Fire Investigation: Forensic Evidence and Interviewing

Student Manual

1st Edition, 3rd Printing
September 2024

U.S. Fire Administration
Working for a fire-safe America

FEMA/USFA/NFA
FI: FEI-SM
September 2024
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FEMA

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Acknowledgments

The development of any National Fire Academy (NFA) course is a complex process aimed at providing students with the best possible learning opportunity we can deliver.

There are many players in course development, each of whom plays an equally important part in its success. We want to acknowledge their participation and contribution to this effort and extend our heartfelt thanks for making this quality product.

Lester Rich, Med
Branch Chief, Response
U.S. Fire Administration (USFA)/NFA
Emmitsburg, Maryland

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Course Description

This six-day, specialized course will address critical skills essential to fire investigation to include interviewing strategies and the identification, collection, packaging, preservation, processing and testing of evidence from a fire and/or crime scene. Using a combination of classroom instruction, activities, written assignments and projects, students will demonstrate the ability to conduct science-based fire investigations with the application of current practices in the forensics investigation field. Outdoor activities require students to have work clothes and boots and be capable of processing a fire scene (bending, kneeling and lifting up to 50 pounds). Successful completion of this course satisfies the education and testing requirements for International Association of Arson Investigators (IAAI) Evidence Collection Technician (ECT) certification. “Fire Investigation: Forensic Evidence and Interviewing” (FI: FEI) (R0780) expands upon concepts presented in “Fire Investigation: Essentials” (FI: E) (R0772).

Course Goal

This course is intended to address critical skills essential to fire investigation, including interviewing strategies, interviewing methodologies, and the identification, preservation, collection, packaging, processing and testing of evidence from a fire and/or crime scene.

Audience, Scope and Course Purpose

The primary audience for this course is full-time public service personnel with fire or arson investigative responsibilities. This course is not designed for crime scene technicians or criminalistics personnel who possess an understanding of crime scene processing.

This course does not focus on traditional fire scene processing, but on crime scene processing for the fire investigator. Priority will be reserved for students who have completed FI: E.

Grading Methodology

Grading rubrics are provided for all graded assignments. Grading rubrics can be accessed on Blackboard by selecting Assessments > Rubrics. Each rubric is labeled according to activity name.

Students who do not complete the entire course will be awarded an Incomplete (I) grade. In accordance with NFA academic policies, an Incomplete (I) grade must be removed by the end of the next semester following the course, or it automatically becomes a Failing (F) grade.

The final course grade will comprise the elements in the following tables:

Elements	Completion/ Formal Grade	Grade	Weights
Activities			
Assignment 1: Compare Evidence Collection Methods Essay	Formal Grade	16	7.5%
Assignment 2: Crime Scene Interview Questions Essay	Formal Grade	12	7.5%
Activity 1.1: Crime Scene Measurement	Completion	–	–
Activity 2.1: Ignitable Liquid: Ignition and Miscibility Testing	Completion	–	–
Activity 2.2: Ignitable Liquid: Sample: Collection	Completion	–	–
Activity 5.1: Latent Fingerprints: Tape	Completion	–	–
Activity 5.2: Latent Fingerprints: Super Glue	Completion	–	–
Activity 5.3: Latent Fingerprints: Dusters/Gel Lifters	Completion	–	–
Activity 6.1: Molotov Cocktail: Collection	Completion	–	–
Activity 9.1: Foot Impression	Completion	–	–
Activity 10.1: Toolmarks: Collection	Completion	–	–
Activity 13.1: Explosives: Collection	Completion	–	–
Practicum Part I: Crime Scene Investigation	Formal Grade	100	30%
Practicum Part II: Submit Lab Requests	Completion	–	–
Practicum Part III: Final Narrative	Formal Grade	12	20%
Practicum Part IV: Prosecutor Presentations	Formal Grade	14	15%
Final Exam	Formal Grade	100	20%
Total			**100%**

Students who do not obtain an end-of-course passing score face possible sanctions for up to 12 months regarding acceptance or placement in future NFA course offerings.

Grading Rubrics

Practicum Part I: Crime Scene Investigation Rubric (Individual Assignment)

This table details the point distribution for Practicum Part I: Crime Scene Investigation.

	ID Two Pieces of Evidence	ID Four Pieces of Evidence	ID Six Pieces of Evidence	ID Eight Pieces of Evidence	Score/ Level
Student will identify eight pieces of evidence	6 Points — The student will receive 6 points for the identification of two pieces of evidence (3 points per evidence item).	12 Points — The student will receive 12 points for the identification of four pieces of evidence (3 points per evidence item).	18 Points — The student will receive 18 points for the identification of six pieces of evidence (3 points per evidence item).	24 Points — The student will receive 24 points for the identification of eight pieces of evidence (3 points per evidence item).	
Student will properly collect evidence identified	8 Points — The student will receive 8 points for the proper collection of two pieces of evidence (4 points per evidence item).	16 Points — The student will receive 16 points for the proper collection of four pieces of evidence (4 points per evidence item).	24 Points — The student will receive 24 points for the proper collection of six pieces of evidence (4 points per evidence item).	32 Points — The student will receive 32 points for the proper collection of eight pieces of evidence (4 points per evidence item).	
Student will properly package evidence identified	10 Points — The student will receive 10 points for the proper packaging of two pieces of evidence (5 points per evidence item).	20 Points — The student will receive 20 points for the proper packaging of four pieces of evidence (5 points per evidence item).	30 Points — The student will receive 30 points for the proper packaging of six pieces of evidence (5 points per evidence item).	40 Points — The student will receive 40 points for the proper packaging of eight pieces of evidence (5 points per evidence item).	
Perimeter security	0 Points — Student does not establish proper perimeter security/control within and outside of crime scene.	1 Point — Student does not establish proper perimeter area, but does control area identified as crime scene.	3 Points — Student establishes proper perimeter security and control within, but not outside of crime scene.	4 Points — Student establishes proper perimeter security and control within and outside of crime scene.	

Grading: 90–100 = A, 80–89 = B, 70–79 = C, 60–69 = D, 0–59 = F

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Practicum Part III: Final Narrative Rubric (Individual Assignment)

This table details the point distribution for Practicum Part III: Final Narrative.

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	**1 Point**	**2 Points**	
Summarize the case scenario. Include the initial observations and initial identification, collection and packaging planning actions anticipated.	The student fails to provide a summary **or** provides an answer that is poorly articulated or does not demonstrate/document the initial scene observations and actions taken.	The student provides a summary that is adequately articulated, demonstrates some reflection, and makes mostly logical ties to the initial scene observations and actions taken.	The student provides a comprehensive summary that is well articulated, demonstrates significant reflection, and makes logical ties to the initial scene observations and actions taken.	
For each item collected: • **Identify the item.** • **Briefly discuss how the item was identified, any unique challenges in identification or recognition of the item, and why the item was deemed important.** • **Write three to four sentences per item.**	**Two** or more of the following: • The student fails to identify all items of evidence. • The student fails to provide a description of the evidence collected. • The student fails to provide a thorough explanation of how the evidence was deemed important to the scenario. • The student provides an answer that is poorly articulated illogical or does not demonstrate sufficient reflection of the scenario, evidence or course material.	**One** of the following: • The student fails to identify all items of evidence. • The student fails to provide a description of the evidence collected. • The student fails to provide a thorough explanation of how the evidence was deemed important to the scenario. • The student provides an answer that is poorly articulated, illogical or does not demonstrate sufficient reflection of the scenario, evidence or course material.	Evidence of understanding and critical thinking: • The student identifies all items of evidence. • The student provides a description of the evidence collected. • The student provides a thorough explanation of how the evidence was deemed important to the scenario. • The student provides an answer that is well articulated, logical and demonstrates sufficient reflection of the scenario, evidence or course material.	

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	1 Point	2 Points	
Choose four items that were collected. • **Provide a written synopsis of the collection method used by the student.** • **Compare and contrast the chosen method with another method that was not used and articulate the justification for the chosen method.** • **Write one paragraph for each item (three to five sentences).**	**Any two** or more of the following: • Fails to include four items. • Fails to address the collection method. • Fails to articulate alternative collection methods. **or** • Fails to justify selected method. **or** • Provides an answer that is poorly articulated, illogical, or does not demonstrate sufficient understanding of the scenario, evidence or course material.	**Any one** of the following: • Fails to include four items. • Fails to address the collection method. • Fails to articulate alternative collection methods. **or** • Fails to justify selected method. **or** • Provides an answer that is poorly articulated, illogical, or does not demonstrate sufficient understanding of the scenario, evidence or course material.	The student comprehensively addresses the reflection point in a manner that is well articulated, demonstrates significant reflection, and makes logical ties that demonstrate a comprehensive understanding of the scenario, evidence and course material.	
Choose four items and list the item and the expected laboratory examination outcome.	The student fails to: • Choose four items. • Address the expected outcome of more than two items. **or** • Provides an answer that is poorly articulated, illogical, or does not demonstrate sufficient reflection of the scenario or the expected laboratory examination outcomes.	The student addresses the reflection point, correctly identifies at least three items in a manner that is adequately articulated and makes mostly logical ties to the scenario and expected examination outcome.	The student comprehensively addresses the reflection point in a manner that is well articulated, identifies four items, demonstrates significant reflection, and makes clear, logical ties to the scenario and expected laboratory outcomes.	

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	1 Point	2 Points	
Choose two items where the collection or packaging did not go as expected and discuss the mistakes identified, lessons learned and actions that may avoid that mistake in the future.	The student fails to: • Address two items. • Address the reflection point, cannot find any room for improvement. **or** • Provides an answer that is poorly articulated, illogical, or does not demonstrate sufficient understanding of the scenario, evidence or course material.	The student addresses the reflection point in a manner that is adequately articulated, discussed only **one** item where there is room for improvement, and makes mostly logical ties that demonstrate understanding of the scenario, evidence and course material.	The student comprehensively addresses the reflection point in a manner that is well articulated, and demonstrates an understanding of the improvement needed or the mistake made in the original collection or packaging activity.	
Grammar, spelling and APA style	Contained more than three grammatical, spelling or APA errors	Contained no more than two grammatical, spelling or APA errors.	Correctly followed APA format with no grammatical or spelling errors.	

Grading: 11–12 = A, 10 = B, 9 = C, 8 = D, 0–7 = F

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Practicum Part IV: Prosecutor Presentations Rubric (Group Assignment/Grade)

This table details the point distribution for Practicum Part IV: Prosecutor Presentations.

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	**1 Point**	**2 Points**	
The complete presentation covers and discusses the following five sections or topic areas: • **Brief overview of the scenario.** • **Review of items collected with photographs and scene diagram.** • **Nexus between the items collected and the crime scene.** • **Conclusions expected outcomes of laboratory examination.** • **Investigative leads developed by the evidence (i.e., next steps).**	Missing **one** or more of the following: • Overview of scenario information. • Review of evidence collected at the scene. • Nexus as to how the evidence collected relates to the scenario. • Conclusions made based on the scene, evidence and lab results. • Next steps identified that are reasonable for real-world application. **or** • All sections are present but contain major flaws in content or reasoning.	**All** of the following are present with only minor flaws: • Overview of scenario information. • Review of evidence collected at the scene. • Nexus as to how the evidence collected relates to the scenario. • Conclusions made based on the scene, evidence and lab results. • Next steps identified that are reasonable for real-world application.	**All** of the following are present with no flaws: • Overview of scenario information. • Review of evidence collected at the scene. • Nexus as to how the evidence collected relates to the scenario. • Conclusions made based on the scene, evidence and lab results. • Next steps identified that are reasonable for real-world application.	

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	**1 Point**	**2 Points**	
Photographic documentation of the scene	Photos are unrecognizable (e.g., out of focus, under/overexposed, etc.) **or** not included (e.g., lost, overlooked, etc.).	Scene is accurately depicted with photographs supporting the scene findings according to NFPA 1033, Section 4.3.2. Must include photographs that accurately capture the scene and evidence items.	Photographs are clear, focused and illustrate the crime scene **and** display a balance of light and shadows in difficult scene conditions to achieve ideal exposure. **or** Use macro photography.	
Completed scene diagram	Any **one** of the following: • Scene diagram is not drawn in plain view. • Cardinal directions are not included. • "Not to scale" disclaimer is not provided when required. • The diagram does not accurately represent the scene.	**All** of the following are present: • Scene diagram is drawn in plain view. • Cardinal directions are included. • "Not to scale" disclaimer is provided when required. • The diagram accurately represents the scene.	Scene diagram satisfies the "Meets Objectives" criteria **and** includes overlays or animations that retain an accurate graphic representation.	
Identification of all evidence	Evidence is not properly identified, collected or properly packaged for shipment to the laboratory, **or** a satisfactory evidence log is not produced.	All evidence is identified, collected and properly packaged for shipment to the laboratory, **and** a satisfactory evidence log is produced.	All evidence is identified, collected, properly packaged and recorded in a comprehensive evidence log, **and** trace evidence or initially overlooked evidence is located and preserved.	

