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Standard Guide for Postmortem Facial Image Capture[1]

This standard is issued under the fixed designation E3148; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 The purpose of this document is to provide guidelines for capturing postmortem facial images of human remains in controlled (for example, morgue) and semi-controlled (for example, field) settings to facilitate automated facial recognition (FR) searches or manual facial comparisons that could contribute to forensic investigations.

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses are mathematical conversions to inch-pound units that are provided for information only and are not considered standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E2916 Terminology for Digital and Multimedia Evidence Examination

2.2 *Other Standards:*

ANSI/NIST-ITL-1-2011 Data Format for the Interchange of Fingerprint, Facial & Other Biometric Information[3]

FISWG "Capture and Equipment Assessment for Facial Recognition Systems," Revision 1.0 (2011.05.05)[4]

ISO/IEC 19794-5 Biometric data interchange formats—Part 5: Face image data[5]

NAME Forensic Autopsy Performance Standards[6]

3. Terminology

3.1 *Definitions:*

3.1.1 For digital and multimedia evidence examination terms, see Terminology E2916.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *facial image capture, n—in facial identification*, the process of collecting a biometric sample from an individual by means of a sensor.

3.3 *Acronyms:*

3.3.1 *CODIS*—Combined DNA Index System

3.3.2 *DNA*—Deoxyribonucleic acid

3.3.3 *FBI*—Federal Bureau of Investigation

3.3.4 *FR*—Facial recognition

3.3.5 *ME/C*—Medical examiner or coroner

3.3.6 *SMT*—Scars, marks, and tattoos

4. Summary of Guide

4.1 FR searches can assist in generating potential candidates and investigative leads for the identification of unidentified remains or connecting decedents to image galleries but, for the FR systems to operate properly, the images submitted must meet certain criteria. This guide provides an overview of the optimal processes and techniques for the capture of postmortem facial images of human remains to maximize their utility in automated FR searches and manual facial image comparisons.

4.2 This guide is intended to supplement forensic autopsy performance standards that medical examiners and coroners

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, http://www.nist.gov.

[4] Available from Facial Identification Scientific Working Group, https://fiswg.org.

[5] Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, http://www.iso.org.

[6] Available from National Association of Medical Examiners (NAME), 362 Bristol Road, Walnut Shade, MO 65771, http://www.thename.org.

(ME/C) must meet for accreditation (for example, NAME Forensic Autopsy Performance Standards or internal agency policies, or both) for proper postmortem examination procedures in the United States.

5. Significance and Use

5.1 The protocols that exist for photographing a decedent's face at autopsy for identification purposes (for example, NAME Forensic Autopsy Performance Standards) do not always result in the capture of facial images that can be used for automated FR searches or manual facial comparisons. It is not always feasible to collect fingerprints from decedents (for example, in disaster situations or when a decedent is in a state of advanced decomposition), and radiograph (medical or dental) comparison requires at least a presumptive identification of remains so appropriate comparative antemortem radiographs can be obtained to confirm the identification. If the decedent's DNA or appropriate family reference DNA profiles are not already stored within a DNA repository (for example, the FBI's CODIS), a DNA association will also require the presumptive identification of a decedent to ensure that appropriate samples are collected for comparison/association.

5.2 It is advisable to follow the guidelines presented in this guide even when not all facial components are present as even incomplete facial images can assist automated FR and manual facial comparison processes, especially through more accurate recording of minute facial details.

5.3 For the purpose of facial image capture, there are various perimortem or postmortem conditions or both that can degrade the usability of any facial images captured:

5.3.1 Presence of trauma (for example, entry/exit wounds, lacerations, bruising, missing components, etc.),

5.3.2 Obscuring matter (for example, blood, fluids, dirt, debris, hair, clothing accessories, and so forth), and

5.3.3 Decomposition and other postmortem changes (for example, bloating, mummification, skeletonization, evidence of insect or scavenger activity, etc.).

5.4 Before any attempt is made to clean or alter the decedent for facial image capture, nationally accepted standards or agency protocols or both should be followed so the alterations do not affect forensic evidence collection, documentation, or chain of custody.

