



# Best Practice Manual: Footwear Impression Examination

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68

69 **1. AIMS**

70 This Best Practice Manual (BPM) aims to provide a framework for procedures, quality  
71 principles, training processes and approaches to the forensic examination of footwear  
72 impressions. This BPM can be used by member laboratories of ENFSI and other forensic  
73 science laboratories to establish and maintain working practices that will deliver reliable  
74 results, maximize the quality of the information obtained and produce robust evidence. The  
75 use of a consistent methodology and the production of more comparable results will facilitate  
76 interchange of data between laboratories.

77 The term BPM is used to reflect the scientifically accepted practices at the time of writing. The  
78 term BPM does not imply that the practices laid out in this manual are the only good practices  
79 used in the field of footwear impression evidence. In this series of ENFSI Practice Manuals,  
80 the term BPM has been maintained for reasons of continuity and recognition.

81 **2. SCOPE**

82 This BPM is aimed at experts in the field and assumes prior knowledge in the discipline. It is  
83 not a standard operating procedure and addresses the requirements of the judicial systems in  
84 general terms only. It is focussed on the processing of footwear impression evidence, both in  
85 the field and on evidence submitted to the lab. As well as the comparison of footwear  
86 impressions recovered from crime scenes with suspect footwear and aspects of footwear  
87 intelligence.

88 The main areas that this manual covers are listed below:

89 • The location, enhancement and recovery of footwear impressions from crime scenes, to  
90 include aspects such as:

- 91 • Lighting
- 92 • Photography/Imaging
- 93 • Lifting techniques
- 94 • Casting
- 95 • Powdering
- 96 • Chemical enhancement

97 • The principles and processes involved in the comparison of crime scene impressions to  
98 suspect footwear, including:

- 99 • Methods used for the production of test impressions
- 100 • Comparison
- 101 • Evaluation of results
- 102 • Verification
- 103 • Footwear intelligence
- 104 • Quality assurance and quality control procedures

105 The manual addresses best practices relating to the forensic examination of footwear  
106 impression evidence. It looks at the total process from scene to lab and provides advice and

107 guidance that the examiner should consider. The law enforcement agency and legal system in  
108 which a forensic laboratory is working is also a factor in determining what processes will be  
109 expected and allowed.

### 110 3. TERMS AND DEFINITIONS

**Impression:** The term *impression* is used to describe the mark left by the (out)sole of an item of footwear. Without any further specifications, it refers to a mark whose origin is in question. It also refers to as an *unknown crime scene mark* or simply a *crime scene mark* in this document.

**Test impression:** This term refers to impressions created from a known item of footwear, generally for the purpose of performing a comparison with an unknown crime scene mark.

**Manufactured characteristics:** Characteristics of a sole that originate from the manufacturing process and that are generally shared by a group of shoes.

**Acquired characteristics:** Characteristics of a sole that form during use of the shoe over time (all kinds of wear) or during a single event (like cuts).

111 For the purposes of this Best Practice Manual (BPM), the relevant terms and definitions given  
112 in ENFSI documents, the ILAC G19 “Modules in Forensic Science Process”, as in standards  
113 like ISO 9000, ISO 17000 and 17020 apply.

### 114 4. RESOURCES

#### 115 4.1 Personnel

116 People are likely to be the most important resource in any forensic application, and for staff to  
117 work effectively and efficiently, everybody involved in the process must understand the nature  
118 of the tasks and the competencies required to perform them. The information provided in this  
119 section defines the key responsibilities, and competencies required by personnel involved in  
120 the forensic examination of footwear impressions. Due to variations in national rules and  
121 regulations, and the structure and size of forensic science organisations, absolute  
122 standardisation of a footwear examiner’s role and responsibilities cannot be achieved.

#### 123 4.1.1 Roles and Responsibilities

124 The key responsibilities include:

- 125 • Scene examination
- 126 • Recovery of evidence
- 127 • Footwear examination and comparison
- 128 • Footwear intelligence (e.g. brand/model determination of a scene impression)
- 129 • Interpretation and evaluation of findings
- 130 • Preparation of reports
- 131 • Peer review and verification of findings

- 132
- Court testimony

133        4.1.2    Knowledge and Competencies

134 Organisations should have written competence requirements for each role, with a documented  
135 training program and a process for assessing that trainees have achieved the required level of  
136 competence.

137 Depending on individual responsibilities, key competencies include:

- 138
- Familiarity with relevant health and safety issues
  - 139 • Familiarity with the organisation's quality management system and procedures
  - 140 • Knowledge of general manufacturing processes regarding footwear
  - 141 • Knowledge of the processes leading to the development of acquired characteristics
  - 142     on shoe soles and to the formation of impressions.
  - 143 • Knowledge of techniques for evidence detection, collection and documentation
  - 144     (including photography)
  - 145 • Practical skills to operate required equipment safely and reliably, in accordance with
  - 146     the laboratory's protocols
  - 147 • Performing brand/model determinations
  - 148 • Evaluation of comparisons
  - 149 • Awareness of other forms of evidence, e.g., DNA, glass
  - 150 • Awareness of the potential for bias and means to limit its influence

151 Personnel responsible for reporting should have the following additional competencies:

- 152
- Performing the examination and comparison of footwear to scene impressions and
  - 153     interpretation of the results
  - 154 • Knowledge of the requirements of the criminal justice system in which they work
  - 155 • Familiarity with the presentation of evidence, in both written and oral forms
  - 156 • Familiarity with courtroom procedures and etiquette

157 All personnel involved in the examination of footwear impressions should also be required to  
158 demonstrate that they maintain their proficiency at regular intervals, e.g., by participating in  
159 annual proficiency tests (PT) and/or collaborative exercises (CE) (see Section 7.1).

160        4.2    Equipment

161 Equipment for the forensic examination of footwear impressions should be shown to operate  
162 properly prior to use in casework. The organisation should have written procedures for the  
163 handling, use, calibration and maintenance of equipment that is required for the correct  
164 performance of laboratory activities and that can influence the results.

165 Examples of equipment:

- 166
- Camera and associated software
  - 167 • Light sources
  - 168 • Lightbox, computer with image comparison software or other equipment for physically
  - 169     and/or digitally comparing footwear and test impressions

- 170 • Scanner and associated software
- 171 • Measuring tools
- 172 • Footwear databases for brand/model determinations
- 173 • Different materials for producing test impressions, e.g. oil, ink, powder, Mikrotrack,
- 174 Biofoam
- 175 • Stereomicroscope with suitable lighting for examination of footwear outsoles

#### 176 4.3 Reference Materials

177 Reference materials are used for purposes such as quality control, calibration and validation  
178 of methods. Where possible, certified values of reference materials should be provided by a  
179 producer with stated metrological traceability to the International System of Units (SI), such as  
180 a producer fulfilling the requirements of ISO 17034.

181 Reference materials may be used for qualitative controls, e.g. to verify the fitness of use of  
182 chemical detection/enhancement reagents. Reference materials may also be used to check  
183 the accuracy of measuring tools, e.g. rulers.

