

Technical Note

Shoe and Tire Impressions in Snow: Photography and Casting

Lesley Hammer
James Wolfe

State of Alaska Department of Public Safety
Scientific Crime Detection Laboratory
Anchorage, AK

Abstract: Shoe and tire impressions in snow present a unique set of collection and preservation challenges. Becoming familiar with and practicing techniques for photographing, coating, and casting snow impressions will enable the successful recovery of this type of evidence.

Introduction

Snow can be an excellent medium for the recording of shoe and tire impressions. Snow, however, can be present in many different varieties. Fresh snow, slush, and ice all have qualities that influence the detail created and recorded in an initial impression, and each “type” of snow creates specific challenges for the collection of the detail that is present.

Photographing a white-on-white impression is challenging; however, the primary skills are the same as those used to photograph other three-dimensional impressions such as those found

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in sand or dirt. Snow impressions are sprayed with different coating materials to increase contrast for photography and to prepare the impressions for casting materials.

Casting an impression in snow may be accomplished with either dental stone products or sulfur. Each method has advantages and disadvantages when considering ease of application, level of detail recorded, and requirement of coating materials. These considerations vary with use in different types of snow.

Photographing Impressions in Snow

Photographing impressions in snow is similar in procedure to photographing any three-dimensional impression, with a few additional steps:

The camera should be placed on a tripod and the camera film plane should be parallel to the plane of the impression. Focus should concentrate on the design elements and on the bottom of the impression to capture the important detail. The impression should fill the frame, and a scale and label should be included in the photograph.

The scale should be placed at the level of the bottom of the impression. This requires the digging of a small trench next to the impression to place the scale on the proper plane. Care is required to avoid disturbance of the impression in this process.

The impression should be photographed with oblique light to create shadows that accent the details. Direct sunlight or direct flash will create a washed-out image (Figure 1). Various lighting angles will accent different details. Therefore, photographs should be taken using oblique lighting from at least three positions around the impression, so that the shadows fall in a variety of directions. A dark sheet of material or other barrier can be effective in controlling the sunlight during photography.

Snow impressions should also be shaded from bright sunlight if rapid melting is a concern. This may be accomplished by covering with a box or by creating a small tent of some type. Some materials may create elevated heat and actually increase the melting of the impression when heated by the sun. It may be



Figure 1

*Photographed with
direct flash.*

*Photographed with
oblique light.*

best to allow cold air to circulate or to practice with materials to determine what would work in your environment. Continued snowfall may be another reason to protect impressions in a similar fashion.

After the initial photographs, the impression may be sprayed with a light coat of gray primer paint (Figure 2). This procedure increases the contrast of the impression for photography and therefore allows for greater visualization of the detail present in the impression. However, the darker color absorbs sunlight and may speed the melting of the snow impression, which should be considered and compensated for by shading the impression if your environment requires such care.

Preparing a Snow Impression for Casting

A thin layer of gray primer can provide a coating to prepare an impression for casting, in addition to creating photographic contrast. If a thicker coating is required, then snow print wax may be used.

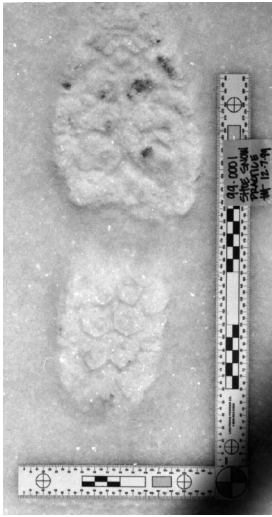


Figure 2

*Photographed without
gray primer.*

*Photographed with
gray primer.*

When casting with dental stone, the snow print wax may be necessary to prevent the “leaking” of the casting material into the snow before hardening can occur. When leaking does occur, the cast has a rough surface with the visual appearance of a sponge material. When using sulfur, there appears to be no need to coat the impression for casting purposes. However, personal experience and preference, as well as overall procedure during photography, often result in the application of some coating material. Neither of the coating materials (paint or snow wax), in our experience, has been found to have an adverse effect on either of the casting materials. Also, there have been no problems observed when both types of spray coatings are used (i.e., the gray primer for photographs followed by the application of spray wax for casting preparation). However, a light coating of snow wax can provide contrast for photographs, thus the application of both coatings may not be necessary.

Environmental temperatures may also be a factor in the choice of a coating material. In our experience, snow print wax becomes difficult to spray in cold temperatures, although the gray primer is still viable.

In summary, the authors would recommend the following:

Preparing the impression for casting with dental stone

Use snow print wax in slush or wet snow conditions. A very light coating of snow print wax may be applied first if needed for photographic contrast, followed with a heavier application to coat the impression for casting. In colder temperatures, we recommend the use of gray primer spray paint for photographs and to provide a light coating for casting.



Figure 3

Casting impressions in snow.

Dental stone tire track with (from left to right) gray primer, orange paint, and snow print wax.

