of the impression. The dam prevents the casting material from flowing away from the impression which would result in a thin cast. When the dam is properly placed, the casting material should not be able to flow under the dam.

3.8 Mix dental stone in a plastic bag or pail for an average footwear or small section of tire using approximately 2 pounds of dental stone to 12 ounces of water, a 5:2 ratio usually produces the correct consistency. The consistency should be similar to thick pancake batter. If it is too thick, add a small amount of water, if it is too runny, add more dental stone until the consistency is achieved.

3.9 Carefully pour casting material outside the perimeter of the impression and direct the flow into the impression. Pour over a large spoon, trowel or other suitable baffle to protect the impression from being hit too hard by the dental stone. 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 that has been poured into the impression can be carefully agitated to help it flow.

3.10 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.

3.11 For fragile and shallow impressions, pour so that it rapidly flows over the impression. A thinner mixture of casting material is necessary for this technique. Avoid pouring directly onto the impression until a sufficient layer of material has accumulated over the impression.

3.12 Larger quantities of dental stone can be mixed in a bucket to cast large segments of tire or multiple impressions.

3.13 Tire casts should be long enough to capture the entire circumference of the tire, usually 6 ft to 8 ft. If it is not practical to make one 6 long cast, two 3 ft long segments should be made to allow for an optimum comparison examination. Smaller casts (e.g., 12 in., 18 in., and 24 in. long segments) can also be made if the proper training, experience, and/or equipment is not available to make a larger cast.

3.14 Ensure the casting material has set up fully before removing it from the impression. The back of the cast will be firm when ready.

3.15 When removing, take care not to damage the surface of the cast impression.

4. Casting in Sandy or Fragile Surfaces

4.1 Take comparison quality photographs of the impression(s) prior to casting using varying light angles to create shadows in the impression which will capture more detail.

4.2 If the impression is in sandy soil or another fragile substrate, hair spray or other simliar fixatives may be applied to the impression to harden the substrate and prevent it from collapsing under the weight of the casting material.

4.3 The spray should be directed in the air above the impression so the spray can drift down into the impression. Spraying directly into the material may disturb the detail.

5. Casting in Snow

5.1 After initial photographs, a thin layer of a highlighting agent (e.g. snow print wax, spray paint, etc.) should be sprayed onto the impression to add contrast. The spray should be directed at an angle, 8-12 inches from the impression.

5.2 Repeat comparison quality photographs.

6. Casting in Snow with Dental Stone

6.1 At least five to six layers of aerosol wax should be applied to create a barrier between the impression and the dental stone casting material. Ensure all horizontal and vertical surfaces of the impression are coated. The wax will retain the detail needed for comparison, so it needs to be protected when packaged and transported.

6.2 If there is moisture such as in wet snow conditions, sift three layers of dental stone powder over the waxed shell coating of the impression. The first layer should be sifted slowly and evenly to absorb the moisture from the snow. Only sift enough to absorb the moisture.

6.3 To prevent the dental stone mixture from melting the impression, it is important to ensure the dental stone mixture is as cool as possible when it is applied to the impression. This can be achieved by placing the container of water in the snow while photographs are being taken or by adding snow to the water until it stops readily melting (almost slush). In colder temperatures it may be necessary to add a tablespoon of potassium sulfate (K_2SO_4) to the mixture to act as a catalyst.

6.4 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. Pour over a large spoon, trowel or other suitable baffle to protect the impression from being hit too hard by the dental stone. Wait until the cast has hardened before removing.

6.5 When the impression in snow is excessively wet, is melting quickly, or has standing ground water, two to three fine layers of dry dental stone should be sifted onto the impression prior to casting.

6.6 Casts in snow can take a long time to harden and might freeze before it does. It will feel hard when in fact, it is frozen. You want to avoid this. A frozen cast will eventually melt, and the captured impression will be damaged. Placing newspaper or cardboard over the cast and covering it with snow will help insulate it and allow it to harden faster.

7. Casting in Snow with Snow Print Plaster

7.1 Follow the manufacturer's instructions.

7.2 Snow Print Plaster is designed for use in snow only.

7.3 Sift a base layer (approximately 10% or 3 oz of the product) of Snow Print Plaster powder over the impression.

7.4 Add water to the plaster bucket and stir until it thickens (45-60 seconds)

7.5 As the plaster begins to set, quickly pour into the impression and fill the impression with the mixture.

7.6 Place newspaper or cardboard over the cast and cover it with snow. This helps prevent the cast from freezing.

7.7 Wait 8-10 minutes and check to see if it has hardened.

8. Casting Submerged Impressions in Standing Water

8.1 Attempt to dam the impression and remove as much water as possible without damaging the impression.

8.2 Sift or sprinkle an even layer of dry casting powder over the impression until the bottom is covered.

8.3 Mix and pour wet casting material into the impression as usual.

8.4 If the impression simply has water in it and is not fully submerged, casting material can be mixed and poured from the outside of the impression, allowing the casting material to flow into the impression, which will displace the water.

8.5 Casts poured into standing water should be allowed to harden for at least 60 minutes before attempting to lift them.

9. Marking and Collecting the Cast Impressions

9.1 Casts should be marked prior to lifting from the substrate (e.g., with permanent marker,

grease pencil). Markings should include identifier numbers which link the casts to diagrams and/or photographs (e.g., placard number), date and initials, and any other pertinent information such as case number.

9.2 Photograph the cast in place prior to lifting to show the location within the crime scene and proximity to other pertinent evidence.

9.3 Allow the casting material to sufficiently set to prevent damage prior to lifting.

9.4 Carefully lift the cast from the substrate. It may be necessary to excavate around the perimeter of the cast to avoid breakage.

9.5 The substrate will usually adhere to the cast. Casts should not be cleaned at the scene.

9.6 Casts must be thoroughly dry (1-2 days) before packaging.

9.7 Casts and any adhered substrate should be adequately packaged to avoid breakage during storage or shipping.

9.8 Package in heavy paper or cardboard, not in plastic.

10. Cleaning the Cast

10.1 Casts should not be cleaned at the scene.

10.2 The cast should be fully dry before cleaning (no less than 48 hours).

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

10.4 Dental Stone casts may be cleaned with water and a soft brush or soaked in water with a saturated solution of potassium sulfate and then cleaned. This can be repeated as necessary.

10.5 Do not clean Snow Print Plaster casts, they are too soft and will damage easily.

11. Mikrosil™ Casting Method

11.1 Follow the manufacturer's instructions.

11.2 Mikrosil™ and the hardener should be stored tightly capped at room temperature.

11.3 If necessary clean the surface to be casted with a soft brush or compressed air.

11.4 Squeeze a length of the casting material onto a card or other appropriate surface, and then squeeze an equal length of the hardener (this is smaller in diameter) on top or next to the casting material.

11.5 Mix the hardener and casting material together and ensure it is thoroughly mixed and has a uniform color, do this quickly so the material does not harden. Mixing should not last longer than 30 seconds.

11.6 Apply the casting material to the surface. Generally, it is best to work the material onto the edge of the surface from one direction. This helps to eliminate trapped air bubbles.

11.5 Allow the material to set up. The unused portion of the material can be checked for proper set up or when the cast is no longer tacky to the touch, it can be removed.

11.6 Carefully peel the cast away from the surface. It can then be trimmed for lighting and observation.

11.7 Often the impression can be cast again if the cast does not turn out as expected.

12. References

12.1 ASB Best Practice Recommendation 126, First Edition 2020, *Best Practice Recommendation for Casting Footwear and Tire Impression Evidence at the Crime Scene.*