#### 184 4.4 Facilities & Environmental Conditions

185 The organisation should have written procedures that address security and access to evidence  
186 examination and storage areas. Laboratory space used for the examinations of items should  
187 be designed for safe, efficient, and effective work, with the provision of adequate lighting. The  
188 organisation should also consider other footwear impression related activities that may be  
189 applicable, such as the recovery of trace evidence or the handling of bio-hazardous items.

190 The room/studio, used for photographing footwear impressions should be suitable for different  
191 types of evidence to be examined (e.g. black gelatine lifters, pieces of glass etc.). It is  
192 preferable for the room/studio to have dark dull-coloured walls to avoid reflections from shiny  
193 surfaces. Several chemical enhancement techniques can be used. An example being the  
194 treatment of footwear impressions made in blood. Good health and safety practices must be  
195 followed, which usually means the use of a fume hood and appropriate personnel protective  
196 equipment when dealing with chemicals.

197 Depending on the method used for making test impressions, it is also important to follow good  
198 health and safety practices. For example, when using powders, it is recommended that there  
199 is good ventilation in the room or the dusting is undertaken in a fume/downdraft hood.

#### 200 4.5 Materials and Reagents

201 Materials used for producing test impressions and chemical detection/enhancement reagents  
202 should be of a suitable quality for its intended use and purpose, risk assessed, labelled and  
203 tested prior to use.

204 **5. METHODS**

205 5.1 Handling Impression Evidence at Scenes and in the Laboratory

206 5.1.1 Introduction

207 This section describes the recommended approaches to handle and protect impressions at the  
208 scene and on evidence. To include searching, detection, documentation, recovery,  
209 enhancement and preservation. For a more detailed description on the described techniques,  
210 refer to [1] or other accepted literature.

211 The methods described may not cover all aspects one may encounter when dealing with  
212 impression evidence. But all relevant available information about the incident should be  
213 obtained before starting any examinations. As the exams proceed, further information gathered  
214 through research, consultation, etc. may be required in order to maximize collection efforts and  
215 consider all possible hypotheses. The examiner should always proceed from non-destructive  
216 to potentially destructive techniques and assess the following included but not limited to:

- 217 • Surfaces involved
- 218 • Material comprising the impression
- 219 • Other evidence types on footwear related evidence such as DNA, trace materials and  
220 bloodstain patterns
- 221 • Whether or not a reconstruction of how an offender moved around a scene will be  
222 required
- 223 • Sequencing of techniques

224 5.1.2 Approaching the Scene

225 **Crime Scene Protection:** All scenes containing potential footwear impressions should be  
226 protected as soon as possible to prevent the loss, damage or contamination post-incident. This  
227 can be done by limiting personnel entering the scene, wearing of disposable overshoes, the  
228 establishment of screened paths and/or the use of stepping plates.

229 At outdoor scenes, the following can be used to protect impressions;

- 230 • Placing a box or another object over an impression in case of rain/snow, etc.
- 231 • Shielding the impression from the sun and/or the wind using a tent
- 232 • Applying a fixative in the case of blood impressions which may be damaged by rain
- 233 • Removing objects which may contain impressions

234 5.1.3 Search Techniques (Scene and Lab)

235 A systematic search should be conducted in order to locate and better observe visible and  
236 latent (possibly higher in quality) impressions. Special focus should be placed on likely areas  
237 in which an offender could have walked such as the point of entry into a scene.

238 A white light source held obliquely is often the first step in this process. Alternate wavelengths  
239 with appropriate filters such as infrared and ultraviolet as well as co-axial lighting may also be  
240 used. Other commonly used techniques are electrostatic lifting, powdering and chemical  
241 enhancement. All of which will be described more below.

242 Any items of evidence or flooring bearing an impression (visible or possibly latent) and can be  
243 removed without damaging the impression should be documented (see 5.1.5) and transported  
244 to the laboratory and not processed in the field.

#### 245 5.1.4 Sampling of Impressions at the Scene

246 Many impressions may be visualized and developed at the scene. These include not only  
247 impressions from the suspect/victim but also those from first responders, innocent bystanders  
248 and family members. Therefore, it may be necessary to make decisions on what will and will  
249 not be considered evidentially significant.

250 For example, using the outsole design only, impressions can be compared to the footwear  
251 from first responders still present at the scene to eliminate those not pertinent. Footwear  
252 exemplars from these individuals (and others) can be taken using techniques such as  
253 photography, inkless kits and gelatine lifts.

254 Any remaining impressions can be examined to determine their suitability for subsequent  
255 brand/model determinations and comparisons based on the clarity and quantity of detail  
256 present and if relevant taking into account the location(s) within the scene and relation to other  
257 evidence types such as bloodstain patterns. All different outsole designs should be processed,  
258 preferably from both the left and right shoes if available.

#### 259 5.1.5 Documentation (Scene and Lab)

260 Examination quality photographs of sufficient resolution must be taken if subsequent  
261 comparisons will be performed as well as before and after each processing technique. This  
262 includes:

- 263 • Filling the frame with the sensor on the back of the camera parallel to the impression
- 264 • Use of a tripod, L-shaped scale, a fixed focal length lens with minimal distortion  
265 (typically 50 or 60mm) and impression number/letter
- 266 • Side lighting

267  
268 Alternatives to photography (such as 3D scanning of impressions) may be employed,  
269 provided that both the materials used and the application of the collected data within  
270 the comparison process have been properly validated.

#### 271 5.1.6 Processing and Recovery

272 **Casting:** Casting is primarily used to recover the detail within and physical size of 3D  
273 impressions in mud, sand, snow, etc. Casting can also be used to lift chemically enhanced  
274 impressions in blood and powdered impressions on textured surfaces. Most commonly a  
275 dental stone material is used however others such as polyvinylsiloxane, plaster and sulfur  
276 cement can be tried depending on the type of impression (e.g. in snow).

277 Before using any casting material, one should refer to manufacturer recommendations on  
278 usage. Given that the environmental conditions may greatly affect the quality of the resulting  
279 cast, it is recommended to test the material on site prior to using on the evidential impression.

280 But the general technique for dental stone is as follows:

- 281 • The correct manufacturers dental stone to water ratio is thoroughly mixed
- 282 • Pour the mixture to the side letting it flow into the impression
- 283 • Lift the cast after drying (about an hour) and label the back of the cast with the
- 284 impression number/letter
- 285 • After the cast has fully cured (about 48 hours), secure in a breathable container

286 For snow impressions, it may be necessary to coat the impression prior to casting with a  
287 material such as grey primer or wax. Any dirt adhering to the cast should be preserved as it  
288 may be evidentially probative.

289 **Electrostatic (ES) Lifting:** ES lifting is used to recover/detect dry residue impressions, both  
290 visible and latent, from non-porous (e.g. laminate) and porous (e.g. carpet) surfaces. This  
291 technique can also be used to remove surface debris from an impression prior to being lifted  
292 with a gel. The recovered light colored impressions can be very high in quality and contrast  
293 well on the black surface of the lifting film.