6. Image Capture

6.1 *Facial Image Capture in a Controlled Environment:*

6.1.1 This section addresses the image capture process and techniques as they relate to a controlled environment, such as a morgue, where all or most variables and decisions can be controlled by the photographer, including equipment, the photographic environment (for example, camera position, lighting, distance, background, and resolution), and the pose and positioning of the decedent.

6.1.2 ME/C and morgue personnel (for example, investigators, autopsy technicians, residents, volunteers, and so forth) should take the following factors into consideration when making decisions for the capture of postmortem facial images, especially when the images are intended to be used for automated FR searches or manual facial comparisons or both.

6.1.3 Recommendations are presented under the assumption that all proper medicolegal investigation procedures have been followed and the body can be prepared and repositioned as needed.

NOTE 1—Facial recognition systems are dependent on facial features including the eye area and pupils. Withdrawing vitreous fluid can alter the eye shape. Therefore, the extraction of vitreous fluid can have a negative effect on the usability of the facial imagery. If possible, the extraction of vitreous fluid from the eyes should be delayed until after all facial imagery is captured.

6.1.4 More information can be found at:

6.1.4.1 For forensic image capture, please refer to Annex E of ANSI/NIST-ITL-1-2011, and

6.1.4.2 For controlled image capture guidance, please refer to FISWG's "Capture and Equipment Assessment for Facial Recognition Systems."

6.2 *Controlled Acquisition:*

6.2.1 This section outlines the optimal environmental conditions for capturing postmortem facial images.

6.2.2 The imaging conditions listed in this section are in the context of an ideal controlled environment. While it's not be possible in all ME/C offices to conform exactly to the specifications listed, especially with regard to the camera position, it is recommended that all attempts be made to approximate these conditions to the best of the photographer's ability. The photographer should be aware that with increasing discrepancies between the ideal environment and the actual image capture environment there will be a decrease in the usable quality of the facial image for FR searching and image comparison.

6.2.3 Fig. 1 provides an example of the photographic environment in a ME/C office with positioning of the camera directly over the decedent's face and a camera-to-subject distance appropriate for minimizing distortion (for example, the "fishbowl effect" resulting from capturing a facial image too close to the face). When possible, it is recommended to use a fixed camera mount to provide stability and reduce the potential for distortion. At a minimum, if a decedent is on a gurney, it is recommended to use a stepladder or other means for elevating the photographer to ensure proper camera-to-subject distance. Standing beside the gurney and reaching over the decedent's face is not recommended.

6.2.4 The following suggestions for the image capture environment should be considered:

6.2.4.1 *Decedent Position*—The decedent should be positioned and suitable equipment should be available to maximize the quality of the imagery. Optimal position of the body for facial image capture is to have the head in a vertical position with the jaw closed to allow the face morphology to be as close to the antemortem reference images with which it will be compared. This will likely require the body to be positioned so that the decedent is seated or standing.

6.2.4.2 *Lighting*—Lighting should uniformly illuminate the decedent. Hot spots, reflections, and shadows on the face and in the background should be minimized.

6.2.4.3 *Camera Position:*

(1) The camera-to-subject distance should be great enough to minimize distortion of the face in the resulting image.