Criteria Category	Needs Improvement	Meets Objectives	Exemplary	Notes
	0 Points	**1 Point**	**2 Points**	
Nexus between the items collected and the crime scene	Fails to accurately evaluate, characterize or understand the evidence collected. **or** Incorrectly interprets the significance of said evidence.	Clearly depicts the evidence collected in a thoughtful and useful manner. **and** Interprets the significance of said evidence.	Analysis demonstrated a complete understanding and analysis criteria. **and** Logically articulates the subsequent investigative steps.	
Comprehensive narrative	Presentation does not "tell the story" of the crime scene. May depict photos but is **not** adequate to present to a supervisor or prosecuting attorney.	Presentation depicts the crime scene **and** helps to explain the examination process of the crime scene analysis.	Presentation satisfies the "Meets Objectives" criteria **and** rises to the level of a presentation worthy of submission to a supervisor or prosecuting attorney.	
Grammar, spelling and length	Any one of the following: • Contained three or more grammatical or spelling errors. • Did not adhere to the 30-minute length requirement (i.e., more than five minutes over or under the prescribed time limit).	Any **one** of the following: • Contained no more than two grammatical or spelling errors. • Generally adhered to the 30-minute length requirement (i.e., less than five minutes over or under the prescribed time limit).	Contained no grammatical or spelling errors. Made effective use of the 30-minute length requirement with no significant deviations.	

Grading: 13–14 = A, 11–12 = B, 10 = C, 9 = D, 0–8 = F

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Schedule

TIME	DAY 1	DAY 2
8:00 – 9:40	Introduction Unit 1: Scene Documentation	Unit 5: Latent Fingerprints (cont’d)
9:40 – 9:55	*Break*	*Break*
9:55 – 12:00	Unit 1: Scene Documentation (cont’d) Unit 2: Ignitable Liquid	Unit 6: Blood/Bodily Fluids/DNA Unit 7: Glass/Physical Matches
12:00 – 1:00	*Lunch*	*Lunch*
1:00 – 2:30	Unit 2: Ignitable Liquid (cont’d) Unit 3: Digital Evidence	Unit 8: Firearms/Weapons Unit 9: Foot/Tire Impressions (Known and Unknown)
2:30 – 2:45	*Break*	*Break*
2:45 – 5:00	Unit 4: Hair/Fiber Unit 5: Latent Fingerprints	Unit 9: Foot/Tire Impressions (Known and Unknown) (cont’d)

Note: This schedule is subject to modification by the instructors and approved by the training specialist.

TIME	DAY 3	DAY 4
8:00 – 9:40	Unit 10: Toolmarks Unit 11: Paint	Unit 15: Practicum Practicum Part I
9:40 – 9:55	*Break*	*Break*
9:55 – 12:00	Unit 11: Paint (cont'd) Unit 12: Questioned Documents	Practicum Part I (cont'd)
12:00 – 1:00	*Lunch*	*Lunch*
1:00 – 2:30	Unit 13: Explosives	Practicum Part II
2:30 – 2:45	*Break*	*Break*
2:45 – 5:00	Unit 13: Explosives (cont'd) Unit 14: The Forensic Interview	Practicum Part II (cont'd) Practicum Part III

TIME	DAY 5	DAY 6
8:00 – 9:40	Practicum Part III (cont'd)	Wrap-up Final Exam
9:40 – 9:55	*Break*	*Break*
9:55 – 12:00	Practicum Part III (cont'd)	Wrap-up (cont'd) Final Exam (cont'd)
12:00 – 1:00	*Lunch*	*Lunch*
1:00 – 2:30	Practicum Part IV	Flex time
2:30 – 2:45	*Break*	*Break*
2:45 – 5:00	Practicum Part IV (cont'd)	Flex time

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FIREFIGHTER CODE OF ETHICS

Background

The Fire Service is a noble calling, one which is founded on mutual respect and trust between firefighters and the citizens they serve. To ensure the continuing integrity of the Fire Service, the highest standards of ethical conduct must be maintained at all times.

Developed in response to the publication of the Fire Service Reputation Management White Paper, the purpose of this National Firefighter Code of Ethics is to establish criteria that encourages fire service personnel to promote a culture of ethical integrity and high standards of professionalism in our field. The broad scope of this recommended Code of Ethics is intended to mitigate and negate situations that may result in embarrassment and waning of public support for what has historically been a highly respected profession.

Ethics comes from the Greek word ethos, meaning character. Character is not necessarily defined by how a person behaves when conditions are optimal and life is good. It is easy to take the high road when the path is paved and obstacles are few or non-existent. Character is also defined by decisions made under pressure, when no one is looking, when the road contains land mines, and the way is obscured. As members of the Fire Service, we share a responsibility to project an ethical character of professionalism, integrity, compassion, loyalty and honesty in all that we do, all of the time.

We need to accept this ethics challenge and be truly willing to maintain a culture that is consistent with the expectations outlined in this document. By doing so, we can create a legacy that validates and sustains the distinguished Fire Service institution, and at the same time ensure that we leave the Fire Service in better condition than when we arrived.

FIREFIGHTER CODE OF ETHICS

I understand that I have the responsibility to conduct myself in a manner that reflects proper ethical behavior and integrity. In so doing, I will help foster a continuing positive public perception of the fire service. Therefore, I pledge the following…

- Always conduct myself, on and off duty, in a manner that reflects positively on myself, my department and the fire service in general.
- Accept responsibility for my actions and for the consequences of my actions.
- Support the concept of fairness and the value of diverse thoughts and opinions.
- Avoid situations that would adversely affect the credibility or public perception of the fire service profession.
- Be truthful and honest at all times and report instances of cheating or other dishonest acts that compromise the integrity of the fire service.
- Conduct my personal affairs in a manner that does not improperly influence the performance of my duties, or bring discredit to my organization.
- Be respectful and conscious of each member's safety and welfare.
- Recognize that I serve in a position of public trust that requires stewardship in the honest and efficient use of publicly owned resources, including uniforms, facilities, vehicles and equipment and that these are protected from misuse and theft.
- Exercise professionalism, competence, respect and loyalty in the performance of my duties and use information, confidential or otherwise, gained by virtue of my position, only to benefit those I am entrusted to serve.
- Avoid financial investments, outside employment, outside business interests or activities that conflict with or are enhanced by my official position or have the potential to create the perception of impropriety.
- Never propose or accept personal rewards, special privileges, benefits, advancement, honors or gifts that may create a conflict of interest, or the appearance thereof.
- Never engage in activities involving alcohol or other substance use or abuse that can impair my mental state or the performance of my duties and compromise safety.
- Never discriminate on the basis of race, religion, color, creed, age, marital status, national origin, ancestry, gender, sexual preference, medical condition or handicap.
- Never harass, intimidate or threaten fellow members of the service or the public and stop or report the actions of other firefighters who engage in such behaviors.
- Responsibly use social networking, electronic communications, or other media technology opportunities in a manner that does not discredit, dishonor or embarrass my organization, the fire service and the public. I also understand that failure to resolve or report inappropriate use of this media equates to condoning this behavior.

Developed by the National Society of Executive Fire Officers

A Student Guide to End-of-course Evaluations

Say What You Mean ...

Ten Things You Can Do to Improve the National Fire Academy

The National Fire Academy takes its course evaluations very seriously. Your comments and suggestions enable us to improve your learning experience.

Unfortunately, we often get end-of-course comments like these that are vague and, therefore, not actionable. We know you are trying to keep your answers short, but the more specific you can be, the better we can respond.

Actual quotes from student evaluations:	Examples of specific, actionable comments that would help us improve the course:
1 "Update the materials."	• The (ABC) fire video is out-of-date because of the dangerous tactics it demonstrates. The available (XYZ) video shows current practices. • The student manual references building codes that are 12 years old.
2 "We want an advanced class in (fill in the blank)."	• We would like a class that enables us to calculate energy transfer rates resulting from exposure fires. • We would like a class that provides one-on-one workplace harassment counseling practice exercises.
3 "More activities."	• An activity where students can physically measure the area of sprinkler coverage would improve understanding of the concept. • Not all students were able to fill all ICS positions in the exercises. Add more exercises so all students can participate.
4 "A longer course."	• The class should be increased by one hour per day to enable all students to participate in exercises. • The class should be increased by two days so that all group presentations can be peer evaluated and have written abstracts.
5 "Readable plans."	• The plans should be enlarged to 11 by 17 and provided with an accurate scale. • My plan set was blurry, which caused the dotted lines to be interpreted as solid lines.
6 "Better student guide organization," "manual did not coincide with slides."	• The slide sequence in Unit 4 did not align with the content in the student manual from slides 4-16 through 4-21. • The instructor added slides in Unit 4 that were not in my student manual.
7 "Dry in spots."	• The instructor/activity should have used student group activities rather than lecture to explain Maslow's Hierarchy. • Create a pre-course reading on symbiotic personal relationships rather than trying to lecture on them in class.
8 "More visual aids."	• The text description of V-patterns did not provide three-dimensional views. More photographs or drawings would help me imagine the pattern. • There was a video clip on NBC News (date) that summarized the topic very well.
9 "Re-evaluate pre-course assignments."	• The pre-course assignments were not discussed or referenced in class. Either connect them to the course content or delete them. • The pre-course assignments on ICS could be reduced to a one-page job aid rather than a 25-page reading.
10 "A better understanding of NIMS."	• The instructor did not explain the connection between NIMS and ICS. • The student manual needs an illustrated guide to NIMS.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Introduction

Student Manual
September 2024

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Contents

Unit Schedule

Topic	Duration
Administrative	5 min.
Course Overview	5 min.
Introduction	20 min.

Audiovisual

Slides I-1 to I-12

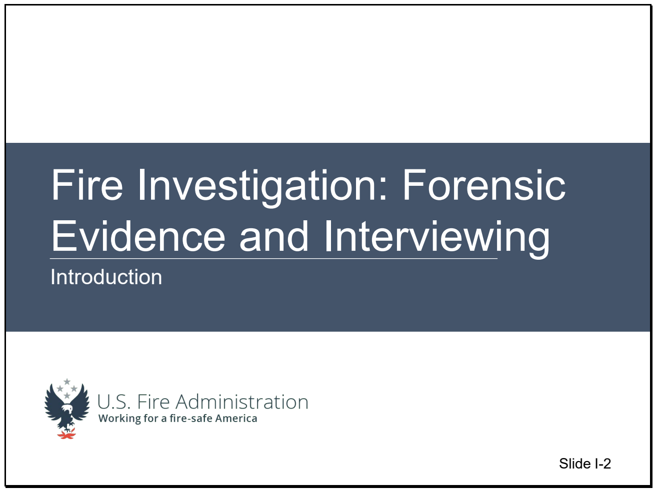
Video: “Welcome to the National Emergency Training Center”

Slide I-1: Welcome

Key Information

Welcome to the National Fire Academy (NFA)!

Slide I-2: Introduction

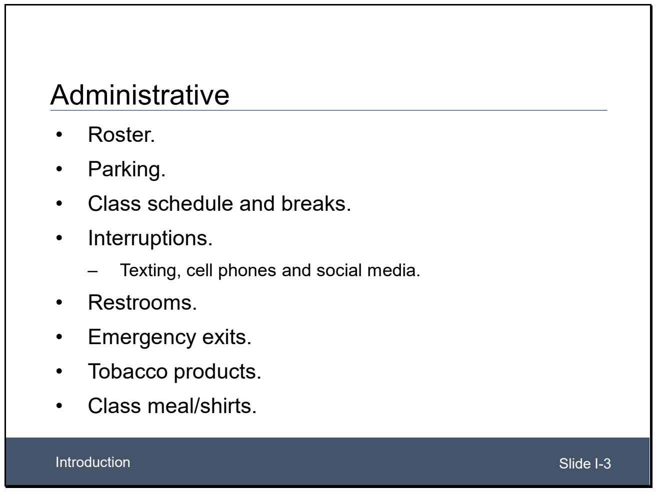


Key Information

This course is for the fire investigator and is designed to bridge the gap between the fire investigator's knowledge and the knowledge of a specialized crime scene technician or investigator. Often the fire investigator becomes "zeroed in" on the evidence more traditionally associated with a fire scene. Items such as fire debris, ignitable liquids or evidence of forced entry are routinely considered by the well-trained investigator, but other evidence may be inadvertently overlooked. This course will serve to highlight other types of traditional crime scene evidence (or nontraditional fire scene evidence) such as DNA, blood spatter, toolmarks, fingerprints, etc.

The following units will review guidance, lab protocols and collection processes for 12 different categories of evidence. Students will receive hands-on practice collecting different types of crime scene evidence and demonstrate best practices for packaging and submitting evidence for laboratory processing. However, successful completion of the course will not make a fire investigator a crime scene technician. As with fire investigation, many of these techniques require many years of practice to be successful in complex circumstances.