294 ES lifting is particularly useful for searching areas for latent impressions prior to another  
295 technique such as powdering since it is considered non-destructive to subsequent processing.  
296 Here, the charged film is rolled over the surface versus using a piece of film when attempting  
297 to recover a single visible impression. Refer to the manufacturer's instructions on how to use  
298 the various kinds of ES lifters. Make sure to label any large rolled out sheets prior to lifting to  
299 denote the orientation.

300 The impressions are quite fragile therefore care must be taken when packaging. A single piece  
301 of film can be taped down impression side up into a non-shedding folder or box. A larger sheet  
302 that was rolled out can be rolled back up and placed into a rigid container (e.g. a cardboard  
303 tube). Examination quality photographs using a high intensity white light can be taken of any  
304 impressions prior to packaging. Lifts should then be submitted for photography as soon as  
305 possible so that the impressions can be documented in a more controlled environment.

306 **Powder:** Fingerprint powder may be used to search for and enhance impressions on smooth  
307 and semi-smooth surfaces, made with a dry or wet item of footwear. Once powdered, the  
308 impression can be recovered with a gelatine lifter as described below. This method will destroy  
309 any residue impressions so must not be performed prior to electrostatic lifting. Powder (or other  
310 specific products for snow impressions) may be useful to enhance contrast of snow  
311 impressions for subsequent photography.

312 **Gelatine (Gel) Lifting:** Gelatine lifts can be used for the recovery of visible dry and wet origin  
313 impressions (after drying) from smooth and semi-smooth surfaces. Gels can also be used to  
314 lift powdered impressions onto a contrasting surface as well as some kinds of blood  
315 impressions which have been chemically enhanced. The general technique to apply a gel is  
316 as follows:

- 317 • Slowly remove the cover
- 318 • Gently roll out the gel over the impression making sure to maximize contact and
- 319 minimize air bubbles

- 320           • Leave the gel on the impression at minimum for several minutes before removing  
321           • Label the back of the gel with the impression number/letter

322 Store in a covered non-shedding container especially if the cover is not replaced. If the cover  
323 must be replaced, gently roll it back over the gel minimizing the amount of air bubbles trapped  
324 between the gel and the cover. Examination quality photographs using a high intensity white  
325 light should be taken of any impression post lifting especially if the cover is replaced. Lifts  
326 should then be submitted for photography as soon as possible so that the impressions can be  
327 documented in a more controlled environment.

328 **Chemical Enhancement:** Chemical techniques can be used both to search for latent  
329 impressions and as an enhancement tool to develop better contrast between the impression  
330 and the underlying substrate. In some cases, chemical techniques can be performed after ES  
331 lifting and powdering. If no detail useful for comparison will be removed, a small area of a blood  
332 impression should be swabbed pre-enhancement for any subsequent DNA testing.

333 Generally, reagents fall into three categories depending upon the material making up the  
334 impression, these being blood, environmental deposits and skin/sweat/sebum.

335 Blood reagents target either proteins (e.g. amido black, fuchsin acid) to stain impressions a  
336 darker color. Or target hemoglobin (e.g. luminol, leuco-crystal violet) whereby a colorless  
337 solution turns to a colored product upon contact with the impression.

338 Chemicals for environmental deposits react with compounds in the impression such as metal  
339 ions or respond to changes in pH. Examples are 8-hydroxyquinoline, bromophenol blue and  
340 ammonium thiocyanate.

341 Similar to the development of fingerprints, ninhydrin, DFO and indanedione target amino acids.  
342 These chemicals are particularly useful for the development of impressions on the inside of  
343 victims clothing due to blunt force trauma from mechanisms such as kicking, stomping or being  
344 run over by a vehicle.

## 345           5.2 Laboratory Examination

346 Evidence submitted to the laboratory must be prioritized by discipline (for example DNA traces  
347 before footwear) to minimize contamination and prevent loss of fragile materials while ensuring  
348 that all examinations can be performed (see Chapter 10). This may require communication  
349 with the contributor (e.g. prosecutor, investigative personnel, etc.) to understand the forensic  
350 questions to be addressed and what evidence types may be most probative to address any  
351 propositions and alternatives in a particular case.

352 In addition, for the examination of footwear evidence in particular, it is important to know the  
353 following (refer also to Section 9.2 for initial assessment):

- 354           • That all the items have been submitted for examination. This includes all images of  
355 impressions taken on scene, casts/lifts of these impressions and any original evidence  
356 such as a piece of flooring bearing an impression. Also, any footwear from suspects  
357 and victims as well as exemplars (e.g. from first responders).

- 358
- The date between incident and collection of known footwear has been recorded.

359 **Triaging Impressions in the Laboratory:** In some cases, there may be many multiple  
360 impressions, with sometimes more than one pattern, present in the submitted evidence. If the  
361 number of impressions to be examined is too onerous, the contributor should be consulted to  
362 see if all the examinations are necessary to address the questions in a case. It may be possible  
363 to narrow down the number of examined impressions by sampling based on the clarity and  
364 quantity of detail present.

365 **5.3 Test Impressions**

366 Test impressions may need to be made with any submitted footwear for comparison to the  
367 scene impressions. Normally, more than one impression is made per item of footwear using  
368 static (shoe is held or placed on a holder) and dynamic (wearing the shoe) methods. A  
369 validated process which reproduces the details of the outsole should be used. For example:

- 370
- Applying powder or ink to the outsole and then pressing it onto an adhesive film which  
371 is subsequently covered with clear acetate.
  - Using an inkless process with chemically treated pad and paper.
  - Using a material such as bio-foam for the reproduction of 3D impressions.
- 372
- 373

374 **5.4 Comparative examination**

375 **5.4.1 General Principles**

376 Footwear evidence is a comparative discipline where a scene impression is visually compared,  
377 through side by side and superimposition techniques, to an item of footwear. Test impressions  
378 made with footwear serve as a tool to assist with the comparison to ensure that features are  
379 reproduced.

380 Comparative examination of footwear involves a 4 step process commonly called ACE-V  
381 (Analysis, Comparison, Evaluation and Verification) during which the examiner analyses,  
382 compares and evaluates the degree of correspondence in manufactured and acquired  
383 characteristics between the scene impression and item of footwear to reach a conclusion  
384 before it is verified by a second examiner.

385 Any limitations within the process must be noted such as:

- 386
- Lack of original items
  - Improper scene documentation or collection
  - Lack of clarity/detail within the impression
- 387
- 388

389 The exact conclusion scale may vary across jurisdictions, but comparisons have the ability to  
390 exclude/include to some degree the shoe as the source of the scene impression.

391 **5.4.2 ACE-V process**

392 Refer to Section 9.2 for initial assessment.

393 **Analysis:** In this stage, the scene impression will be examined and features marked prior to  
394 examining the known footwear. Documentation of all observations must be made through  
395 notes, diagrams, photography, etc.