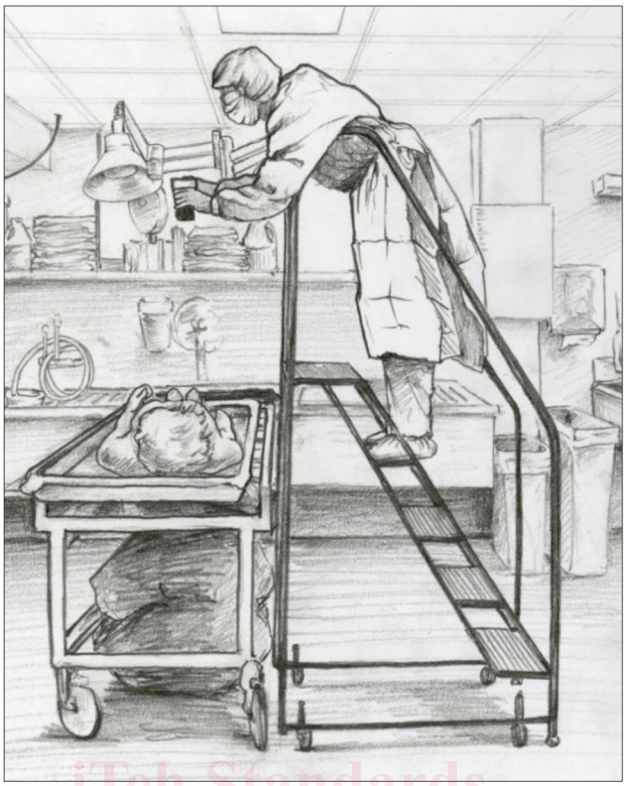

FIG. 1 Photographic Environment in ME Office

Camera placement that is too close to the decedent can result in an apparent change in facial proportions in which the ears are no longer visible and the mid-face region appears to be artificially wide and forward projecting.

(2) The camera should be directed to the front of the face with the lens in line with the nose and should ideally be positioned 1.2 m to 2.5 m (4 ft to 8 ft) from the decedent. The width of the face should fill approximately 50 % of the horizontal image width.

6.2.4.4 *Background*—The background should be a uniform, smooth, flat, nonreflective surface with a neutral shade creating a contrast between the facial features of the decedent and background.

6.3 *Decedent Body Preparation*—This section outlines the optimal decedent positioning and appearance for capturing a postmortem facial image. While the information pertains mainly to frontal images, it should also apply to other captured images (for example, right/left profile and angled images).

6.3.1 *Head Position for Frontal Images:*

6.3.1.1 *Supine Position:*

(1) The head should be adjusted to face directly toward the camera with no more than ±5° variance from frontal in pitch (head tilted up or down), roll (head tilted side-to-side), yaw (head turned side to side), or any combination thereof. For example, the position of the head and face should appear as they would in a driver's license or passport photo. For more information on facial position for FR appropriate image capture, see ISO/IEC 19794-5 on face image data.

(2) Visual cues that can assist with determining "forward orientation" are:

(a) Both eyes are level on an imaginary horizontal line (zero roll angle);

(b) Both ears are equally visible if unobstructed by hair and nose is forward (zero yaw angle); and

(c) The chin is neither elevated nor dropped (zero pitch angle). In the postmortem setting, a body block can be used under the back of the neck to adjust the angle of the head and face (see Fig. 2).

(3) In Fig. 2, the image on the left shows the decedent's head position before the insertion of a body block. The head has a noticeable upward pitch (the head is tilted back). The image on the right shows the change in head position with the insertion of a body block beneath the head/neck. The decedent's face is now facing directly toward the camera.

6.3.2 *Sitting Position:*

6.3.2.1 1 In a sitting position, the forces of gravity will act in such a way that the soft tissues of the face are distributed in a more lifelike way, as opposed to falling backward and causing the appearance of increased thickness surrounding the posterior aspects of the cheeks and jaw and decreased thickness in the lips and anterior aspects of the cheeks and mouth areas. In this position, the decedent's mandible will likely need to be elevated (for example, by using a gloved finger to hold it in place) so the mouth can be closed. When the decedent is seated, the camera should be affixed to a tripod or otherwise stabilized to ensure a camera angle that is directly perpendicular to the subject's face.

6.3.2.2 As with the supine position, the decedent's head should be adjusted to face directly toward the camera with no more than ±5° variance from frontal in pitch (head tilted up or