Slide I-3: Administrative

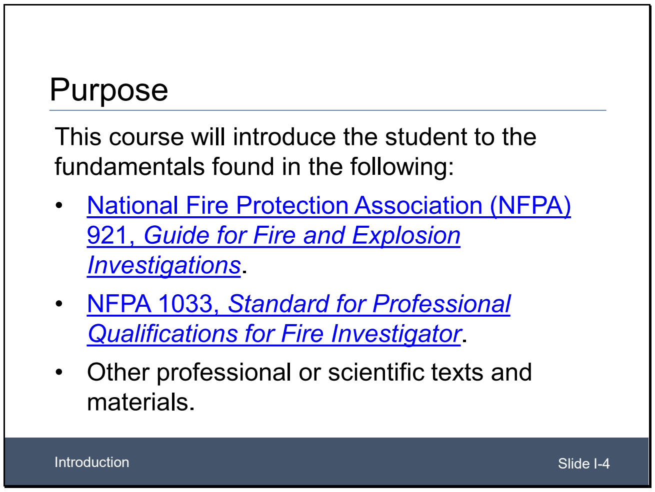


Key Information

Administrative considerations for the course:

- Classes begin at 8 a.m. and end at approximately 5 p.m.
- Fire exits: Note fire exits and relevant procedures.
- No tobacco products in class.

Slide I-4: Purpose

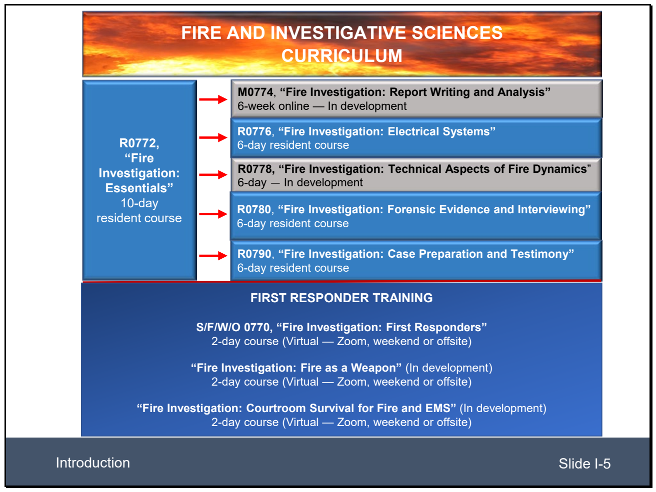


Key Information

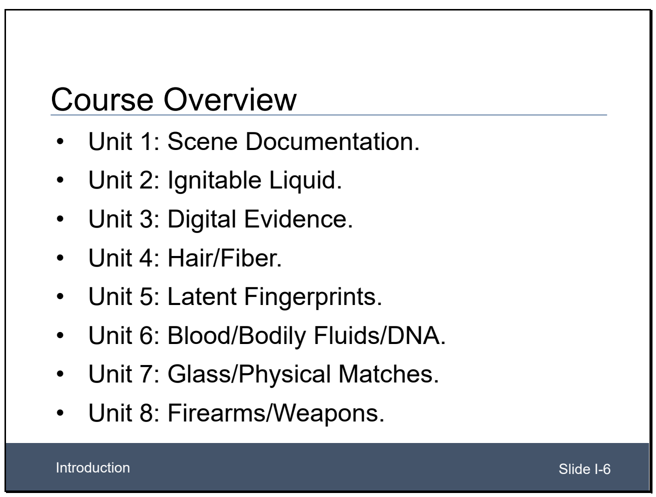
This course will introduce the student to the fundamentals found in:

- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
- NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*.
- Other professional or scientific texts and materials.

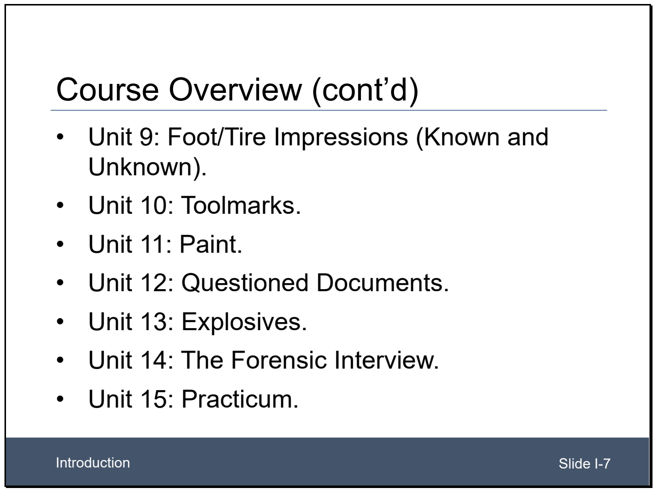
Slide I-5: Fire and Investigative Sciences Curriculum



Slide I-6: Course Overview



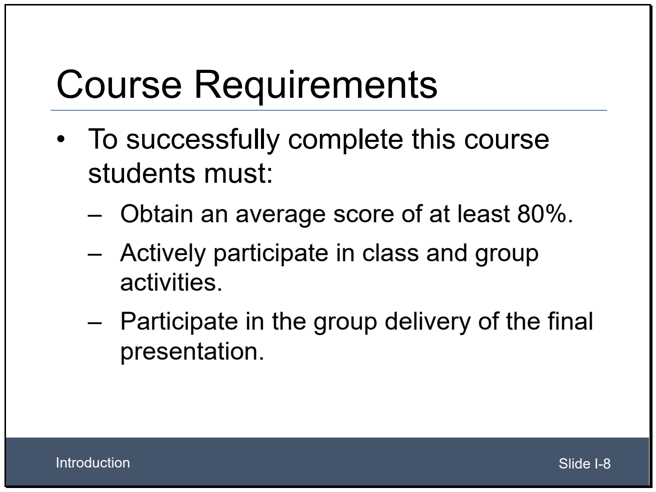
Slide I-7: Course Overview (cont’d)



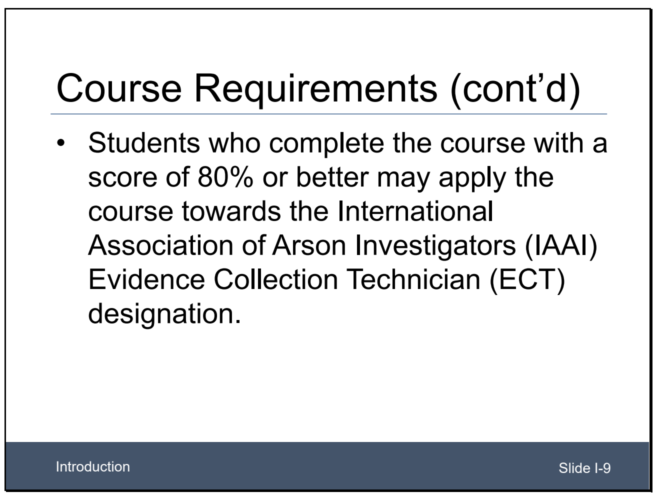
Key Information

These slides list the units in the course.

Slide I-8: Course Requirements



Slide I-9: Course Requirements (cont'd)



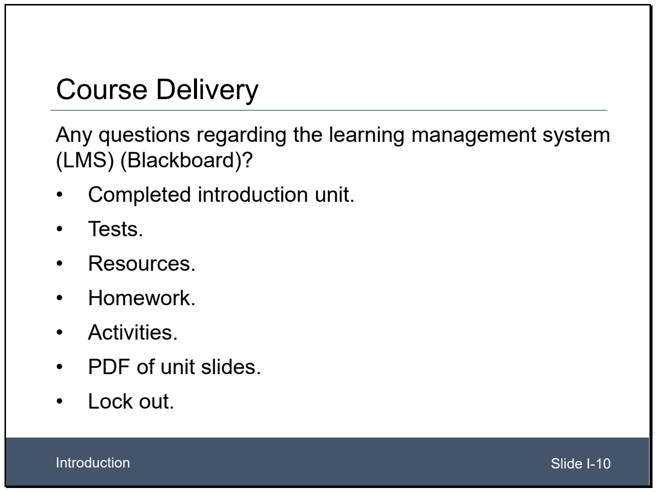
Key Information

To successfully complete this course, students must:

- Obtain an average score of at least 80%.
- Actively participate in class and group activities.
- Participate in the group delivery of the final presentation.

Students who complete the course with a score of 80% or better may apply the course towards the International Association of Arson Investigations (IAAI) Evidence Collection Technician (ECT) designation.

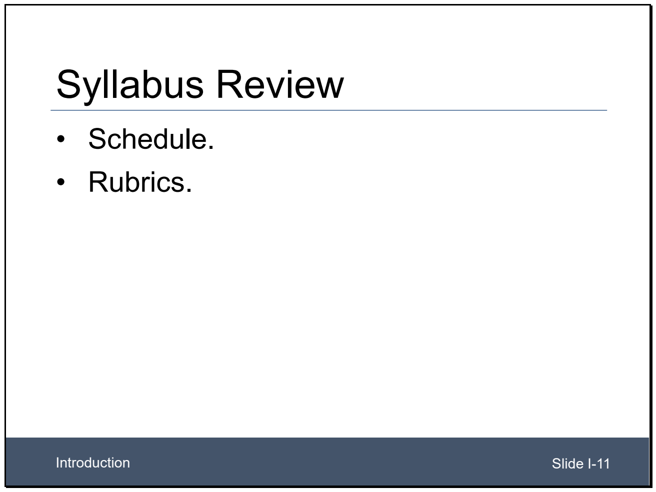
Slide I-10: Course Delivery



Key Information

Time allotted for Blackboard questions or issues.

Slide I-11: Syllabus Review



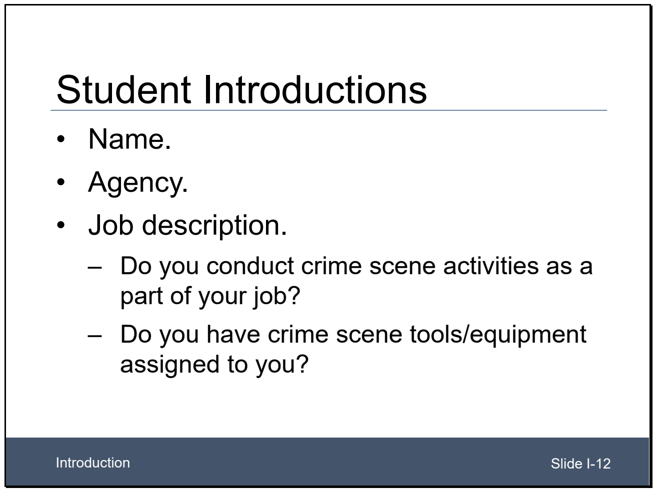
Key Information

The course syllabus is available electronically in Blackboard. Additionally, each student is provided a paper copy. Please refer to the syllabus for all course instructions, grading methodology, weights and assignments.

Students are responsible for knowing the material in the syllabus. Course materials include:

- Student Manual (SM) provided via Blackboard (no paper copies).
- Terminal Learning Objectives (TLOs) describing the on-the-job performance expected by the students after completing this course.
- Enabling Learning Objectives (ELOs) specifying what the students are to accomplish at any point in the course after receiving appropriate training.

Slide I-12: Student Introductions



Key Information

Students will be invited to introduce themselves to instructors and classmates by providing this information:

- Name.
- Job description (e.g., fire investigator, police, crime scene technician, inspector).
- Agency.
  - As a part of your job, do you conduct crime scene activities?
  - Do you have crime scene tools/equipment assigned to you?

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 1: Scene Documentation

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Differentiate accepted practices in fire and crime scene documentation and preservation.

Unit Enabling Learning Objectives (ELOs)

1.1 Illustrate the impact of spoliation.
1.2 Evaluate photographic equipment requirements.
1.3 Articulate best practices in both fire and crime scene photography.
1.4 Examine technology available for fire scene documentation, examination and presentation.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Differentiate accepted practices in fire and crime scene documentation and preservation.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Illustrate the impact of spoliation.	Class dialogue/ facilitated discussion	Final Exam
Evaluate photographic equipment requirements.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Articulate best practices in both fire and crime scene photography.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Examine technology available for fire scene documentation, examination and presentation.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Introduction	5 min.
Regulations, Guidance and Standards	10 min.
Terminology	10 min.
Fire Scene Preservation	5 min.
Legal Implications and Consequences of Spoliation	15 min.
The Scientific Method	5 min.
Crime Scene Basics	5 min.
Scene Documentation	20 min.
Activity 1.1: Crime Scene Measurement	60 min.
Evidence Collection Kits	15 min.
Summary	5 min.