Sulfur casts of boot heels with (from left to right) snow print wax, no coating, and gray primer.

Dental Stone Casting

Materials:

Dental stone (pink and buff are commonly used)

Ziplock bags (gallon size)

Wide mouth jar for water

Potassium sulfate

1. Place approximately 2 cups of dental stone in a ziplock bag. Add a tablespoon of potassium sulfate to the dental stone, and mix. The purpose of the potassium sulfate is to accelerate the curing process, before the cast material freezes.
2. Place the bag with dental stone in the snow to cool down to snow temperature.
3. Photograph the impression, apply a spray coating material, and rephotograph.
4. Cool the mixing water by adding snow until a slight amount of slush is present.
5. Add the cold water to the dental stone until a consistency of thick pancake batter is achieved. This requires approximately 10 ounces of water per 2 pounds of dental stone. Note: Dental stone may be mixed in larger quantities in a bucket for multiple or large volume casts.
6. Pour the casting material into the impression, taking care that the initial drop of material does not damage the impression. Wiggle the surface of the wet casting material to aid distribution.
7. Pull up cast when hardened. Let the cast thaw and cure at room temperature for 12 to 24 hours.

Preparing the impression for casting with sulfur

It is not necessary to coat the impression for casting purposes, so the impression may be coated as desired for photography and followed with the casting process.

Sulfur Casting

Materials:

Sulfur (1.5 kg for one impression or approx. 3 cups of pellets)

Pot

Spoon

Heating plate or burner

1. Melting the sulfur

Place the sulfur in the pot, and turn the heat to medium to begin melting the sulfur (the melting point of sulfur is 119 °C). The sulfur should slowly turn from a yellow solid to a translucent amber liquid. If the temperature of melted sulfur exceeds 160 °C, it becomes dark, like thick syrup at the bottom of the pan. This is the visual sign that the sulfur has become too hot and that the temperature should be lowered immediately. Melt until all solids have turned to liquid. Note: There will be a layer of yellow on the spoon because of cooling, but this does not need to be removed.

Cautions:

The flash point of sulfur is 207 °C.

The self-ignition point of sulfur is 232 °C.

Be careful that the sulfur does not catch fire while melting.

The gas caused while melting the sulfur is harmful and poisonous.

Always melt the sulfur outdoors.

Read the MSDS for sulfur before using!

With an effective heating plate or burner, the sulfur melts within 10 minutes. Total time for the procedure (melting, cooling, and pouring) will take about half an hour.

2. Cooling the sulfur

Cool the melted sulfur by stirring it with a big spoon or scoop continuously until the sulfur becomes grainy. The sulfur should be a liquid, nonelastic gruel, and its color will have lightened. Stir the sulfur constantly as it cools. Do not put the pot in the snow, water, or any place where it will begin to cool quickly, because then the sulfur will harden too quickly and you may not have enough time to pour it into the impression. If this occurs, it will require the sulfur to be melted again.

3. Pouring the sulfur into the impression

When you pour the sulfur into the impression, it must be grainy and the temperature must be as close as possible to the melting point. This is because the sulfur hardens instantly after pouring. Cool the sulfur very near to the impression you are going to cast so you can pour as soon as it is ready. Surround the impression with a frame if needed.

Start the pouring on the lower part of the impression and direct the melted sulfur evenly over the impression. Pour the melted sulfur close to the snow surface to minimize the distance the sulfur has to fall into the impression. The casting should be at least 2 cm thick. Do not pour another layer and do not use other items for strengthening (e.g., sticks or wire).

4. Lifting the sulfur cast

Let the cast cool until it is warm (not hot) to the touch. Then lift up the cast from the snow. Do not leave the sulfur cast in the impression for a long time because it can freeze to the ground. Place the cast on a firm surface and handle the cast very carefully. It will be fragile and will break easily.

A layer of dental stone can be added to the back of the cast to prevent breakage. This can be done before or after the sulfur cast is lifted from the impression.

Conclusion

With practice and a few specialized techniques, shoe and tire impressions in snow can be successfully collected at a crime scene. These impressions should be photographed using the standard techniques for three-dimensional impressions. To increase the visibility of detail and contrast in the photographs, the impression should be coated. Gray primer is the recommended coating for photography. Snow print wax sprays may also be used to coat the impression if needed to prevent the leaking of the dental stone into the snow. Both dental stone and sulfur are effective methods for casting in snow. Dental stone may be easier to use; however, sulfur captures the most detail. Both methods require development of techniques and should be practiced thoroughly before they are used at a crime scene. It should also be noted that both dental stone and sulfur may also be used in nonsnow impressions (mud, dirt, sand, etc.).

For more information, please contact:

Lesley Hammer
State of Alaska Department of Public Safety
Scientific Crime Detection Laboratory
5500 East Tudor Road
Anchorage, AK 99507-1260
lesley_hammer@dps.state.ak.us

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