396 In general, documentation of impressions should include (if relevant):

- 397 • Is the impression partial or complete?
- 398 • Are there overlapping impressions?
- 399 • Was the impression processed (e.g. powder/chemicals)?
- 400 • Are there any signs of particular dynamism or distortion?
- 401 • The orientation of the impression (left or right shoe)
- 402 • Are there any indications of the size of the footwear which made the impression?
- 403 • Is there any background “noise” which obscures detail?
- 404 • What are the type of substrate and the composition of the impression?
- 405 • What are the geometric shapes present?
- 406 • Are any manufacturing characteristics present?
- 407 • Are there possible wear or other acquired characteristics present?

408 In general, documentation of footwear should include (if relevant):

- 409 • Outsole design which may show text and logos
- 410 • Features on the outsole which indicate the consumer size of the shoe
- 411 • Manufacturing method
- 412 • Manufacturing characteristics (e.g. mould detail)
- 413 • Presence of general and specific wear and/or other acquired characteristics
- 414 • The presence of material stuck in the outsole

415

416 If the impression is unsuitable for comparison, for example due to a lack of clarity/detail, it will  
417 be noted clearly describing the limitations. If there is correspondence in overall outsole design  
418 between the impression and item of footwear, the examination will proceed to the comparison  
419 stage. See Section 5.3 for comments on making test impressions.

420 **Comparison:** During the comparison, the scene impression, outsole and test impression are  
421 fully compared next to each other (side by side) to evaluate the degree of correspondence/non-  
422 correspondence in manufactured characteristics including specific outsole design or other  
423 manufacturing features. It is also possible to compare the degree/location of general wear. The  
424 scene impression can also be overlaid (superimposition) with the test impression to evaluate  
425 the degree of correspondence/non-correspondence of these features as well as physical size.

426 The comparison then proceeds to correspondence/non-correspondence in acquired  
427 characteristics (position, orientation, size and shape) using the same side by side and  
428 superimposition techniques. Areas of specific wear such as Schallamach detail (ridgeline  
429 pattern produced through wear) that can be observed will be noted.

430 After being observed on a test impression, any corresponding features of manufacturing detail  
431 and acquired characteristics must be verified as being on the item of footwear.

432 A microscope, light table or software such as Adobe Photoshop can be used if needed for the  
433 comparison.

434 **Evaluation, Interpretation and Conclusions:** The examiner then evaluates and interprets  
435 the significance of the observed correspondences/non-correspondences between the  
436 impression and examined footwear. This includes any limitations in the comparison. A  
437 conclusion, used to describe the significance of any findings in the context of the case, will be  
438 assigned at this point. All findings, observations and results should be recorded in the case  
439 notes and on a working report. Refer to Chapter 12 for more detailed information.

440 **Review of Technical Findings and Verification:** The case material and examination results  
441 must be verified by another qualified examiner prior to reporting any inclusions. Exclusions can  
442 be verified according to the laboratory policy. Refer to Section 7.4 for more detailed  
443 information.

444 **Case Records:** All records generated during the forensic examinations must be in accordance  
445 with the requirements of the legal system operating in the member country and in sufficient  
446 detail to allow another competent forensic examiner to evaluate the quality and reliability of the  
447 work. Examination records, test impressions, photographs and other items generated during  
448 the examination process should be retained per the policy of the laboratory.

#### 449 5.5 Scene Linking/Forensic Intelligence

450 Forensic intelligence is defined as the processing of forensic case data for investigation and/or  
451 criminal intelligence purposes. Particularly in the context of serial (or high volume) crime,  
452 linking criminal events is crucial and footwear impressions may assist with this task.

453 Performing scene linking should mainly be understood as the process of comparing unknown  
454 impressions collected on distinct events, generally without having a suspected shoe at hand.  
455 Comparing or triaging marks from one single event might be assimilated to this process but  
456 with different outcomes and utility.

457 Comparing two unknown impressions will be done through a similar process as described in  
458 Section 5.4: A preliminary examination followed by a side-by-side comparison or  
459 superimposition. When the only use of the comparison result is a forensic intelligence process,  
460 it is acceptable to have a less extensive documentation of the result and a verification step  
461 may not be mandatory.

462 The result of the comparison can be expressed using a scale representing different degrees  
463 of support. Within a forensic intelligence environment, it is also accepted to use a simplified  
464 conclusion scale (for example: link/no link). This type of conclusion scale requires the examiner  
465 to decide whether or not the link should be established. This decision is based upon the  
466 evaluation of the observations on the two impressions but may also take into consideration  
467 contextual information. However, it must be emphasised that in the context of forensic  
468 intelligence, the existence of a link between two unknown impressions must not be equated to  
469 an "identification" (an association to the exclusion of any other source).

470 Independently of the conclusion scale used, comparison between crime scene impressions  
471 allows generally for a less informative comparison result (as opposed to impression to known  
472 shoe comparison). Any person (stakeholder) involved the investigation and/or forensic  
473 intelligence process should be made aware of this limitation.

474 Should the result of an impression to impression comparison be used in an evaluative report,  
475 the whole comparison process must comply with the principles described in Section **Erreur !**  
476 **Source du renvoi introuvable..**

477 From an investigative point of view, an unknown crime scene impression may also provide  
478 valuable information: from the general pattern visible on a crime scene impression, it is  
479 possible to infer a list of possible brands and models of the shoe at the source of the impression  
480 and thus give information on the possible appearance of the upper part of the shoe. This type  
481 of information will typically be found in case records of the laboratories, databases, through  
482 commercial services or even through general knowledge of the examiner.

483 Examiners should bear in mind that, no matter the source of information used, a list of possible  
484 brands and models can never be considered as exhaustive due to the rapid evolution of the  
485 shoe market. When a list of possible brands and/or models is communicated as a result, the  
486 communication should state clearly that the list should not be considered as exhaustive.

## 487 **6. VALIDATION AND ESTIMATION OF UNCERTAINTY OF** 488 **MEASUREMENT**

### 489 6.1 Validation

490 Validation is a documented process for obtaining, recording and interpreting the results needed  
491 to prove that a process consistently delivers products that meet given specifications. For the  
492 validation of methods used in the field of footwear impression examination, follow the ENFSI  
493 document “Guidelines for the Single Laboratory Validation of Instrumental and Human Based  
494 Methods in Forensic Science” [2].

### 495 6.2 Estimation of Uncertainty of Measurement

496 A scene impression was produced during the incident under unknown conditions which will  
497 affect the way in which the characteristics of the outsoles are reproduced. These conditions  
498 are (but not limited to) [1]:

- 499 • The weight, walk, and gait of the individual wearing the shoe
- 500 • The force and manner with which the impression is made
- 501 • The outsole composition and its general condition
- 502 • The substrate in which the impression is made
- 503 • The type of surface on which the impression is deposited
- 504 • Environmental conditions at the time the impression is made and after
- 505 • Any action altering the impression after being made

506 Since the ground truth around the scene impression is not known, good documentation at the  
507 crime scene and knowledge of aspects of the case may help to assess some of these factors.