Audiovisual

Slides 1-1 to 1-35

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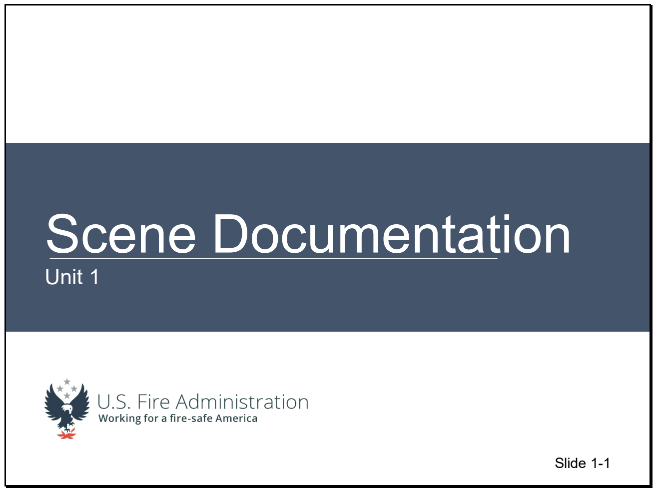
Slide 1-1: Scene Documentation

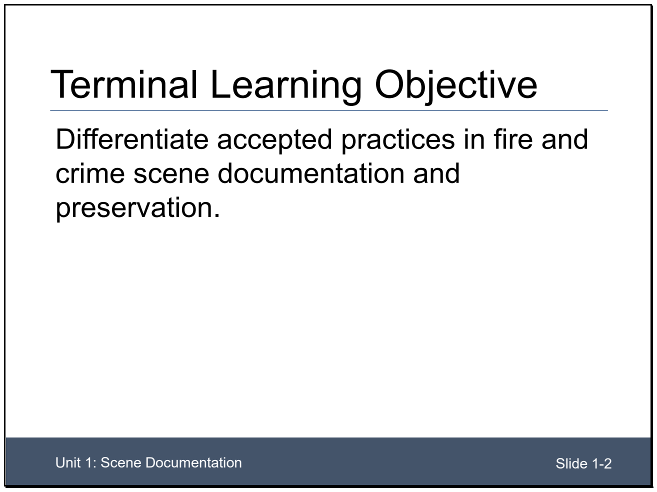


Key Information

Documenting a fire scene, whether identified as a crime scene or not, requires patience, practice and technique. The investigator needs, at a minimum, to understand the types of evidence they may encounter and the proper ways to identify and preserve that evidence prior to and during collection.

This unit will establish a basis for the remainder of the course. It will review standards, terminology, equipment for processing fire or crime scenes, and specifics of scene preservation and documentation, including the impact of spoliation and the technology available to document evidence before and during collection. Students will discuss evidence collection tools and receive evidence collection kits to use throughout the course.

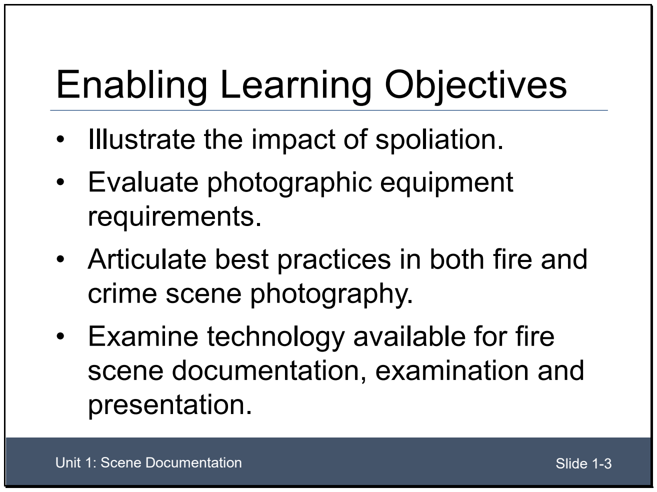
Slide 1-2: Terminal Learning Objective



Key Information

Differentiate accepted practices in fire and crime scene documentation and preservation.

Slide 1-3: Enabling Learning Objectives

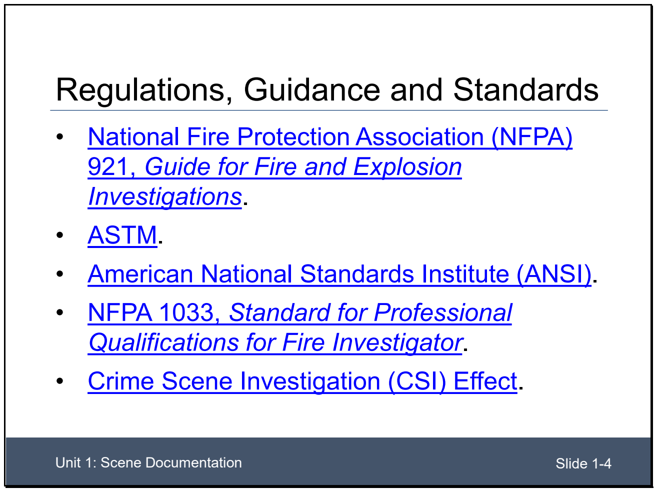


Key Information

After completing this unit, students will be able to:

- Illustrate the impact of spoliation.
- Evaluate photographic equipment requirements.
- Articulate best practices in both fire and crime scene photography.
- Examine technology available for fire scene documentation, examination and presentation.

Slide 1-4: Regulations, Guidance and Standards



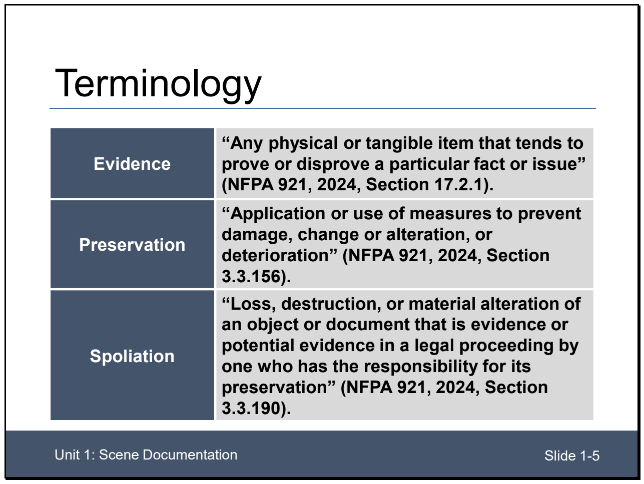
Key Information

For fire scene preservation and documentation, important sources of guidance include:

- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
  - Serves as the guidebook of the fire investigation industry.
  - Used by the court system to evaluate the quality of a fire investigation.
- ASTM International.
  - "Committed to serving global societal needs, ASTM International positively impacts public health and safety, consumer confidence, and overall quality of life. We integrate consensus standards — developed with our international membership of volunteer technical experts — and innovative services to improve lives… helping our world work better" (ASTM, 2018a, p.2).
  - Provides standards and technical content development, including that of evidence collection.
- American National Standards Institute (ANSI): "ANSI's mission is to enhance both the global competitiveness of U.S. business and the U.S. quality of life by promoting and facilitating voluntary consensus standards and conformity assessment systems, and safeguarding their integrity. Encompassing nearly every industry, the Institute represents the diverse interests of more than 270,000 companies and organizations, and 30 million professionals worldwide" (ANSI, 2022).

- NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*.
  - Requires investigators to have and maintain, at a minimum, an up-to-date basic knowledge of the topics beyond a high school level.
  - The job performance requirements (JPRs) are heavily involved in the responsibilities of evidence examination/crime scene work.
- Crime Scene Investigation (CSI) Effect: "The CSI effect posits that exposure to television programs that portray forensic science (e.g., "CSI: Crime Scene Investigation") can change the way jurors evaluate forensic evidence" (Chin & Workewych, 2016).

Slide 1-5: Terminology



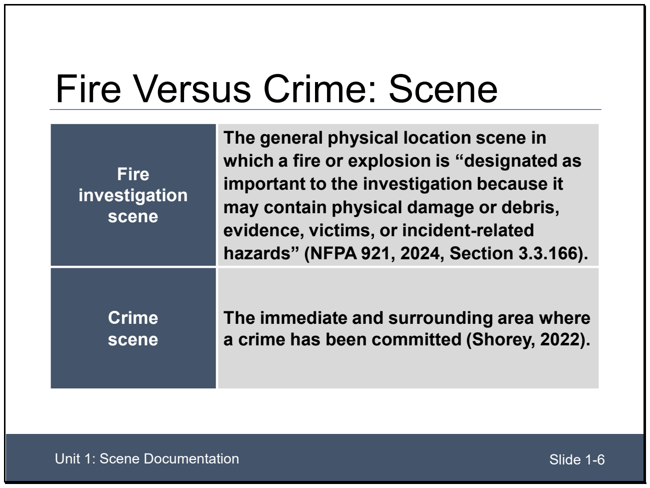
Key Information

Evidence is "any physical or tangible item that tends to prove or disprove a particular fact or issue" (NFPA 921, 2024, Section 17.2.1).

Preservation is the "application or use of measures to prevent damage, change or alteration, or deterioration" (NFPA 921, 2024, Section 3.3.156).

Spoliation is the "loss, destruction, or material alteration of an object or document that is evidence or potential evidence in a legal proceeding by one who has the responsibility for its preservation" (NFPA 921, 2024, Section 3.3.190).

Slide 1-6: Fire Versus Crime: Scene

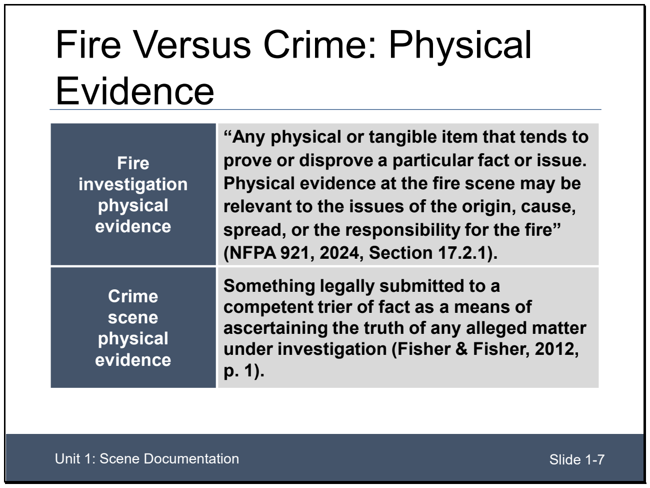


Key Information

- **Fire investigation scene** is the general physical location scene in which a fire or explosion is “designated as important to the investigation because it may contain physical damage or debris, evidence, victims, or incident-related hazards” (NFPA 921, 2024, Section 3.3.166).

- **Crime scene** is the immediate and surrounding area where a crime has been committed (Shorey, 2022).

Slide 1-7: Fire Versus Crime: Physical Evidence

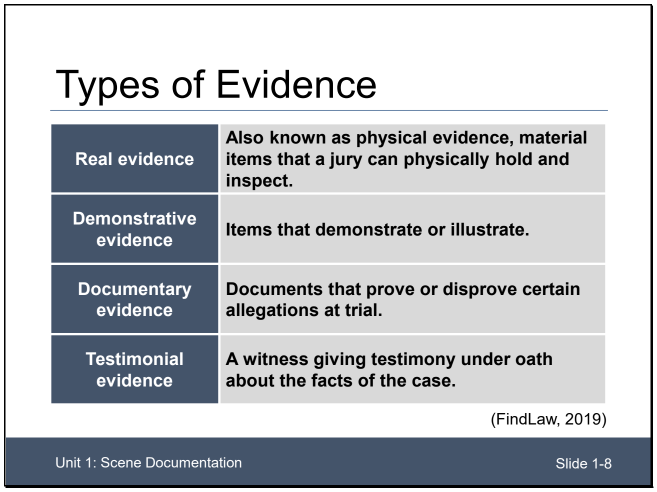


Key Information

- **Fire investigation physical evidence** is “any physical or tangible item that tends to prove or disprove a particular fact or issue. Physical evidence at the fire scene may be relevant to the issues of the origin, cause, spread, or the responsibility for the fire” (NFPA 921, 2024, Section 17.2.1).

- **Crime scene physical evidence** is something legally submitted to a competent trier of fact as a means of ascertaining the truth of any alleged matter under investigation (Fisher & Fisher, 2012, p. 1).

Slide 1-8: Types of Evidence

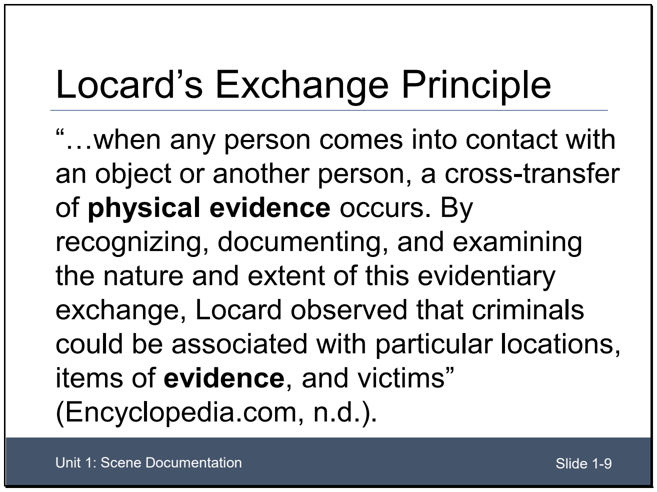


Key Information

There are four types of evidence (FindLaw, 2019):

- **Real evidence**, or physical evidence, refers to material items that a jury can physically hold and inspect.
- **Demonstrative evidence** describes items that demonstrate or illustrate.
- **Documentary evidence** refers to documents that prove or disprove certain allegations at trial.
- **Testimonial evidence** is provided by a witness giving testimony under oath about the facts of the case.