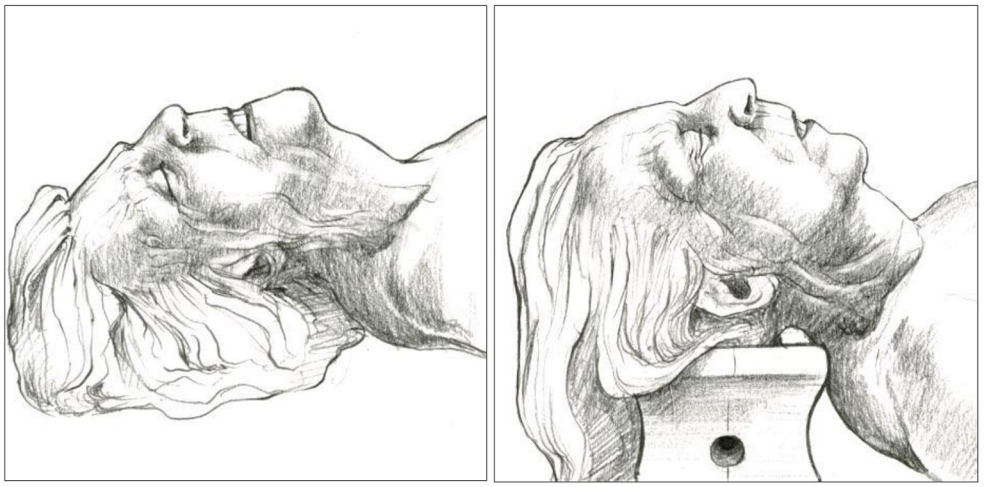

FIG. 2 Placement of the Body Block to Adjust Head Position for Capturing Frontal Image from Above

down), roll (head tilted side-to-side), and/or yaw (head turned side-to-side). For example, the position of the head and face should appear as they would in a driver's license or passport photo. For more information on facial position for FR appropriate image capture, see ISO/IEC 19794-5 on face image data.

6.3.2.3 Visual cues that can assist with determining "forward orientation" are:

(1) Both eyes are level on an imaginary horizontal line (zero roll angle);

(2) Both ears are equally visible if unobstructed by hair and nose is forward (zero yaw angle); and

(3) The chin is neither elevated nor dropped (zero pitch angle). In the postmortem setting, a body block can be used under the back of the neck to adjust the angle of the head and face (see).

6.3.3 *Head Position for Non-Frontal Images:*

6.3.3.1 It is highly recommended to capture non-frontal images for each side of the face at a 90° angle (profile image) and a 45° angle (three-quarter profile image). If non-frontal images or angled images or both are captured for facial comparison purposes, they can be acquired by adjusting the camera position. Turning the head is not preferable but acceptable.

6.3.3.2 More information for clarification on non-frontal image capture can be found in Annex E, of ANSI/NIST-ITL-1-2011.

6.3.4 *Head Coverings and Accessories*—Any item that obscures the hairline, chin/jawline, and ears (for example, hats, scarves, jewelry, etc.) should be removed so the full face and ears are displayed. If the decedent has facial piercings and the piercing jewelry is available, at least one frontal image should be captured with the jewelry in place and one image after the jewelry has been removed.

6.3.5 *Shoulder Position*—The top of the shoulders and neck should be included in the image frame.

6.4 *Decedent Face Preparation:*

6.4.1 This section outlines the optimal facial conditions for a postmortem image for FR and comparison purposes. Obscuring matter (for example, blood, particles, dirt, and so forth) or hair on the face, large open wounds, closed eyes, and eyeglasses can adversely affect FR searches and facial comparisons, limiting the usefulness of the images.

6.4.2 If a scale (ruler) is used, efforts should be made to place the ruler in the same plane as the face and it should not cover or obstruct any portion of the head or face.

6.4.3 There are situations in which multiple images at each pose angle can be helpful in improving the usable quality of the postmortem facial imagery for facial comparison.

6.4.4 For all situations, facial comparison requires that the face be fully exposed and in a natural position. For forensic reasons, it is advisable to take images before and after any alterations to increase the usefulness of the images.

6.4.5 *Obscuring Matter:*

6.4.5.1 The face should be cleaned of blood (or other fluids), dirt, debris, makeup, and other foreign matter or obstructions.

6.4.5.2 In Fig. 3, the image on the left shows an obstruction over the face; the image on the right shows the obstruction removed.

6.4.6 *Hair:*

6.4.6.1 When capturing both frontal and profile images, the decedent's hair shall be moved to reveal the full face and ears. If excessive facial hair obscures facial components, then it should be repositioned to approximate a natural condition and the line of growth should be made visible.

6.4.6.2 In Fig. 4, the image on the left shows hair covering portions of the face and ears; the image on the right shows the hair moved away from important facial components.

6.4.7 *Wounds or Fragments:*

6.4.7.1 In Fig. 5, the image on the left shows injuries to the right side of the decedent's face; the image on the right shows an attempt was made to minimize the appearance of the facial trauma. In this illustration, a hand is shown holding the mouth closed.

6.4.7.2 Introduction of additional potentially obscuring objects, such as the hand in this image, should be avoided when possible.