508 A test impression is produced under more controlled conditions in the laboratory but factors  
509 may affect the reproduction of characteristics from the outsole to the impression. These factors  
510 are (but not limited to):

- 511 • The production method (static or by walking/dynamic)
- 512 • The type/amount of powder or ink (or other material) used
- 513 • The type of material used to transfer the impression from the outsole

514 Multiple test impressions may need to be produced to assess how these factors affect the  
515 reproduction of characteristics.

516 Other potential sources that may influence the uncertainty of measurement:

- 517 • The way in which the scene impression was photographed (e.g. taken at an angle or  
518 distortion and position of the scale)
- 519 • The amount of time between the deposition of the impression at the scene and the  
520 seizure of the comparison shoes as well as how these shoes were used in-between.
- 521 • Limited data available while assessing the rarity of a feature
- 522 • Human factors such as explicit or implicit bias

523 A scene impression has been produced under unknown conditions and therefore cannot be  
524 reproduced exactly. A test impression made from a shoe is produced under controlled  
525 conditions and can be repeated. While evaluating the rarity of a matching characteristic (i.e.  
526 the probability to find a similar characteristic on another shoe), only the quality and clarity of  
527 that characteristic as seen on the scene impression should be taken into consideration.

## 528 **7. QUALITY ASSURANCE**

### 529 **7.1 Proficiency Testing/Collaborative Exercises**

530 Annual proficiency tests (PT) and/or collaborative exercises (CE) are strongly recommended  
531 to assure the quality of footwear impression examination processes and the competence of  
532 the involved examiners. A list of currently available PT/CE, as put together by the QCC, is  
533 available on the ENFSI website or at the ENFSI Secretariat. Participation in other PT/CE like  
534 exercises is encouraged.

535 Participants should follow the standard laboratory procedures for casework. They should not  
536 give the tests/exercises any special treatment that would not be given in the same  
537 circumstances to routine casework.

538 Any design and implementation of the PT/CE should be carried out in accordance with the  
539 recommendations of the ENFSI Framework for the Conduct of Proficiency Tests and  
540 Collaborative Exercises [3].

### 541 **7.2 Quality Controls**

542 Beside verification/peer review, reported results should be submitted for administrative (non-  
543 technical) review to ensure that procedures in place have been followed and that all supporting  
544 documentation is included in the case packet.

545 The laboratory should have a documented Quality Management System for controlling all  
546 systems, processes and methods used in the examination and reporting of footwear casework.

547 The Quality Management System should include requirements for the following minimum  
548 documentation relating to footwear examinations:

549 Casework administration procedures:

- 550 • Details of systems for the safe storage of casework material
- 551 • Records of all transfers of possession of casework material (chain of custody)
- 552 • Records of all case relevant communications within the laboratory and with external  
553 personnel
- 554 • Details and results of all examinations/analyses/calibrations carried out
- 555 • Any statements/reports concerning the examinations
- 556 • Records of checking results and case file review
- 557 • Financial records and costing data (if applicable)

558 Equipment:

- 559 • Inventories of equipment held and those responsible for them
- 560 • Records of commissioning, suitability for purpose and validation records
- 561 • Maintenance schedules and records of breakdowns, work carried out, etc.
- 562 • Calibration records

563 Materials and Chemicals:

- 564 • Records of preparation and/or acceptance testing

565 Protocols and Standard Operating Procedures (if applicable):

- 566 • for the preparation of reagents
- 567 • for the examinations and analytical methods and processes used
- 568 • for calibration and quality control
- 569 • for recording and presenting results

570 Training:

- 571 • Competence standards, training programmes and assessment protocols
- 572 • Records of proficiency tests
- 573 • Training packages
- 574 • Training/competence records for individuals

575 7.3 Data Collection for Control, Monitoring and Trend Analysis

576 Not applicable to this manual.

577 7.4 Verification/Peer Review

578 The case material and examination results must be verified by another qualified reporting  
579 examiner prior to issuance of the report. This peer review is a useful method to improve

580 objectivity and increase the reliability of results. Its use should not necessarily be limited to the  
581 review of results prior to issuance of a report. A peer review can be used during the whole  
582 examination process including for all critical steps/findings.

583 A review can be done using the existing case notes with conclusions or by a second  
584 independent (blind) examination where the verifying examiner does not know the original  
585 conclusions (blind peer review is recommended). It's most important for the verifier to note if  
586 the data/observations/documentation support (or do not support) the conclusions and have all  
587 appropriate examinations/analyses been carried out.

588 Following lab policy, significant editing (additions or modifications) in the original case notes  
589 should be trackable.

590 Once an agreement is in place, the name of the verifier and date must be marked on the case  
591 notes and depending on lab policy, an issued report.

592 If the conclusions differ between examiners, then a discussion can be had as to where there  
593 are differences and a decision made as to which of the two conclusions will be used. In this  
594 case, often the more conservative conclusion is the preferable one. Any changes to the  
595 conclusions will be documented in the case notes (refer to Section 12.5).

596 If needed, a third examiner can review the evidence, either using existing documents or  
597 independently. If there is still a continued disagreement between examiners, often the most  
598 conservative conclusion will be reported.

599 Any protocols for review should meet the requirements of EN ISO/IEC 17025 [4] or 17020 [5],  
600 the ILAC Guidance for Forensic Science Laboratories G19 [6] and the requirements of the  
601 prevailing criminal justice system.

## 602 **8. HANDLING ITEMS**

603 The collection and packaging of footwear and processing for footwear impressions requires  
604 the same standards as the collection of other evidence types. The integrity of the item and the  
605 traceability (chain of custody) are of utmost importance and are required in all case  
606 investigations.

### 607 **8.1 At the Scene**

608 The ENFSI Best Practice Manual for Scene of Crime Examination [7] provides a framework for  
609 the procedures, quality principles and approaches to the forensic examination of scenes of  
610 crime. The examiner should be aware of and understand the laboratory procedures concerning  
611 assessment of evidence at the scene and subsequent examination of evidence. The examiner  
612 should remain in compliance with their local laws relating to search, sampling, seizure and  
613 recovery of items of evidence. The techniques used for detection, collection, and preservation  
614 of items should be recorded together with the location from which the items are removed. The  
615 following subsections list some factors that are especially important to consider when dealing  
616 with footwear and footwear impressions at the crime scene. This guidance is directed towards  
617 ensuring that nothing is done by scene and/or lab personnel that may lead to erroneous links

618 being established between suspects and the scene, victims and suspects through the  
619 mishandling or cross-contamination of items and materials.

#### 620 8.1.1 Anti-Contamination Precautions

621 Seized items should be handled in such a way that contamination or destruction/degradation  
622 is minimized as much as possible or ideally entirely avoided. For footwear and footwear  
623 impressions, contamination of other forensic material such as DNA, glass, paint, fibres, soil  
624 etc. needs to be considered.