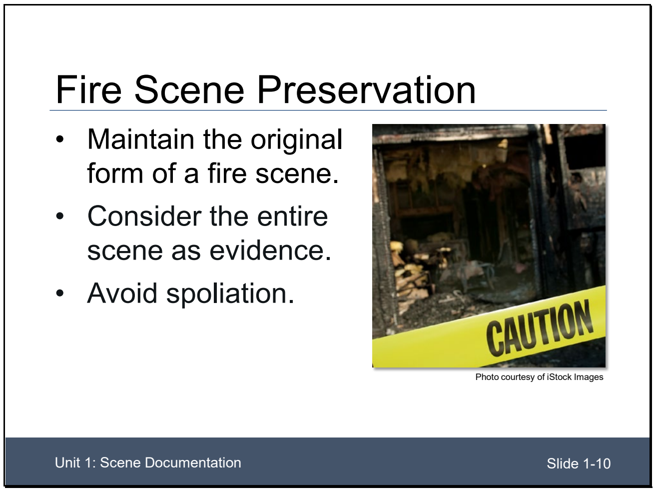
Slide 1-9: Locard's Exchange Principle



Key Information

Locard's Exchange Principle states that "with contact between two items, there will be an exchange" (Encyclopedia.com, n.d.). In forensic science, this means that physical evidence is transferred between people and the objects or other people they touch. By studying the creation of evidence, Edmond Locard (1877-1966), a French criminologist, found that "criminals could be associated with particular locations, items of evidence, and victims. The detection of the exchanged materials is interpreted to mean that the two objects were in contact. This is the cause and effect principle reversed; the effect is observed and the cause is concluded" (Encyclopedia.com, n.d.).

Slide 1-10: Fire Scene Preservation

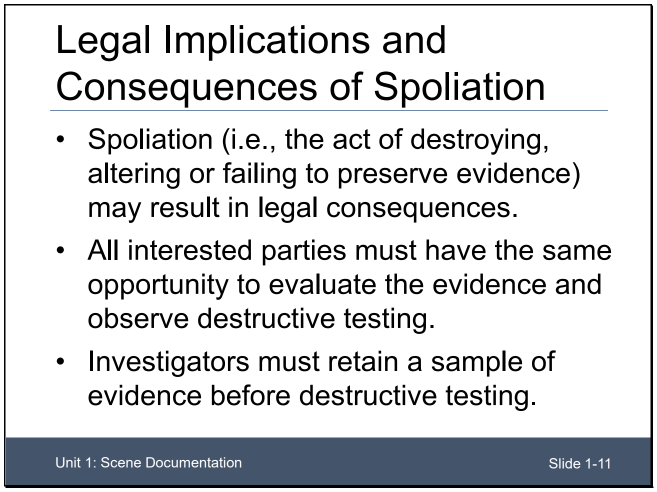


Key Information

Fire scene preservation aims to maintain the original form of a fire scene. The entire scene — not just fire debris — should be considered evidence, and investigators must strive to protect and preserve the entire scene. Items located in or around a scene can help to better understand why an event occurred. These items may not always provide a direct understanding of what happened and may need to be tested.

Spoliation can occur when the evidence is not treated in a proper manner, hindering the efforts of investigators and potentially damaging a pending case. Investigators who do not have the necessary experience, skills or tools to collect a particular type of evidence must preserve the evidence on scene until it can be collected.

Slide 1-11: Legal Implications and Consequences of Spoliation



Key Information

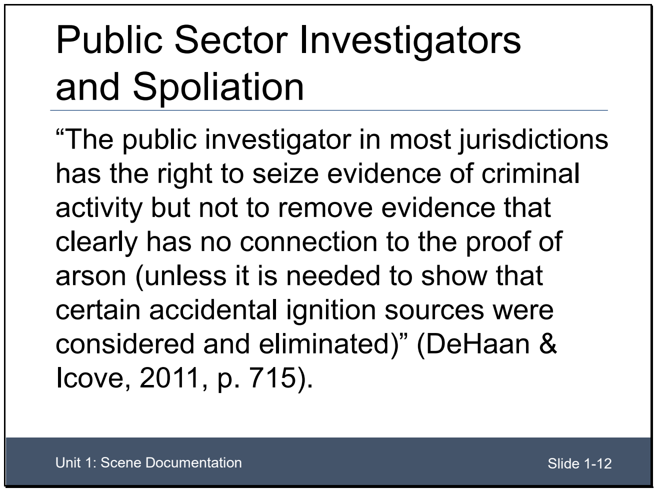
Spoliation is the act of destroying, altering or failing to preserve evidence. If someone, while handling the evidence, destroys, alters or fails to preserve the evidence, consequences may occur. These consequences could include denial of the use of the evidence or any results from the testing. The person responsible for the destruction of the evidence could be held liable, both civilly and criminally.

All parties with an interest in evidence should have the same opportunity to evaluate the evidence. The condition of evidence often dictates the method of testing that can occur. In criminal and civil cases, if testing could be destructive to the evidence, all concerned parties should be involved.

“An examiner is obligated to retain a sample of evidence if testing is going to be destructive, document the condition of the evidence completely beforehand, or ask that a representative of the opposition be present to observe the test” (DeHaan & Icove, 2018, p. 590).

When the testing of evidence is likely to change that evidence such that the opposing party (or other interested parties) cannot test it properly (e.g., examining a stove), testing should be delayed until all interested parties are notified and have an opportunity to nominate a representative to take part in the testing. Failure to notify the parties may expose the investigator and the examiner to civil penalties, including denial of admissibility of the results of the testing.

Slide 1-12: Public Sector Investigators and Spoliation



Key Information

“The public investigator in most jurisdictions has the right to seize evidence of criminal activity but not to remove evidence that clearly has no connection to the proof of arson (unless it is needed to show that certain accidental ignition sources were considered and eliminated)” (DeHaan & Icove, 2011, p. 715).

For more information, review:

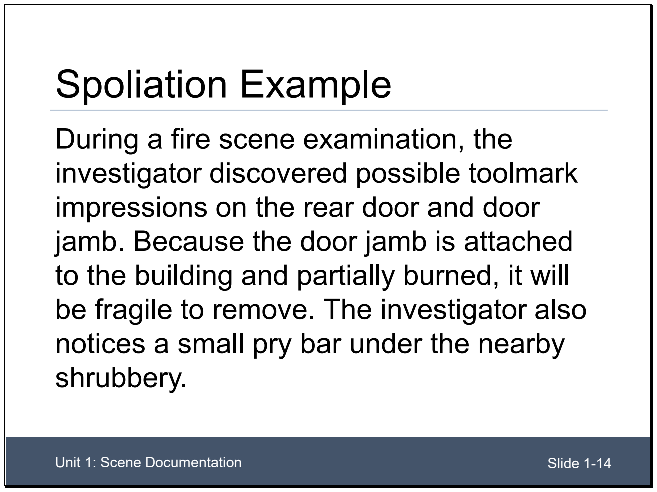
- Spoliation and its Impact on Fire Investigation.
- Fire Scene Spoliation: Have We Gone Too Far?
- Spoliation of Evidence in All 50 States.

Slide 1-13: Private Sector Investigators and Spoliation

Key Information

“The private-sector investigator or forensic expert does not have government immunity. Before removing evidence from a scene, the investigator should make reasonable efforts to notify known or possible defendants, plaintiffs, or other interested parties of the loss and the intent to remove the evidence” (DeHaan & Icove, 2011, p. 715).

Slide 1-14: Spoliation Example



Key Information

During a fire scene examination, the investigator discovered possible toolmark impressions on the rear door and door jamb. Because the door jamb is attached to the building and partially burned, it will be fragile to remove. The investigator also notices a small pry bar under the nearby shrubbery.

Both objects — the marks in the material and the prybar — can provide valuable information.

- What information do these objects provide?

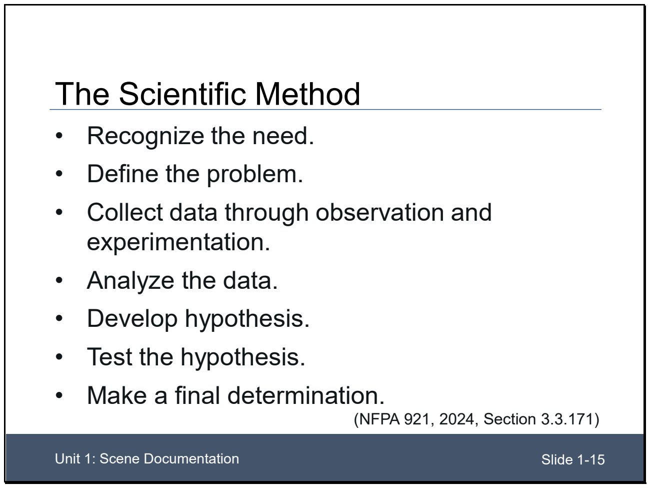
- What are some examination options that preserve the evidence and document the evidence?

- Given these items, how could a claim of spoliation be avoided?

For more information, consult these additional resources that document examples of spoliation from real-world cases:

- State Farm Fire & Cas. Co. v. Gen. Motors, LLC.
- Preserving Evidence: The Responsibility of the Investigator.

Slide 1-15: The Scientific Method



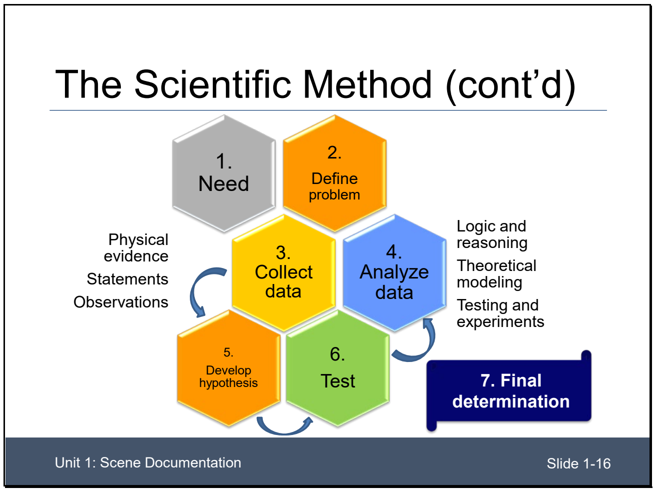
Key Information

To conduct a careful and thorough CSI, investigators must follow a path that allows for the collection of all available evidence. The forensics community uses a basic methodology, known as the scientific method, to accomplish this requirement.

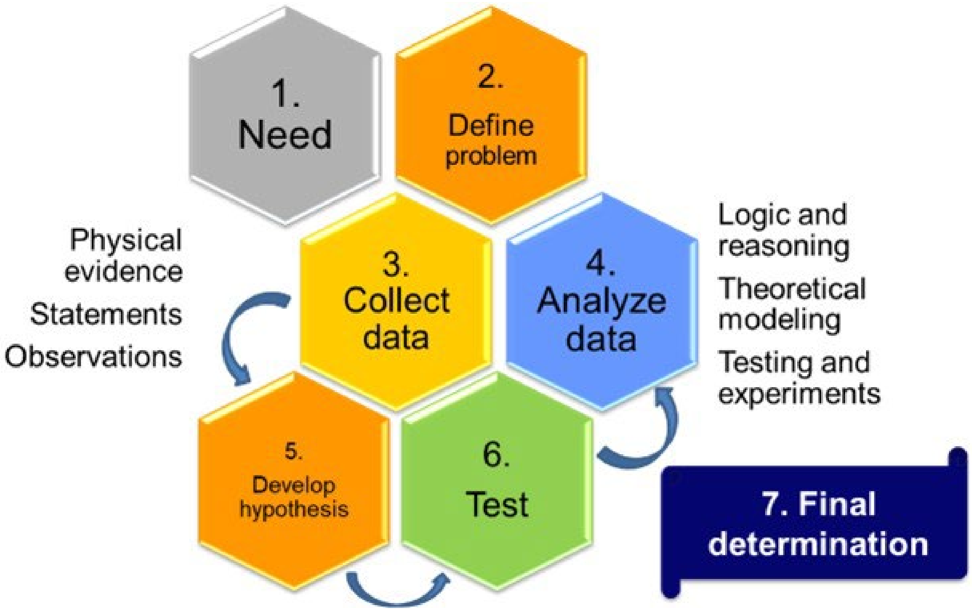
NFPA 921 defines the scientific method as, “The systematic pursuit of knowledge involving the recognition and definition of a problem; the collection of data through observation and experimentation; analysis of the data; the formulation, evaluation and testing of hypotheses; and, where possible, the selection of a final hypothesis” (NFPA 921, 2024, Section 3.3.171).

