

## Making Casts of Footprints

### Choice of Casting Materials

Technicians are constantly experimenting with casting materials and many materials have been used for casting footprints including but not limited to sulfur, foam, stone (dental), silicone, and plaster. For working in the field with animal tracks, plaster is an adequate and suitable material. We use plaster most of the time to make the actual cast and recommend it for use.

Plaster is calcium sulfate which may have molecules of water attached. Most types of plaster will work in the field to make durable, long-lasting casts of footprints. Expensive products are not needed such as plaster compounds offered by Sirchie (Casting Plaster \$16.95 for 10 lbs; Shake-N-Cast \$14.50 for 2 lbs) are not needed. If the label says Plaster, Hydrocal, or Stone it will work okay. Plaster of Paris is a brand and any Plaster will work.

There are 100s of plaster footprint casts over 50 years old in the Track Education Center and the Murrie Center has plaster casts over 80 years old. These are neither Hydrocal nor stone casts but simple plaster. Plaster will take adequate detail in any substrate and if the caster needs super fine detail the compound can be sifted or mixed thin (later thicker plaster is added to the back to strengthen the cast).

There are some types not to use. Those products labeled Patching Compound or Wall Board Plaster are designed for putting on walls. Sometimes at low temperatures experienced in the field, these compounds do not harden well and may break. Also avoid any product labeled PolyPlaster. The Polyplasters contain a polyurethane compound to increase their flexibility and quality but they do not harden well at temperatures below 50°F.

The term plaster is used below to include all plaster, Hydrocal, and stone compounds. Read the manufacturers directions for variation in curing times.

### Materials for Special Situations

When casting in snow, plaster compounds go through exothermic reactions, that is they give off heat while curing. Heat melts snow and the water from the snow comes in contact with the plaster, diluting it and creating a cauliflower-like appearance that is usually worthless for collecting evidence.

There are two products to prevent the problem with melt water and thus produce good impressions of footprints in snow. Snow Print Wax (Lightning Powder Company, Kinderprint, CSI Forensics Supply, and Forensics Service) and Snow Impression Wax (Sirchie) are bees wax compounds. We prefer Snow Impression Wax as it goes further and does not rub off on hands later.

Before mixing the plaster, the wax is sprayed over the footprint. The wax forms a waterproof seal. When the plaster is poured in the track, it still gives off heat and still melts the snow but the water cannot get back to the plaster to dilute it.

The recommended procedure for using wax is to spray six layers over the footprint. Each layer should be thin and about two minutes allowed between sprayings for the wax to bind and harden. If thick layers are sprayed, eventually the plaster cast reveals the detail of the wax not the footprint itself. Between spraying rotate around the footprint 120 degrees before the next spraying. After three sprayings move around 60 degrees before starting the last three.

The waxes contain a red dye. After each spraying, examine the wax covering carefully looking for white spots of snow showing through. With subsequent sprayings, cover all white spots. It is difficult to get the wax into the delicate parts of the footprint such as the claws so concentrate efforts to cover these spots.

Once hardened, plaster may be poured into the footprint. In reality, in the field it is often possible to use only three sprayings of wax. This is dependent on the importance of the case and availability of other footprints should the first one fail.

Waxes are delicate items that require lots of TLC. If you allow wax to get cold, it will harden in the can. In the field during cold weather, the can should be carried inside the coat. The colder the weather the more protection you must give the wax. However, do not get it too hot or it may melt detail in the footprint when sprayed on the track. We also never leave wax in places where it may freeze when not in use. Cans also sometimes loose pressure from one winter season to the next.

It is also wise to prepare ahead of time and carry wires (safety pin or paper clips) small enough to fit into the nozzle to clean the nozzle as they are notorious for clogging. Also carry pliers so the nozzle may be pulled off for cleaning.

There is a definite safety hazard associated with the cans. The plastic tops become very brittle when exposed to cold. This is not a problem if stored in a warm vehicle but when carried by field personnel it may happen. The problem when pulling a cold cap off in the field is that it may shatter and cut personnel. Sharp edges have been know to create cuts requiring several stitches.

The solution to the cap problem is to take the cap off when it is warm inside. Then take a sharp knife and make two small slits through the thick rim edge down about half way on the cap. The slits should be about 1.5 to 2 inches apart. Next bend the cap over. This will create a place where fingers may be safely placed in the field to lift the cap off. Also take the knife and make a slit through the thick edge of the inner ring so it will not grip the can so tightly.

When casting in fine soil, dust, or sand the weight of the plaster or even just breathing on a track may destroy it. In these cases it is best to harden the footprint first. Sirchie sells "Dust and Dirt Hardener" but TSI has found that spray polyurethane works just as well and is cheaper. Each company that makes spray paint usually makes a can of spray polyurethane for about \$4.00.

To use the hardener, spray a fine mist from high above the footprint; since the can is under pressure too close and you will blast the footprint apart. Subsequent sprayings get closer and closer to the track until a thin plastic layer has been created that will bear the weight of the plaster.

## Casting Kit

TSI suggests making a casting kit to keep in the car or your pack. Since we must carry our kits, often great distances, in the field we are minimalists. Kit items we typically carry include:

Plaster container: 1 - 1-gallon plastic container with a screw-top lid. Avoid plastic sacks as they break too often. Also avoid zip lock bags as once plaster gets in the zipper they leak.

Plaster: 2 lbs or more (we must cast grizzly footprints)

Water: Carry at least a quart or have access to a local water supply such as a stream.

Mixing cups: 3 plastic 32 oz. cups. Cups may be obtained at Walmart or Kmart type stores or at McDonald's or similar places.