#### 625 8.1.2 Preservation and Packaging

626 All items should be packaged and sealed as soon as they are retrieved, using breathable bags  
627 or containers of an appropriate size, to avoid the packaging being damaged or the seals being  
628 broken. Packages should be sealed in such a way that all gaps are covered and secure, e.g.  
629 folded bags should be sealed with adhesive tape along all open edges. Every precaution (for  
630 example labelling, barcode, etc.) should be taken with the packaging to ensure a proper chain  
631 of custody.

632 In cases where the only examination is likely to be a comparison of footwear with a crime scene  
633 impression, then the footwear should be packaged to ensure that no additional damage is  
634 acquired or material lost from the outsole. If there may be other evidence types adhering to the  
635 footwear, such as glass, blood, trace materials or accelerants, then additional precautions may  
636 need to be taken.

637 All footwear must be packaged in non-airtight containers (avoid sealed paper bags) to prevent  
638 the development of mould. If testing for accelerants may be needed, only then can airtight  
639 containers be used but sampling for accelerants should be conducted as soon as possible.  
640 Any wet items of footwear should be dried prior to packaging. Each pair of shoes should be  
641 packed separately to avoid mix-up and contamination. The left and right shoes can also be  
642 packaged separately.

643 For items bearing footwear impressions such as pieces of flooring or clothing, care must be  
644 taken to ensure that the packaging does not rub up against the impressions. See Chapter 5  
645 for more detailed information on packaging ES and gelatine lifts as well as casts.

#### 646 8.1.3 Labelling and Documentation

647 In order to demonstrate the chain of custody for judicial proceedings, documentation of who  
648 has handled an item and when, from collection through to examination (if requested) and final  
649 storage must be maintained. This is done through a written record with date/time/initials and/or  
650 full name of everyone who has handled an item of evidence. The exact location from where an  
651 item was recovered may be documented through video, photography (including associated  
652 photo log) and/or on a sketch.

#### 653 8.1.4 Transport

654 The submission of footwear evidence to a forensic institute/laboratory will be determined by  
655 local protocols and the needs of the investigation. Generally, it involves the transportation by

656 police or an authorised carrier of the correctly packaged items which must be handled with  
657 care. All chain of custody requirements are to be followed. Consideration of temperature inside  
658 the transport vehicle must be taken into account as environments which are too hot or too cold  
659 could affect the evidence.

## 660 8.2 In the Laboratory

### 661 8.2.1 Anti-Contamination Precautions

662 Care must be taken at all times when handling casework material to minimize or eliminate the  
663 possibility of contamination. This is especially true when handling evidence that may contain  
664 other materials such as DNA or trace materials (e.g. soil, glass, hair, fibres).

665 Anti-contamination steps may include, but are not limited to:

- 666 • Following the quality management system of the laboratory.
- 667 • Using personnel protective equipment such as face masks, gloves, lab coats and  
668 white disposable scene suits as well as disposable equipment when required.
- 669 • All items are packaged, sealed and labelled to ensure integrity and continuity of an  
670 item.
- 671 • Documenting packaging on arrival at the laboratory in the case of damaged materials  
672 that may have led to evidence being lost or contaminated.
- 673 • Cleaning work areas and equipment prior to use.
- 674 • Making sure that recovered items, or materials obtained from items, cannot be mixed  
675 up with other items or materials.
- 676 • Ensuring that all DNA testing and collection of trace materials has been done prior to  
677 the footwear impression comparison.
- 678 • Making sure that all material gathered from victim(s) is stored separately from material  
679 gathered from suspect(s).

### 680 8.2.2 Labelling

681 A unique identifying number(s) (e.g., case number and/or item number) should follow the item  
682 throughout the examination in the laboratory. Depending on the local guidelines, the items can  
683 be labelled by putting the item in a package with a label, by attaching e.g., a cable tie with a  
684 label to the item or by putting a label with the number directly on the item. Care must be taken  
685 not to damage any item when labelling it. Test impressions that are produced during the  
686 examination process should also be labelled or put into labelled containers.

### 687 8.2.3 Precautions to Avoid Mix-Ups

688 A high level of cleanliness in the laboratory is important. Laboratory routines to minimise the  
689 risk for mix-up include:

- 690 • Taking photos of the items at an early stage.
- 691 • Regular cleaning and clearing of laboratory benches.
- 692 • Labelling of the items.

693           8.2.4   Storage Conditions

694   The items should be stored properly while adhering to the quality management system of the  
695 forensic institute/laboratory. In general, evidence has to be stored safely in a proper place,  
696 protected from damaging environmental influences. Exhibits with residual moisture must not  
697 be kept in closed sealed containers. Exhibits treated with chemical reagents and/or  
698 biohazardous must be packaged in accordance with health and safety guidelines and should  
699 have warning labels attached.

700   **9. INITIAL ASSESSMENT**

701           9.1   Assessment at the Scene

702   All relevant available information about the incident should be obtained before starting any  
703 examinations at the scene, e.g., viewing surveillance footage and/or getting information from  
704 witnesses. All possible hypotheses, from all sources, should be considered as part of this  
705 process. If footwear was not seized from the suspect, it is important to establish a link using  
706 methods such as DNA analysis and/or social media/CCTV images of person of interest  
707 wearing the shoes.

708           9.2   Assessment at the Laboratory

709   Before starting the examination, the contributor (submitter of evidence) requirements must be  
710 clearly and unambiguously defined and documented. In the case of unclear or ambiguous  
711 requests, the contributor must be contacted for clarification prior to starting any examinations.  
712 In addition, all information on the circumstances necessary for the laboratory examination and  
713 the interpretation of the results must be obtained. For example, the time between the incident  
714 and collection of the suspect's shoes. Furthermore, it must be clarified exactly whether the  
715 examination falls within the specialist field of footwear impressions and if other specialist fields  
716 are required. If the documentation is not clear about the connection between the footwear and  
717 the suspect, the contributor should be contacted.

718   If several disciplines are involved in the examination of the same evidence, the order of  
719 examination must be critically reviewed (see Chapter 10). In general, the footwear impression  
720 examinations are carried out after the other disciplines (especially DNA). Examples of  
721 materials that can persist on footwear and other impression evidence includes:

- 722           • Blood (visible and latent)  
723           • Bloodstain patterns  
724           • Fire accelerants (arson cases)  
725           • Trace materials (soil, paint and glass)

726   In addition, it must be clarified that the laboratory has the capacity, appropriate resources,  
727 facilities and equipment to carry out the necessary examinations. The next step is to take an  
728 inventory of all evidence items and check that they are complete and packaged according to  
729 standard laboratory procedures. This involves a check that all items have been submitted to  
730 the laboratory. For example, both images and dental stone cast (if taken) of a footwear  
731 impression. An assessment of photographic needs and the potential for physical/chemical

732 enhancement of the evidence can also be made in this stage. The footwear impression  
733 examination can be started after this initial assessment has taken place. Otherwise, limitations  
734 may apply to the validity of the outcomes and must be documented in the case record.