The scientific method applies to both the origin of the fire and what caused the fire to occur. This process does not just occur at the fire scene.

Slide 1-16: The Scientific Method (cont'd)



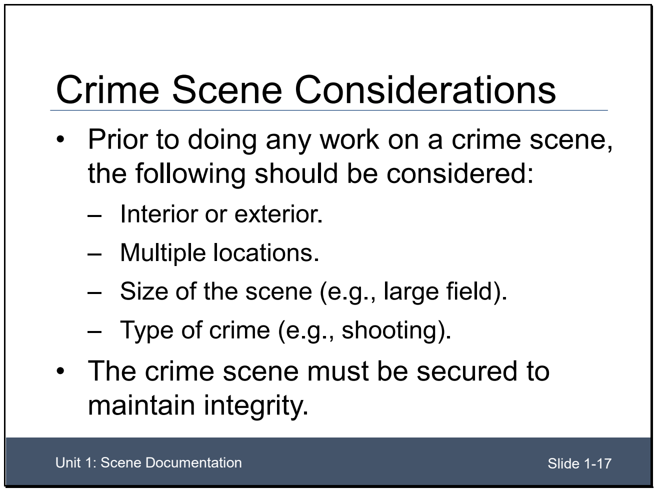
Key Information



Examples of a systematic approach (e.g., examining and documenting) for a fire or criminal act include:

- Examining a scene from the exterior to the interior.
- Working from areas with least to most damage.
- Using consistent fire (crime) scene documentation, as covered in the course "Fire Investigation: Essentials" (FI: E) (R0772).

Slide 1-17: Crime Scene Considerations



Key Information

As sources of evidence, crimes scenes must be carefully and thoroughly investigated for both visible and latent data. Each crime scene is unique, and the extent of the investigation depends on the type and location of the crime as well as the available resources.

The purpose of a crime scene search is to develop evidence which would link a suspect or a victim to the scene, and to answer questions crucial to the investigation, such as who, how and why the crime was committed. Locating physical evidence on a crime scene can be challenging as damage or an obstruction can change where to look.

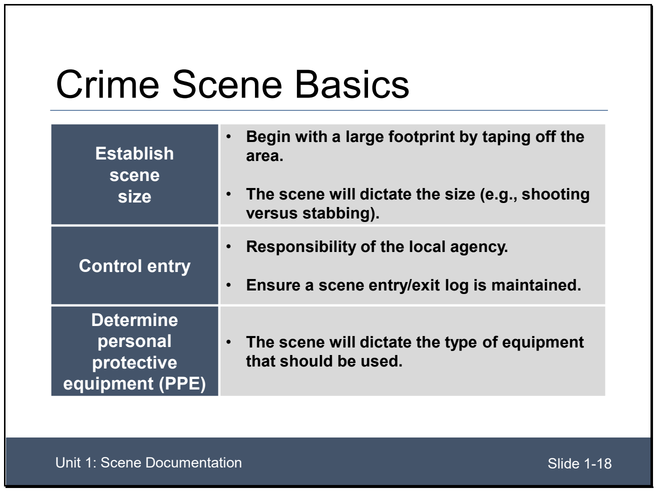
Prior to doing any work on a crime scene, the following should be considered:

- Interior or exterior.
- Multiple locations.
- Size of the scene (e.g., large field).
- Type of crime (e.g., shooting).

A standard practice is to start big and reduce the size of the crime scene once information has been gathered.

The crime scene must be secured to maintain integrity. This can be conducted by placing barriers (e.g., crime scene tape, vehicles, manpower) between the inner and outer perimeters.

Slide 1-18: Crime Scene Basics



Key Information

Scene preservation is a complex endeavor that will involve multiple individuals from firefighters and police officers to investigators and even the private sector. The scene should already be established by the first responding officers. However, this may not always be the case. First responders should follow basic guiding principles when responding to and securing a fire crime scene.

- **Establish scene size:** Begin with creating a large footprint by securing the area with crime scene tape. The type of incident (e.g., small fire, fatal fire, multiple buildings) will dictate the size of the scene.

- **Control entry:** This should be the responsibility of the local agency, but the fire investigator or responding crime scene technician should ensure an entry/exit log is kept for the scene.

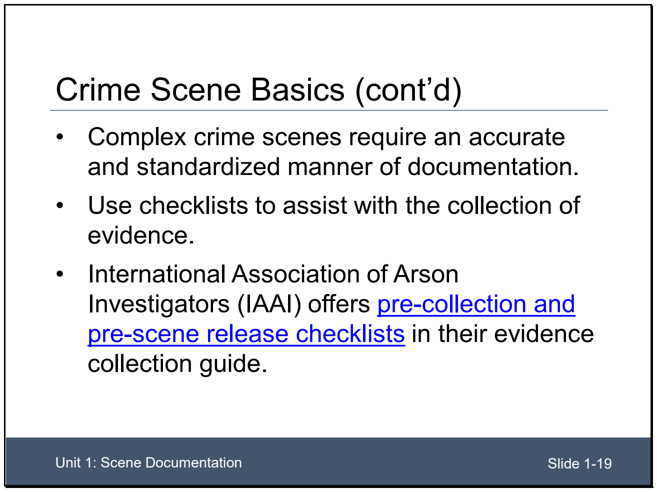
- **Determine personal protective equipment (PPE):** The scene and type of incident will dictate the type of equipment that should be used. Students will follow best practices of PPE use while performing the student activities and mock crime scenes.

  Examples include (International Association of Arson Investigators (IAAI), 2022):

  – Nitrile gloves.
  – Tyvek® coveralls.
  – Universal precautions as related to fatal scenes.
  – Respiratory protection.
  – COVID or infectious disease protocols.

Consult the IAAI Health and Safety Committee Best Practices Quick Facts document for more information on PPE for fire investigations.

Slide 1-19: Crime Scene Basics (cont'd)



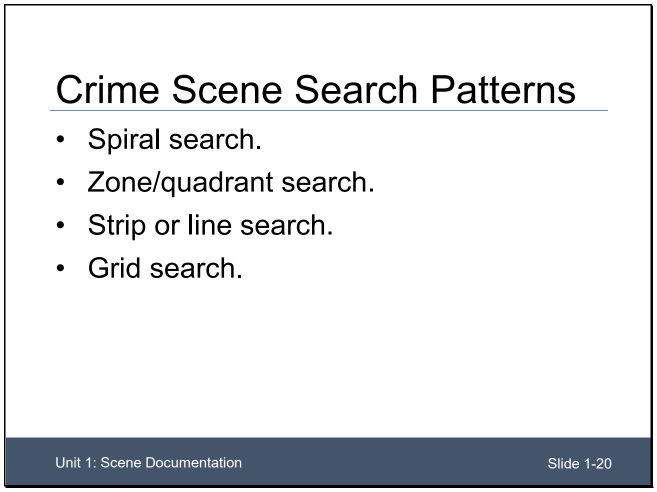
Key Information

Crime scenes, especially those involving fire or explosion, are complex and require an accurate and standardized manner of documentation. To ensure complete scene documentation, the investigator or fire scene technician should use checklists to assist with the collection of evidence.

The IAAI offers pre-collection and pre-scene release checklists in their evidence collection guide. The checklists provide the evidence collector with the necessary processes to ensure proper collection of evidence.

For more guidance, visit the IAAI's Fire Scene Evidence Collection Guide | Evidence Collection (iaaievidenceguide.com).

Slide 1-20: Crime Scene Search Patterns

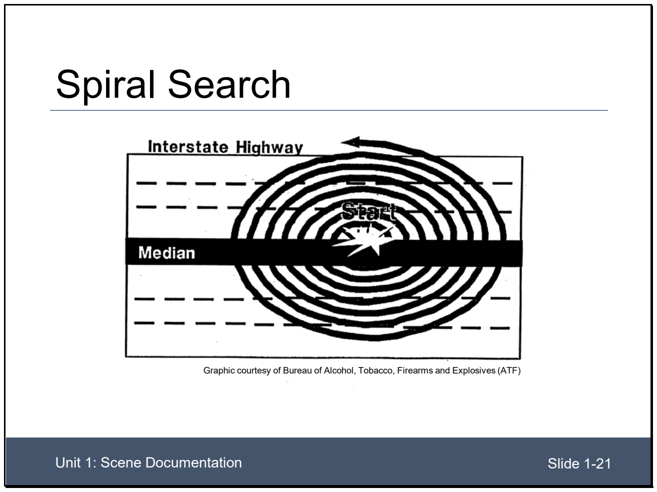


Key Information

Search patterns can be effective when used in a single manner or in combination with each other. Common search patterns include:

- **Spiral search:** Used most often for outdoor crime scenes, conducted by one person, and done by walking in a circle from the outermost point of the inner perimeter towards the center of the circle.
- **Zone/quadrant search:** The crime scene is divided into four quadrants and searched using another method, such as a strip or line search.
- **Strip or line search:** The crime scene is divided into a series of lanes in which personnel search up and down the lanes until the scene is completely searched.
- **Grid search:** Similar to a strip or line search but is also divided into lanes perpendicularly, thereby constituting a more systematically thorough search from multiple perspectives.

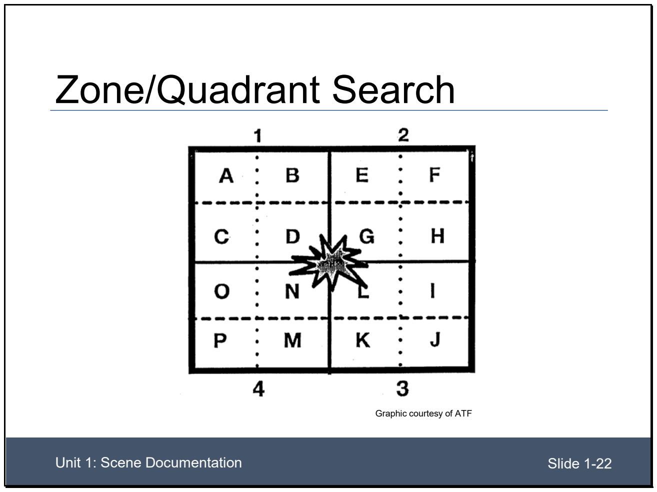
Slide 1-21: Spiral Search



Key Information

This slide shows a spiral search pattern.

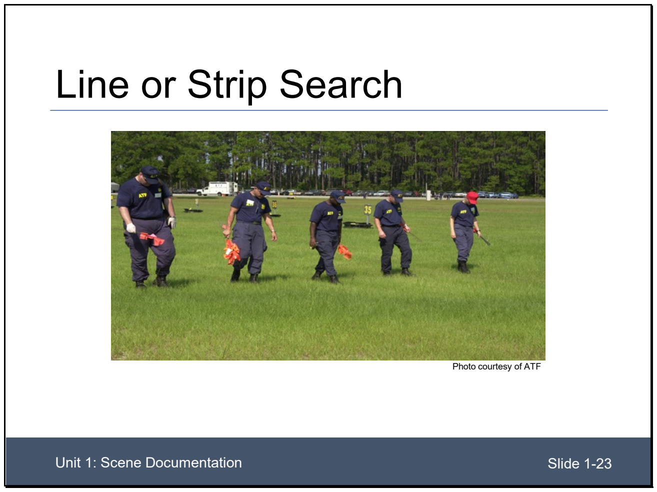
Slide 1-22: Zone/Quadrant Search



Key Information

This slide shows a zone/quadrant search pattern.

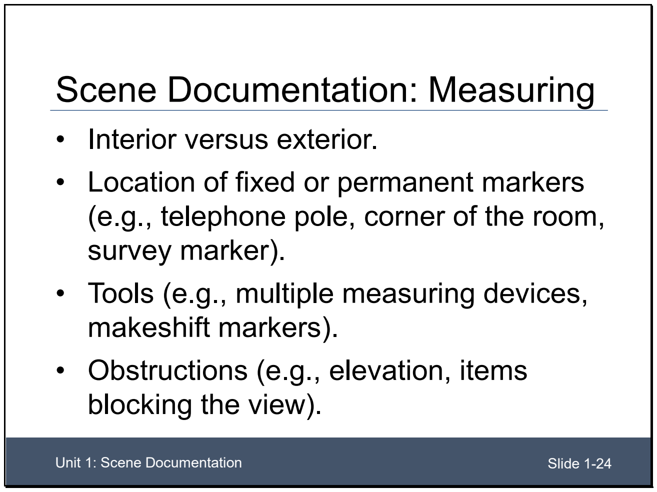
Slide 1-23: Line or Strip Search



Key Information

This slide shows a line or strip search pattern.

