	<p style="text-align: center;"><b><i>Latent Procedure</i></b></p> <p><b>Pitt County Sheriff's Office Forensics Services Unit</b>  <i>Issued by Technical Leader</i></p>	<p><b>Effective Date:</b>  2018/04/01</p>	<p><b>Ver.:</b>  <b>2</b></p>
<p><b>Procedure for Zinc Chloride-HFE-7100</b></p>			<p><b>Page #:</b>  <b>1 of 5</b></p>

### Technical Procedure for Zinc Chloride-HFE-7100

**1.0 Purpose** - This procedure outlines how to make zinc chloride-HFE-7100 solution and apply it to items of evidence.

**2.0 Scope** - This procedure applies to porous items of evidence that are to be examined for the presence of latent prints. Zinc chloride-HFE-7100 is applied after processing an item with ninhydrin or a ninhydrin analog. Zinc chloride-HFE-7100 causes the latent prints to fluoresce under an alternate light source. HFE-7100 is an environmentally safe solvent that is fast drying and generally will not cause inks to run.

**3.0 Definitions – (ALS) Alternate light source:** Any equipment used to produce light at various wavelengths to enhance or visualize potential items of evidence. ALS equipment readily available in the Latent Evidence Section includes, but is not limited to, the CrimeScope, Mini Blue Maxx, Short and Long Wave lamps and Handscope Xenon (spex) ALS.

**4.0 Equipment, Materials and Reagents:** (Alternatively pre-mixed solutions may be purchased from a commercial forensic supplier)


#### 4.1 Equipment and Materials

- Laboratory coat and gloves
- Face shield visor and/or safety goggles
- Magnetic stirrer, magnetic follower, and magnetic retriever
- Glass beakers
- Graduated cylinders
- Dark, shatter-proof container
- Forceps
- Fume hood
- Glass tray, paint brush, or aerosol sprayer (for application)
- Camera/scanner
- Laser and/or alternate light source with orange filter and goggles
- Dust or mist respirator (for application outside of fume hood)
- Image processing systems

#### 4.2 Reagents

- Zinc chloride (6 g)
- Ethyl alcohol (ethanol) (50 ml)
- Glacial acetic acid (10 ml)
- 2-propanol (10 ml)
- HFE-7100 (1-methoxynonafluorobutane) (200 ml)

#### 5.0 Procedure

	<p align="center"><b><i>Latent Procedure</i></b></p> <p><b>Pitt County Sheriff's Office Forensics Services Unit</b>  <i>Issued by Technical Leader</i></p>	<p><b>Effective Date:</b>  2018/04/01</p>	<p><b>Ver.:</b>  <b>2</b></p>
<p><b>Procedure for Zinc Chloride-HFE-7100</b></p>			<p><b>Page #:</b>  <b>2 of 5</b></p>

## 5.1 Chemical Preparation

- 5.1.1 Place fifty (50) ml of ethanol into a 400 mL glass beaker with a magnetic follower.
- 5.1.2 Add ten (10) ml of 2-propanol to the solution and continue to stir.
- 5.1.3 Add ten (10) ml glacial acetic acid to the solution and continue to stir.
- 5.1.4 Add six (6) g of zinc chloride to the solution and stir until it is completely dissolved.
- 5.1.5 Add two-hundred (200) mL of HFE-7100 to the solution and continue to stir until a colorless solution is produced, approximately five (5) minutes.
- 5.1.6 Remove the magnetic follower from the beaker and pour the solution into a dark, shatter-proof container.


## 5.2 Processing Procedures

### 5.2.1 Chemical Application

- 5.2.1.1 Examiner/technician shall produce a self-made test print to be processed concurrently with items of evidence. (See section technical procedure for Ensuring Quality Control.)
- 5.2.1.2 **Dipping Method** – Place the working solution into a tray that will allow the item to be submerged completely. Submerge the item for five (5) to ten (10) seconds.
- 5.2.1.3 **Brush Method** – Dip the brush into the working solution and brush directly onto the item.
- 5.2.1.4 **Spray Method** – Spray the item with the working solution to saturate the item completely.
- 5.2.1.5 Allow the item to dry completely prior to proceeding. Purple marks from the use of ninhydrin or one of the ninhydrin analogs will change to an orange/red color when the zinc chloride reaction is complete.
- 5.2.2 View the item under the laser or alternate light source using the orange goggles and filters. Preferred wavelengths range from 450 nm to 515 nm.
- 5.2.3 **Preservation of Developed Impressions** – Preserve the developed impressions through photography (see photographic equipment procedures) and/or by electronic recording (see section technical procedure for Image Processing and Recording of All Analytical Data).