735 The examiner should then consider to what extent the proposition put forward by the  
736 contributor can be tested and should also frame at least one alternative proposition.

737 The examiner should consider what he/she would expect to find if each proposition was correct  
738 and should assess the likely evidential value of the anticipated findings. In the case of footwear  
739 evidence, this may require consideration of:

- 740 • Quality of the footwear impression. Impressions should be evaluated for the  
741 clarity/detail available for comparison. If unsuitable, documentation should show why.  
742 Any items with no discernable impressions should be noted.
- 743 • Quality of the test impressions
- 744 • Manufactured characteristics
- 745 • Acquired features (wear, accidental, etc.)
- 746 • Degree of correspondence
- 747 • Time delay (time between date of incident and recovery of footwear). This is  
748 particularly important if the examiner eventually finds differences in the degree of wear  
749 between the unknown impression and the submitted footwear.
- 750 • Relevant databases

## 751 **10. PRIORITISATION AND SEQUENCE OF EXAMINATIONS**

752 Where there is more than one item and/or evidence type involved in the examination of a case,  
753 then priorities and sequences for the examinations will need to be considered, whether it is at  
754 the crime scene or laboratory. Before commencing any examinations within a case, the  
755 following matters should be considered:

- 756 • The urgency and priority of the case/investigation.
- 757 • The other types of forensic examinations which may have to be carried out on the  
758 same item.
- 759 • Which evidential types or items have the potential to provide the most information in  
760 response to the various propositions and alternatives.
- 761 • The perishable nature of any material that may be present.
- 762 • Health and safety or security considerations.
- 763 • Environmental conditions.

764 If an item of evidence is to undergo more than one forensic examination, all relevant examiners  
765 should determine the most appropriate sequence based on the needs of the case. Evidence  
766 like fingerprints, paint and DNA may be destroyed or altered during a footwear examination.  
767 So they are often recovered before the footwear examinations. However, deviations from the  
768 general sequence and prioritisation of examinations are possible, depending on case specific  
769 requirements and sample material present.

770 The sequence of examinations may be re-evaluated at all stages of examinations with respect  
771 to the results of any previous analyses.

## 772 **11. RECONSTRUCTION OF EVENTS**

773 The laboratory examination of footwear evidence generally falls into two areas:

- 774 1. Footwear intelligence: At the investigation stage, the determination of brand/model of  
775 a shoe which could have made a scene impression as well as scene linking based on  
776 a correspondence in outsole designs of impressions between scenes.
- 777 2. Footwear examination: The comparison of a scene impression to an item of footwear  
778 to determine a common (or not) source. This may link a shoe being worn by an  
779 individual to a scene, a victim or a particular piece of evidence.

780 However, in some cases, it may be useful to reconstruct the movement of individuals around  
781 a scene or to provide some information on the dynamic nature of how an impression was made.  
782 When trying to reconstruct movements, care must be taken to properly document all the  
783 impressions in the context of the scene. Measurements from fixed points placed onto a sketch,  
784 overall photography, notes and video are all useful techniques in order to demonstrate the  
785 findings.

786 For example, a person of interest when interviewed may admit to being in a scene and so the  
787 link between his/her footwear and a scene impression is less probative. But in the same  
788 interview, the suspect may have provided a specific account of how he/she moved around the  
789 scene. This account could be proved or disproved by looking at a particular track of  
790 impressions of the same outsole design. Following this track could also conceivably lead to  
791 finding other evidence (for example a discarded firearm). Lastly, a track may describe the  
792 movement of first responders or other involved people as they walked through the scene after  
793 the crime was committed. As such, it is important to get exemplars from first responders and  
794 others who had been in the scene post-incident.

795 In terms of looking at how an impression was made, an example could be an impression on  
796 the inside of the victim's clothing or on the victim's skin. These impressions may be visible or  
797 latent and when observed, indicate forceful contact with the victim. Another example would be  
798 an impression on a forcefully kicked door. In these two cases, it may be necessary in the lab  
799 to try and reproduce the mechanisms of action which made the impressions. Any limitations to  
800 the lab reproduction must be documented in the case notes as it may not be possible to  
801 reproduce all the exact conditions under which a scene impression was made.

## 802 **12. EVALUATION AND INTERPRETATION**

### 803 **12.1 General Considerations**

804 The document "Guideline for evaluative reporting in forensic science" published by the ENFSI  
805 provides a recommended framework for formulating evaluative reports [8]. The application of  
806 this guideline is recommended. This section provides recommendations that are compatible  
807 with the ENFSI guideline but apply more specifically to the examination of footwear

808 impressions. The recommendations provided hereafter apply whether or not the evaluation is  
809 done using likelihood ratios.

810 Evaluation and interpretation aim to assess the evidential value of corresponding and  
811 dissimilar features between a crime scene impression and a test impression (made from the  
812 subject's shoe) or between two unknown impressions. The features taken into account are  
813 those observed and documented during the analysis and comparison steps.

814 Independently of the scale or wording used to express the conclusions, during the evaluation  
815 two (or more) competing propositions are used to explain the observed features. In the field of  
816 footwear impressions, these propositions will typically be that the scene impression and test  
817 impression originated from the same source or from different sources. The evaluation in itself  
818 will therefore be the assessment of the plausibility of the observed features given the  
819 proposition that the scene impression and test impression are originating from the same source  
820 versus from different sources.

821 When available, the evaluation phase should take into account background information about  
822 the scene impression and the test impression that could affect the observed features. This  
823 information can be (but not limited to) date and time of the incident, when the evidence was  
824 collected/documentated, the location of the impression, the sequence and method used to  
825 collect impressions or create test impressions, when any footwear was recovered or any  
826 information that could inform about the production process of the scene impression (for  
827 example a particular force that can cause distortion).

828 The whole evaluation process must be fully and transparently documented in the case file. The  
829 examiner should have an awareness of bias and how it applies to the comparison.

## 830 12.2 Type of Features

831 Multiple types of features can be observed during the comparison process. They can be  
832 divided into two main categories: those created during the manufacturing process and those  
833 acquired after this process.

834 Manufactured characteristics are generally shared by a group of shoes. These can be  
835 characteristics of a mould purposely added (for example the general outsole design and  
836 physical size) or happen by accident (for example a defect in the mould).

837 Acquired characteristics on the outsole appear after the manufacturing processes and occur  
838 during use of the shoe. These include characteristics such as general and specific wear that  
839 may occur over a larger area of the outsole. Or those that are limited to one position,  
840 orientation, size and shape such as a rock stuck in the tread or a piece of rubber that has been  
841 removed from the outsole.

842 Manufactured characteristics have generally a lower discriminating power compared to the  
843 discriminating power of acquired characteristics. Each characteristic may have its own  
844 discriminating power, however, the whole combination of features must be taken into account  
845 during the evaluation.