Slide 1-24: Scene Documentation: Measuring



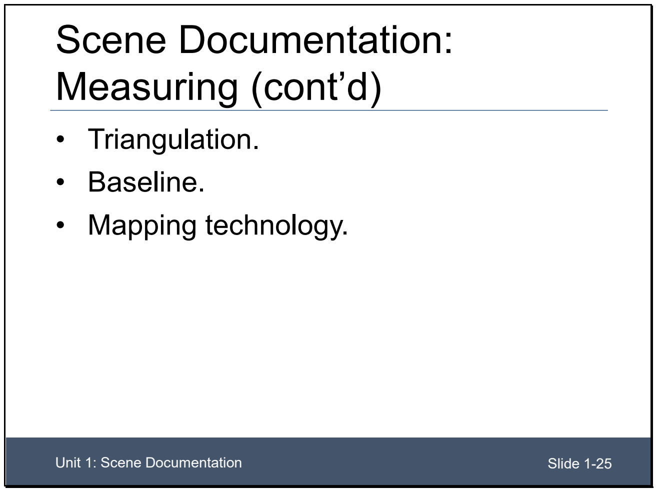
Key Information

When identifying, documenting and collecting evidence, care should be taken to provide the relationship of the item within the scene. This can be accomplished by measuring the item(s) to known locations within or around the scene.

There are several factors to consider when determining the best way to measure the location, including:

- Interior versus exterior.
- Location of fixed or permanent locations (e.g., telephone pole, corner of the room, survey marker).
- Tools (e.g., multiple measuring devices, makeshift markers).
- Obstructions (e.g., elevation, items blocking the view).

Slide 1-25: Scene Documentation: Measuring (cont'd)



Key Information

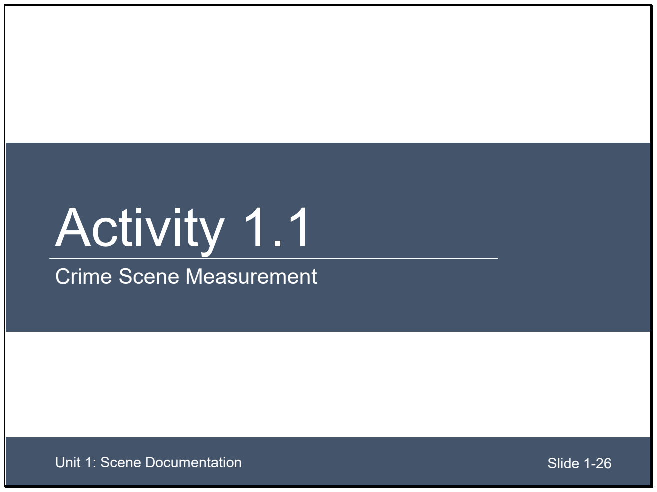
There are three primary ways to measure within the crime scene community: triangulation, baseline and mapping technology.

- Triangulation: This process can be used on almost any crime scene. A measurement is taken from two known points (the distance between the two known points is not necessarily relevant), beginning from a baseline of "0." The distance is usually calculated to the center of the object from both points and recorded.

- Baseline: This process is usually used when you have a crime scene that is long. A measuring tape (e.g., 100 feet or longer) is placed between two known points in a straight line having a baseline of "0." The piece of evidence is then measured (another tape measure) at a 90-degree angle from the original line (baseline of "0"). The distance from each baseline is measured.

- Mapping technology: This process uses technology (e.g., laser on a tripod to a measuring device) to gather the information. The information is either loaded into a computer or the device has a built-in system to record the data. The data can then be laid on a map or onto a computer diagram.

Slide 1-26: Activity 1.1



Activity Estimated Time: 60 minutes

Activity Purpose

This activity provides students with an opportunity to practice measuring a crime scene. Students will build a grid box in an open field to practice common search methods.

Activity Directions

1. Build a 9-foot-by-9-foot grid box, including four corners and string running parallel and vertical at 3-foot intervals. Label each square “A,” “B,” “C,” “D,” “E,” “F,” “G,” “H” and “I.” The lower-left corner of each of the labeled squares is the “0” starting point for measurements.

2. Triangulate the grid box from known locations.

3. Demonstrate each of the search methods (i.e., spiral, zone, line and grid) in an open field.

Tools

Three-foot long sticks (four), hammer, construction string, black marker, 3-inch by 5-inch card to mark boxes, marking flags, tape measure, camera.

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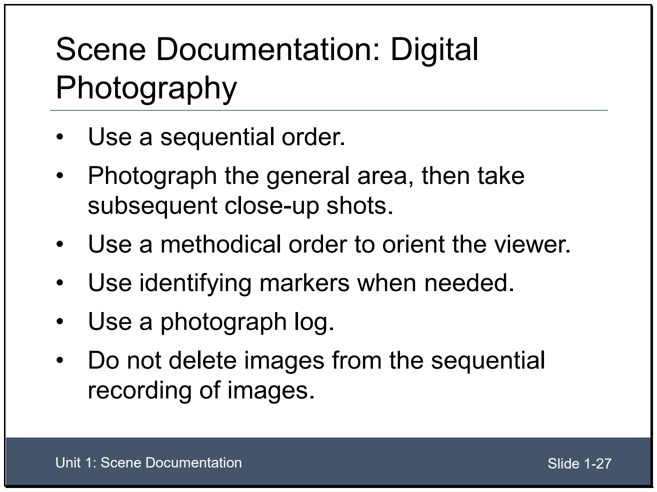
Slide 1-27: Scene Documentation: Digital Photography



Key Information

Documentation prior to and during the collection of evidence is crucial to prevent spoliation. Thorough crime scene documentation is essential to the overall ability of the investigator to provide an accurate representation of the scene. There are many ways to accomplish this task (e.g., notes, sketches, reports and photographs). One of the most effective means of documenting any scene is the use of digital photography.

These best practices for scene documentation using photography will help to ensure that your efforts are successful and timely:

- Order the collection of digital images or photographs sequentially.

- Photograph the general area surrounding the scene to orient the viewer, then take close-up shots of the documented subject.

- Take photos in a methodical order to orient the viewer (e.g., wide area shots progressing to close-up shots).

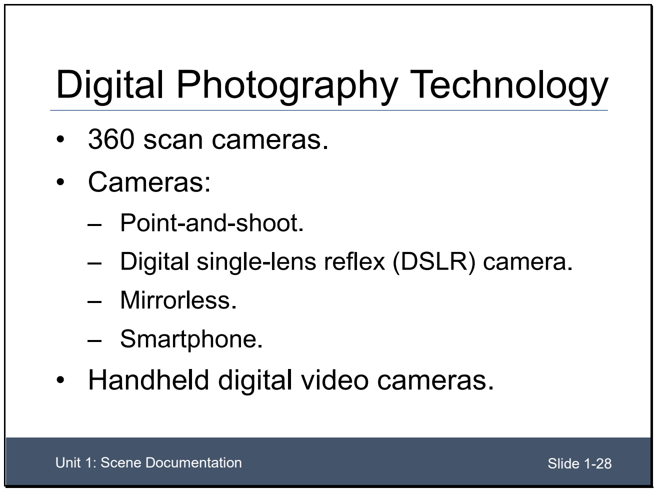
- Use identifying markers when needed.

- Use a photograph log to record pertinent data (see Appendix A: Photo Log).

- Do not delete images from the sequential recording of images.

- Do not mix candid scene photos with crime scene photos.

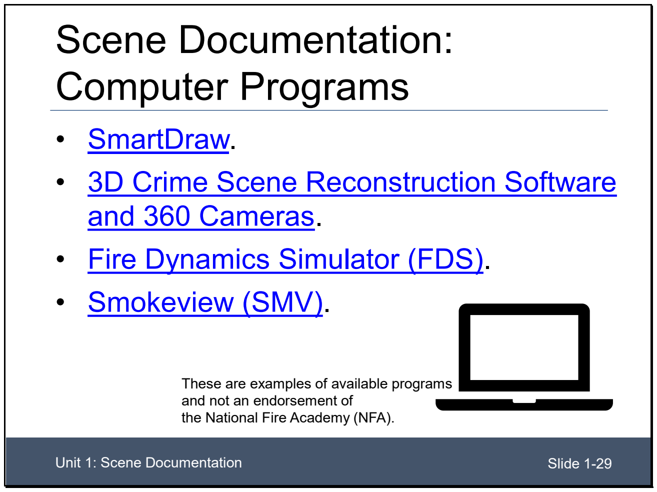
Slide 1-28: Digital Photography Technology



Key Information

- **360 scan cameras:** There are several affordable models available from various manufacturers. These can be operated remotely and provide demonstrative evidence for the courtroom.
  - OSCR 360 by L-Tron.
  - CSi360 Camera Systems.
- **Cameras:**
  - Digital.
  - Pixel strength for clarity of image.
  - Models.
    - Point-and-shoot: compact with a fixed and variable focal length.
    - Digital single-lens reflex (DSLR) camera: detachable lens, recording videos, RAW format.
    - Mirrorless: no optical viewfinder.
    - Smartphone cameras: less picture detail; replaced point-and-shoot. Remember, if you use your personal phone, your phone can be preserved as evidence and the entire contents examined.
- **Video:** Handheld digital video cameras allow for a continuous systematic approach to recording the scene.

Slide 1-29: Scene Documentation: Computer Programs



Key Information

Some computer programs available to assist in fire scene documentation include:

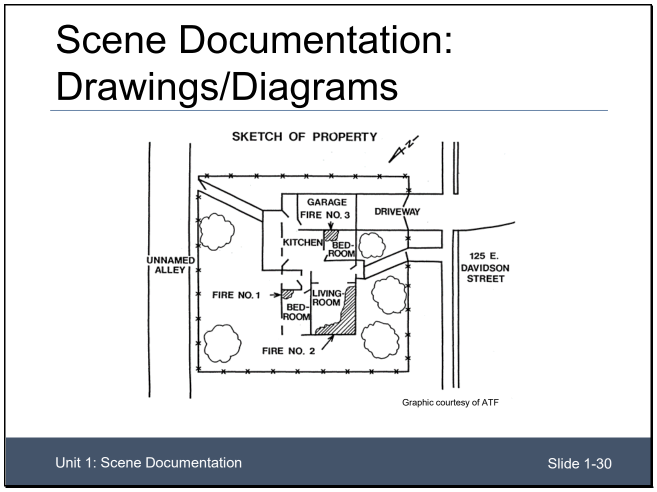
- **SmartDraw:** This program, like other specialty programs, allows the recreation of a crime scene in order to document the investigation and forensics evidence. Any crime scene diagram starts with a floor plan of where the crime was committed: a home, office, street or business.

- **3D Crime Scene Reconstruction Software +360 Cameras:** These programs combine crime scene software and 360 scan cameras to present a visual presentation of the scene as processed.

- **Fire Dynamics Simulator (FDS) and Smokeview (SMV):** This program by the National Institute of Standards and Technology (NIST) is, "a computational fluid dynamics (CFD) model of fire-driven fluid flow. FDS solves numerically a form of the Navier-Stokes equations appropriate for low-speed … thermally-driven flow with an emphasis on smoke and heat transport from fires" (NIST, 2013b, p. 3).

Please note: These products are not endorsed by the NFA.

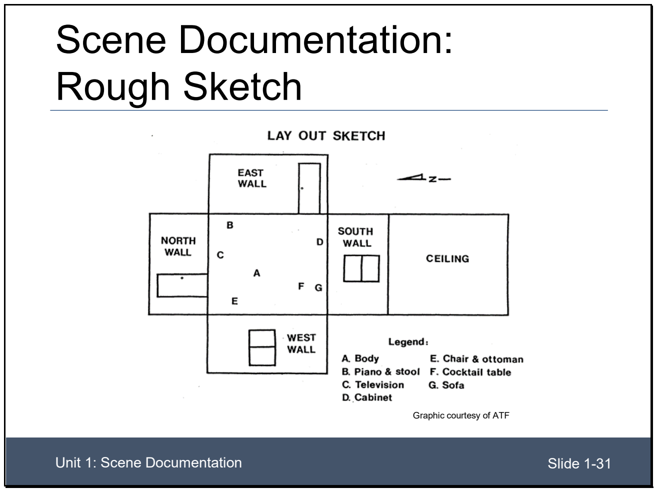
Slide 1-30: Scene Documentation: Drawings/Diagrams



Key Information

In addition to software programs, investigators sketch drawings and diagrams to document fire scenes. These documents include quickly drawn rough sketches and more detailed final sketches.