Spatulas: 2 Spatulas, should be the narrow type with strong handles. These seem to be getting more difficult to locate.

Plastic garbage sacks: 2 or more. Casters must be environmentally aware and all traces of plaster or spray must be carried out. Do not wash mixing cups in streams but carry out the dirty cups.

Some optional items include brushes and tweezers for cleaning out the track (we generally use the tip of a knife) and plastic, metal, or cardboard walls to support plaster above the track. Excellent plastic walls can be made from a number of different plastic containers found at the grocery store. Simply cut strips about 2 inches tall from the container. Splitting the circle of plastic will allow adjusting for track size. Paper clips or alligator clips may be used to hold edges together. Since we seldom carry extra items (and weight) in the field we may wall around the casts by using natural materials such as mud, sand, sticks, and stones.

Seasonally we carry waxes and polyurethane.

### Procedure:

TSI and program participants have cast tens of thousands of casts since 1958. There are several methods that be used. We will list one here that we know works most often especially with those that may be new to casting.

To protect a cast from breaking, you must control for two things: thickness and density. Control for thickness by building a wall (natural or artificial) around the footprint. The wall needs to extend above the footprint so that the thinnest part of the cast is at least 1/4 of an inch thick. This will work for casts up to 6-in in diameter. Casts greater than six inches should have 3/8 inch thickness over the thinnest part. Really big casts require more and may be strengthened with sticks or other materials.

Control for density by mixing plaster at the manufacturer's recommended ratio of plaster to water. The ratio is generally two parts plaster for one part water. However, in the field we often do not measure but simply mix plaster to the consistency of a thin milk shake or thick

pancake batter. When possible mix plaster a bit dense for strength but if there is a lot of detail in the footprint you may need plaster just a touch thinner. Add thicker plaster to the back of the cast to strengthen it.

Over the years, TSI has experimented with about every method we have heard about. We prefer adding water first and then adding plaster. This seems to provide the most consistent results for new casters and avoids wasting a lot of plaster. First estimate the water needed by pouring water into the mixing cup one pad at a time. Pour in enough to cover the pad level. Then move to the next pad and add the appropriate amount of water. Once all pads are accounted for, add enough water to bring the surface to the desired 1/4 or 3/8-in thickness.

We prefer adding plaster while mixing because we are using narrow cups (in broad bowls it may be possible to let water soak into plaster before mixing). By working in a team of two, one person pours plaster in while the other mixes. Plaster is mixed with force but not beating bubbles into the plaster. The plaster needs to be a thick liquid and not an air-filled meringue.

When the plaster pourer gets ahead of the mixer, the mixer (who controls the operation) will say stop. Then the mixer scraps side and stirs in all lumps asking for more plaster as needed. Initially, it will take a lot of plaster but near the end of the mixing process only a tablespoon or two may be needed.

Try to avoid the “add water / add plaster” syndrome but if the mixture is too thick do add water. It is best to add water by a capful (about a tablespoon) at a time.

To pour plaster into a cast, hold the spatula close to the footprint and pour on to the spatula letting plaster run off the spatula about 1.4 inch into the cast. This procedure will prevent destroying delicate tracks especially in the snow.

Once the mixing process has started, try to finish the process of mixing and getting the plaster into the cast within a minute. If you take longer the plaster thickens and will not flow into delicate parts of the track.

Next place the spatula tip on to the top surface of the cast and vibrate rapidly up and down but no more than about 1/8 inch. Move slowly around the surface. This will cause the air bubbles to rise and provide a smooth back.

After the cast has hardened about 15 minutes, carefully scratch collection data into the cast: date, time, location, collector’s name or initials.

Allow the cast to harden for 30 minutes (check manufacturer’s recommendation). The cast may then be carefully removed by removing walls and digging just under the edge of the cast all the way around the cast. Insert fingers under the cast on opposite sides of the shortest axis of the cast. Carefully break any seal with the surface by lifting one edge. Next roll the cast over onto your fingers.

Casts at this stage are durable if they were mixed at the proper density. Carefully scrape dirt from the surface and wash gently. Do not use a brush but a spray from a hose may be used. After 24 hours a strong spray may be used.

Some folks scrub their casts white and then may paint pads black. We believe that detail is best seen when some dark surface material remains to show contrasting elevation on the surface of the cast.

Plaster continues to cure for seven or more days. Place the cast in an open, dry, warm area so moisture may be driven out. Never place a cast in plastic as it traps moisture and may cause the cast to crumble. Additionally wet casts left in plastic will mold.

If a track is being made in snow an additional step is needed. As soon as the plaster is poured, cover the cast with a plastic bag. Then insulate the cast with clothing or a deep layer of snow. This will trap the exothermic heat inside and let the cast cure. In very cold condition, we give casts 40 minutes before picking up. If left longer, the melted water may refreeze trapping the cast. If this happens take a shovel and dig out a large piece of snow containing the cast. Place this glob in a bath tub. When the ice melts, the cast will be ready for viewing.

Cast stored in a dry place will last a long time. No special care is needed. Although some believe they should be varnished, we have never done that to our collections and, as said previously, footprint cast over 80 years old are in the museum collection.

#### Suppliers

CSI Forensic Supply -- [www.csiforensics.com](http://www.csiforensics.com)

800-227-6020

925-686-6667

Forensics Source - [www.forensicsource.com](http://www.forensicsource.com)

800-852-0300

Kinderprint.com now transfers to CSI Forensics

Lightning Powder Company now transfers to Forensics Source

Sirchie - [www.sirchie.com](http://www.sirchie.com)

800-356-7311