846 The type of characteristic (manufactured or acquired) should be verified not only with the test  
847 impression of the sole but also by examining the sole itself (or a recording of it).

848 12.3 Assigning a Value to Observations

849 The creation process of a scene impression is, by definition, a unique event that occurred in  
850 the past at a particular time and place and under uncontrolled conditions. No statistical model  
851 exists that could apply universally to all comparisons. Therefore, to assign a value to an  
852 observation (such as corresponding acquired features), the examiner will use a combination  
853 of data and subjective judgements.

854 Numerical data used to assign a value should be appropriate and relevant to the case under  
855 examination [8]. They can be:

- 856
- 857 • Published data
  - 858 • Unpublished data (for example a laboratory database)
  - 859 • Case specific experimentation
  - 859 • Personal data such as experience in similar cases and peer consultations

860 The value assigned to the observation and the origin of the data used should be recorded in  
861 the case file in order to be transparent as to how the examiner came to a particular conclusion.

862 12.4 Expressing the Conclusion

863 At a minimum, when a positive conclusion is reached (i.e. the result of the comparison supports  
864 to some degree that the scene impression and the test impression have a common source), a  
865 verification should be conducted by another qualified examiner. This should be reflected in the  
866 laboratory's Standard operating procedures.

867 The conclusion expressed in the report must reflect the evidential strength of the findings. The  
868 evidential strength is the logical compilation of all assigned values of the observations.

869 According to the probabilistic approach, the outcome of the evaluation phase is the estimation  
870 of the evidential strength of the findings under two mutually excluding hypotheses. The  
871 evidential strength is reported as a likelihood ratio which can be calculated or expressed by  
872 using a verbal scale and/or a numerical scale. The conclusion is based on a combination of  
873 data and the subjective interpretation of the examiner.

874 According to the posterior approach, the basis of a footwear impression conclusion is that an  
875 examiner has located corresponding and in some cases sufficiently discriminating features  
876 between the scene impression and the test impression. Here the expert's opinion of the  
877 evidence strength is guided by the experience/training of the examiner and other sources such  
878 as published research. The limits of the association and the given conclusion should be stated  
879 in the report. For example, any other shoe with the same outsole design and physical size  
880 could have also made the scene impression.

881 Posterior scales of conclusions or opinions are still widely used in certain legal systems by  
882 laboratories. They include conclusions based on posterior probabilities, such as "It is highly  
883 probable that shoe A left the scene impression". This type of scale states probabilities of the

884 propositions given the findings and not, as expressed in the likelihood ratio, the probabilities  
885 of the findings given the propositions.

886 If a scale is used to express conclusions, whether it is numerical or not, it should be made  
887 accessible to the recipient of the report.

888 When considering a conclusion scale and wording, examples can be found within the Guideline  
889 for Evaluative Reporting in Forensic Science [ref], published by European Network of Forensic  
890 Science Institutes.

### 891 12.5 Conflict Resolution Policy

892 Agencies should have a written procedure to handle differences in conclusions reached by  
893 examiners during the verification process. The conflict resolution policy should reflect all the  
894 elements taken into account during the analysis, comparison and evaluation phases by the  
895 examiners, and should address the necessary steps to adjudicate any conflict.

## 896 **13. PRESENTATION OF EVIDENCE**

### 897 13.1 General Principles

898 The overriding duty of those providing expert testimony is to the court and to the administration  
899 of justice. As such, evidence should be provided with honesty, integrity, objectivity and  
900 impartiality. Any limitations to the examination should be made clear.

901 Evidence can be presented to the court either orally or in writing. Only results which are  
902 supported by the examinations carried out should be presented. Presentation of evidence  
903 should clearly state the results of any evaluation and interpretation of the examination.

904 The relevant legal framework may define the information that must be stated when presenting  
905 evidence. But in any case, the evidence must be accompanied by sufficient information to  
906 enable the recipient to understand the origin of the known and unknown evidence under  
907 examination. All relevant information should be made available and presented whenever  
908 required. This can include (but is not limited to):

- 909 • details about staff involved in the examination and about the laboratory
- 910 • details about the received/collected/examined evidence
- 911 • chronological data of the examinations
- 912 • methodological details of the examinations and evaluation.

913 All discipline specific terminology should be explained in such a way that all recipients can  
914 clearly understand.

### 915 13.2 Written Report

916 Written reports should include all the relevant information in a clear, concise, structured and  
917 unambiguous manner as required by the relevant legal process. Written reports must be peer  
918 reviewed.

919            **13.3 Oral Testimony**

920        Persons expected to give oral testimony should have received instruction and/or mentoring in  
921        the procedural requirements of the particular criminal justice system in which the evidence is  
922        to be presented.

923        Only information which is supportable by the examinations carried out should be presented,  
924        unless specifically directed by the court.

925        Expert witnesses should resist responding to questions that take them outside their field of  
926        expertise unless specifically directed by the court, and even then, a declaration as to the  
927        limitations of their expertise should be made.

928            **13.4 Visual Documentation**

929        Whether presented in writing or orally, the results can be supported by visual documentation.  
930        This documentation should enable the recipient to have a better understanding of the results  
931        and their meaning. In particular, it may highlight the corresponding features found and used to  
932        reach a conclusion.

933        Modifications to the original evidence (e.g. adding arrows) can be made, but they should not  
934        alter the perception of the degree of correspondence. Any enlargements shown should include  
935        a view of the entire piece of evidence.

936            **14. HEALTH AND SAFETY**

937        Health and safety considerations are extremely important in all aspects of the work and at all  
938        stages of the forensic process. The materials dealt with in footwear enhancement and recovery  
939        (or in other steps) can be inherently hazardous and a risk assessment should be undertaken  
940        prior to use and appropriate health and safety protocols followed. At crime scenes, hazardous  
941        materials may be encountered within difficult circumstances. Often the exact facts of the scene  
942        may not be known. The reporting examiner should at all times be aware and take appropriate  
943        actions to ensure a safe method of working. It is advisable upon leaving a scene to  
944        communicate with supporting law enforcement any chemicals or other hazardous substances  
945        that were used during scene processing. So that appropriate clean-up of the scene can be  
946        performed if necessary.

947            **15. BIBLIOGRAPHY**

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963 **16. AMENDMENTS AGAINST PREVIOUS VERSION**

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965 Not applicable as this is the first published issue of the BPM for footwear impression  
966 examination

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ENFSI wishes to promote the improvement of mutual trust by encouraging forensic harmonization through the development and use of Best Practice Manuals. Furthermore, ENFSI encourages sharing Best Practice Manuals with the whole Forensic Science Community which also includes non ENFSI Members.

Visit [www.enfsi.eu/documents/bylaws](http://www.enfsi.eu/documents/bylaws) for more information. It includes the ENFSI framework document Framework for the Process for the Creation of Technical Documents within ENFSI (code: QCC-FWK-001).

