

Wake County Bureau of Forensic Services  
Crime Scene Science Division Technical Manual

Effective Date: 3/22/24

Chapter 14: Three-Dimensional Impression Casting

Issued By: Director

## Chapter 14: Three-Dimensional Impression Casting

### 1. Purpose

1.1 To establish actions necessary to cast and recover three-dimensional impression evidence found at crime scenes.

### 2. Materials

- Water
- Frames
- Ziplock bag with 2 lbs. of dental stone
- Packaging materials

### 3. Procedures

3.1 The ratio of dental stone to water is based upon a single footwear impression cast. Larger areas will require additional material using the same ratio.

3.2 Preparing the Material:

- Three-dimensional impression photographs should be taken of all impressions to be cast following the appropriate procedure as outlined within this manual. See Documentation of Impression Evidence chapter of the Crime Scene Science Division Technical Manual.
- Measure approximately 10 ounces of water (volume will affect the consistency of mixture).
- Pour water into zip lock bag containing two pounds of dental stone and seal.
- Thoroughly knead the water and powder until all the lumps are removed (approximately three minutes) and the mixture is the consistency of pancake batter. If mixture is too thick to pour, gradually add more water as needed to get the correct consistency.
- If preferred, the mixture may be prepared in a bucket or other vessels instead of a bag.

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### 3.3 Preparation of the Impression for Casting:

- If possible, carefully remove any debris surrounding the impression (sticks, leaves, trash). Do not remove any debris that will disturb the impression.
- If the surface of the ground is uneven or the impression is shallow, a frame may be placed around the impression to retain the casting mixture. The frame should be adjustable to allow for irregularities in the impression shape. Carefully place the frame around the impression so as not to disturb the detail of the impression.
- When casting large segments of tire impressions, thirty-six inch segments are optimal for examination. Shorter segments may also be of value.

### 3.4 Pouring the Mixture:

- Determine how the mixture may flow across the impression (grade of the land, uphill, downhill).
- Choose a side to start the pour.
- Off the perimeter of the impression, start to slowly pour the mixture on the ground, building a small mound of the mixture.
- Slowly move the pour into the impression allowing the mound of the mixture to push itself into the impression. This will prevent damage to the impression from the stream of the mixture.
- Continue pouring the mixture over the entire impression until all of the mixture has been used. Any stoppage of the pour will create a “pour line” in the cast and may obliterate detail.
- The top of the pour can be smoothed, using a small ruler or your hand. This will also allow for the perimeters of the impression to be filled with casting mixture.
- Allow the cast to dry and mark the cast with the following information: Wake County Bureau of Forensic Services case number, date, the name or initials of the employee, and Bureau Item number.

### 3.5 Removing the Cast from the Ground:

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- After it has dried, carefully pick up the cast and transport it, impression side up, to the laboratory. Make sure that the cast is packaged appropriately in order to prevent it from being damaged.
- Do not scrub dirt from the cast, as detail may be lost (preferably done by Footwear Examiner).

#### 4. Limitations

- 4.1 Impressions may be encountered that are submerged in water. The water should be left in place. Submerged impressions are processed as any other impression. Off the perimeter of the impression, start to slowly pour the mixture, building a small mound of the mixture allowing the mound of the mixture to push itself into the impression. The casting material will sink to the bottom of the impression forcing the water out.
- 4.2 An alternative method prior to pouring the cast, a small amount of the powder can be sifted into the impression to provide stability to the ground. To accomplish this task, scoop some powder into the hand and slowly and carefully sift the powder over the impression until a thin layer is covering the impression. This may take several attempts until the entire surface is “dusted”. After the surface is prepared, carefully pour the cast.

#### 5. Safety Considerations

- 5.1 The use of chemicals will be in accordance with the manufacturer’s instructions and Safety Data Sheets.
- 5.2 Wear suitable protective clothing such as gloves.

#### 6. References

- 6.1 SWGTREAD (n.d.). *Guide for Casting Footwear and Tire Impression Evidence* (03/2007). Nist.gov. Retrieved January 21, 2023, from [https://www.nist.gov/system/files/documents/2016/10/26/swgtread\\_11\\_guide\\_for\\_casting\\_footwear\\_and\\_tire\\_impression\\_evidence\\_200703.pdf](https://www.nist.gov/system/files/documents/2016/10/26/swgtread_11_guide_for_casting_footwear_and_tire_impression_evidence_200703.pdf)

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**Document Revision History**

Revision Date	Prepared By	Revision
8/3/2024	B. Fail	Updated materials and references.
1/26/2024	B. Fail	Updated materials and references. Numbered chapters of Crime Scene Science Technical Manual, Header and Revision History updated to new format.
3/22/2024	B. Fail	Removed “above” from section 3.1
10/30/2024	A. Abernethy	Document revised to reflect the agency name change from Raleigh/Wake City-County Bureau of Identification to Wake County Bureau of Forensic Services, effective December 1, 2024. No change to procedure content.