## 5.3 Standards and Controls – N/A

***All copies of this document are uncontrolled when printed.***

	<p align="center"><b><i>Latent Procedure</i></b></p> <p><b>Pitt County Sheriff's Office Forensics Services Unit</b>  <i>Issued by Technical Leader</i></p>	<p><b>Effective Date:</b> 2018/04/01</p>	<p><b>Ver.:</b> <b>2</b></p>
<p><b>Procedure for Zinc Chloride-HFE-7100</b></p>			<p><b>Page #:</b> <b>3 of 5</b></p>

**5.4 Calibration** – N/A

**5.5 Sampling** – N/A

**5.6 Calculations** – N/A

**5.7 Uncertainty of Measurement** – N/A

## **6.0 Limitations**

**6.1** Latent prints treated with zinc chloride will fluoresce yellow under an alternate light source. Background fluorescence shall be considered when using this chemical.

**6.2** Zinc chloride solutions shall be stored in dark, shatter-proof containers until needed.

**6.3 Shelf Life**

**6.3.1** Zinc Chloride-HFE-7100 Solution - six (6) months.

## **7.0 Safety**

**7.1** The process shall always be performed in a fume hood as the fumes may cause some irritation when in contact with the eyes or skin and may be harmful if inhaled or ingested.

**7.2** Protective goggles, gloves and aprons shall be worn during processing.

**7.3** Glacial acetic acid and ethyl alcohol are extremely flammable and shall be handled in accordance with Safety Manual.


## **8.0 References**

Herod, D.W., and E.R. Menzel. "Laser Detection of Latent Fingerprints: Ninhydrin Followed by Zinc Chloride." *Journal of Forensic Science*. Vol. 27, 3: 513-518 (July 1982).

Kent, T., ed. *Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processing for the Development of Latent Fingerprints*. Police Scientific Development Branch, London (July 1992).

Lee, H.C. "Methods of Latent Print Development." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 15–24.

Lennard, C.J., and P.A. Margot. "Sequencing of Reagents for the Improved Visualization of Latent Fingerprints." *Proceedings of the International Forensic Symposium on Latent Prints*. (July 1987): 141-142.

	<p style="text-align: center;"><b><i>Latent Procedure</i></b></p> <p><b>Pitt County Sheriff's Office Forensics Services Unit</b>  <i>Issued by Technical Leader</i></p>	<p><b>Effective Date:</b>  2018/04/01</p>	<p><b>Ver.:</b>  <b>2</b></p>
<p><b>Procedure for Zinc Chloride-HFE-7100</b></p>			<p><b>Page #:</b>  <b>4 of 5</b></p>

*Manual of Fingerprint Development Techniques: A Guide to the Selection and Use of Processes for the Development of Latent Fingerprints.* Scientific Research and Development Branch, London (1986).

Stoilovic, M., et al. "Evaluation of a 1,2-Indanedione Formulation Containing Zinc Chloride for Improved Fingerprint Detection on Paper." *Journal of Forensic Identification*. Vol. 57, 1: 4–18 (2007).

Trozzi, T.A., R.L. Schwartz and M.L. Hollars. *Processing Guide for Developing Latent Prints*. (2000): 1-64.

US Department of Justice. *Chemical Formulas and Processing Guide for Developing Latent Prints*. FBI Laboratory Division, Latent Fingerprint Section (1994).

**9.0 Records – N/A**

**10.0 Attachments – N/A**



## ***Latent Procedure***

**Pitt County Sheriff's Office Forensics Services Unit**  
*Issued by Technical Leader*

Effective Date:

2018/04/01

Ver.:

**2**

**Procedure for Zinc Chloride-HFE-7100**

Page #:

**5 of 5**

### **REVISION HISTORY**

<b>CURRENT VERSION</b>	<b>EFFECTIVE DATE</b>	<b>SUMMARY OF CHANGES</b>
1	2016/07/01	Original transferred into DM
2	2018/04/01	Change Revision history table , changed issue date to effective date , changed rev# to Ver# and added statement allowing purchase of premixed. Add Safety Manual reference under section 7 safety.

***All copies of this document are uncontrolled when printed.***