Slide 1-31: Scene Documentation: Rough Sketch

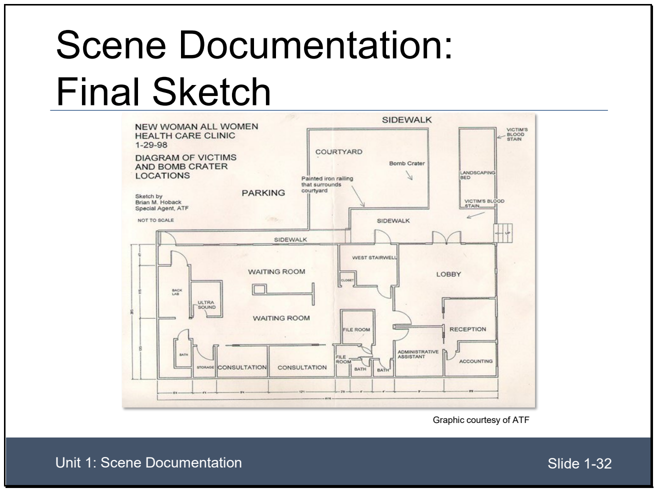


Key Information

A rough sketch can:

- Be completed on the scene.
- Provide the investigator the ability to record details not necessarily captured through other means (e.g., locations and direction of photographs).
- Include a legend that provides additional information (e.g., address, case number, directions, etc.).

Slide 1-32: Scene Documentation: Final Sketch

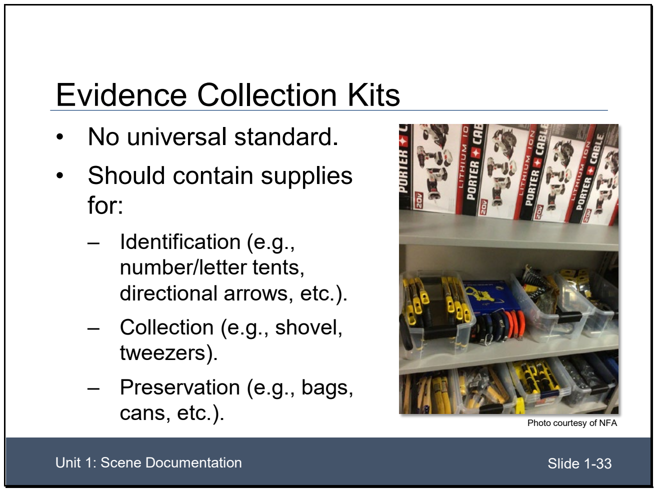


Key Information

A final sketch can be:

- Used for court presentations.
- Developed with enough time to provide adequate detail, unlike the rough sketch.
- Can be hand-drawn (i.e., mechanical pen, draft paper, ruler).
- Can be created using computer programs (e.g., SmartDraw, Crime Scene Sketch).

Slide 1-33: Evidence Collection Kits



Key Information

The forensic evidence collection kit is an important tool for the crime scene technician/investigator. Evidence collection involves not only identification but also the retrieval and preservation of an item.

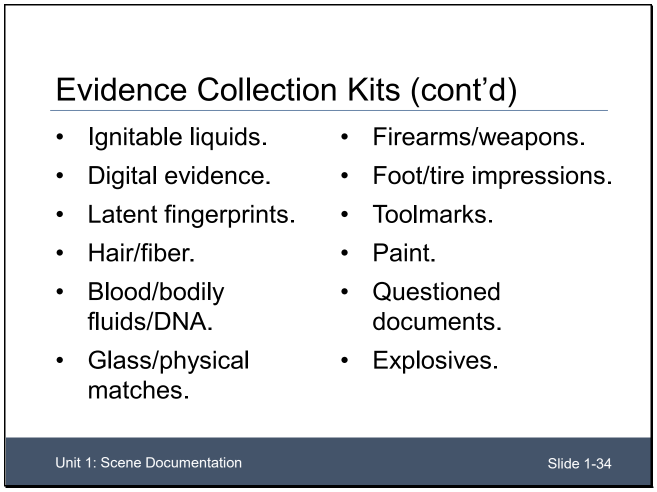
Access to adequate supplies, including collection tools, disposable items (e.g., PPE, gloves, latent print cards, etc.) and decontamination tools (e.g., plastic or metal products), allows scene personnel to document and collect any type of evidence.

There is no universal standard for establishing and maintaining a crime scene kit. At a minimum, collection kit inventory should be associated with the ability to provide identification (e.g., number/letter tents, directional arrows, etc.), collection (e.g., shovel, tweezers) and preservation (e.g., bags, cans, etc.).

The required evidence collection tools will vary depending on the crime. For example, on a crime scene involving a shooting in which a bullet is unaccounted for, the investigator may need to determine its trajectory to find a possible final resting point. This may require the use of a laser and marking tools (e.g., tape measure, marking pole, etc.), which is equipment found in a specialty crime scene unit.

When setting up an evidence collection kit, consideration should also be given to the knowledge, training and skills of the investigator. If an investigator comes upon a scene in which the proper collection tools are not available, they should know which resource to contact for access to specialty equipment and people authorized to use it when needed (e.g., the state crime scene unit).

Slide 1-34: Evidence Collection Kits (cont'd)



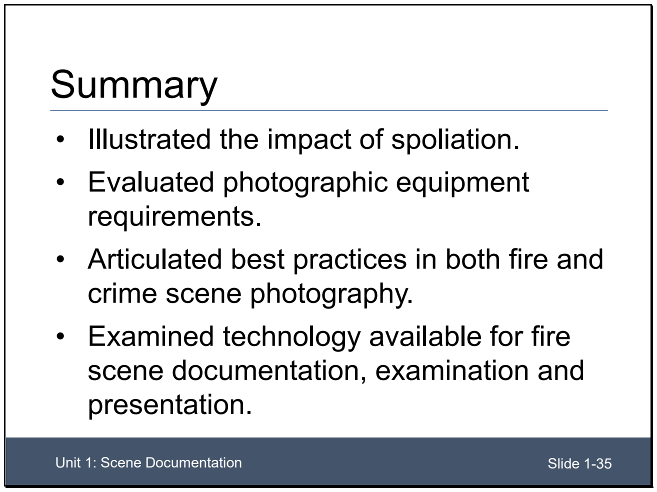
Key Information

Different types of evidence require unique tools and protocols for proper collection. See **Appendix B: Evidence Collection Kit Inventory List** for the full list of kit inventory.

This course will cover the collection of these types of evidence:

- Ignitable liquids.
- Digital evidence.
- Latent fingerprints.
- Hair/fiber.
- Blood/bodily fluids/DNA.
- Glass/physical matches.
- Firearms/weapons.
- Foot/tire impressions.
- Toolmarks.
- Paint.
- Questioned documents (e.g., wet/charred paper, impressions).
- Explosives.

Slide 1-35: Summary



Key Information

Students should now be able to:

- Illustrate the impact of spoliation.
- Evaluate photographic equipment requirements.
- Articulate best practices in both fire and crime scene photography.
- Examine technology available for fire scene documentation, examination and presentation.

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Appendix A

Photo Log

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Photo Log

Case No.: ____________________ Name: ____________________
Date: ____________________ Address: ____________________
Equipment: ____________________

Photo #	Subject or Location	Date/Time	Condition

Signature (Photographer) ____________________

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Appendix B

Evidence Collection Kit Inventory List

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Evidence Collection Kit Inventory List

Top lid

- Tweezers (one).
- Scissors (one).
- Pens (two to three).
- Fine point permanent markers (one to two).
- Eyedropper (one to two).
- Pipettes (three to four).
- Ink-remover towelettes (six to eight).
- Glass vials with caps (two to three).

Tray section

- Cotton-tipped applicators (six to eight).
- Tongue depressors (six to eight).
- Phillips-head and flathead screwdrivers (one each).
- Light and dark fingerprint powder brushes (one each).
- 1-inch rolling tape measure (one).
- 6- and 12-inch rulers (one each).
- Pocket Rod (two).
- 1- or 2-inch roll of clear fingerprint lifting tape (one).
- 4-inch roll of clear fingerprint lifting tape (one).
- Hot Shot canister (one).
- Single and multiple fingerprint lifting packets (white and/or clear) (six to eight of each).
- Utility knife (one).
- Evidence tags (six to eight).

Bottom section

- 3-by-5-inch and 5-by-8-inch white notecards (eight to 10 each).
- 3-by-5-inch black notecards (six to eight).
- Brown and white Mikrosil (one tube of each color with hardener).
- Rubber mallet (one).
- Metal or wooden spoon (one).
- Sifter/strainer (one).
- Buccal swab kits (two).
- White, black and gray/silver fingerprint powder (one jar of each).
- Paintbrush (one).
- Magnetic wand and magnetic powder (one each) (powder may be from those previously listed).
- Magnifying glass (one).

- Hairspray (one can).
- Evidence tape (one roll).
- 4-by-4-inch gauze pads (three to four).
- “L,” “T,” and 3-foot folding measuring scales (one each).
- Number tents (one to 15).
- Trowels.
- Hand rake.

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 2: Ignitable Liquid

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Integrate proper collection processes for ignitable liquids to achieve the best possible outcome during laboratory analysis.

Unit Enabling Learning Objectives (ELOs)

2.1 Evaluate ignitable liquids as forensic evidence.
2.2 Manage all aspects of ignitable liquid evidence as viable forensic evidence.
2.3 Collect ignitable liquid as forensic evidence.
2.4 Preserve ignitable liquid as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Integrate proper collection processes for ignitable liquids to achieve the best possible outcome during laboratory analysis.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Evaluate ignitable liquids as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Manage all aspects of ignitable liquid evidence as viable forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect ignitable liquid as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve ignitable liquid as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

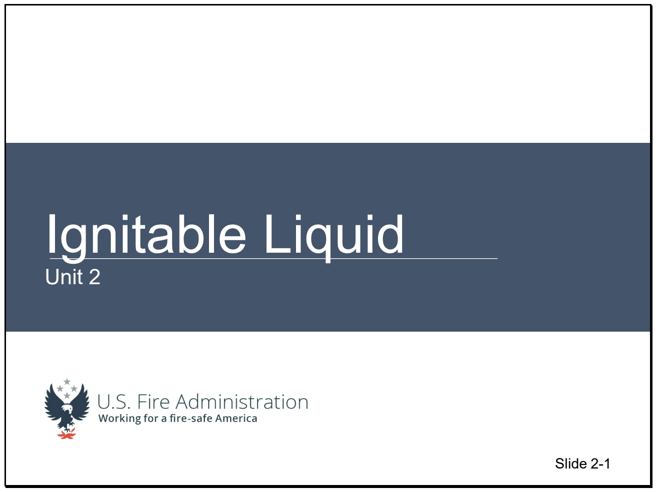
Unit Schedule

Topic	Duration
Lesson	100 min.
Activity 2.1: Ignitable Liquid: Ignition and Miscibility Testing	15 min.
Demonstration	15 min.
Activity 2.2: Ignitable Liquid: Sample Collection	30 min.
Summary	5 min.

Audiovisual

Slides 2-1 to 2-50

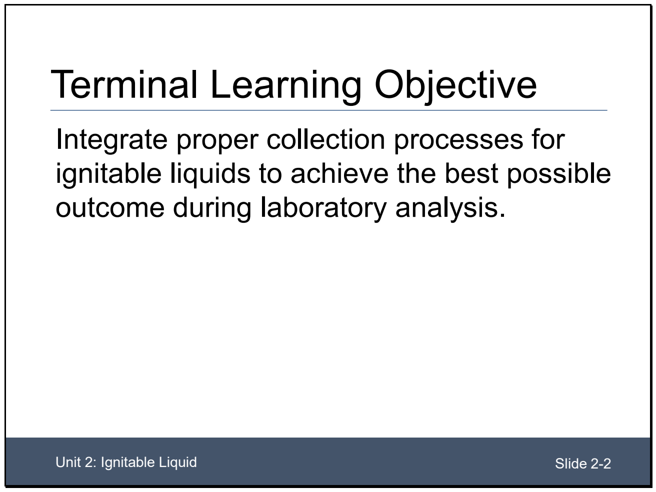
Slide 2-1: Ignitable Liquid



Key Information

Welcome to Unit 2: Ignitable Liquid!

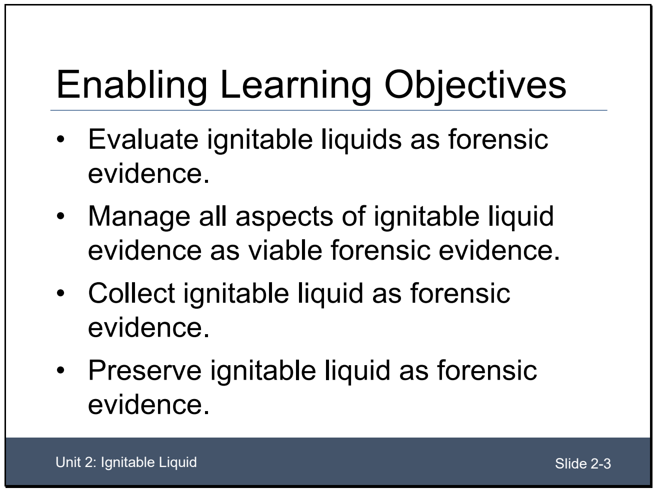
Slide 2-2: Terminal Learning Objective



Key Information

Integrate proper collection processes for ignitable liquids to achieve the best possible outcome during laboratory analysis.

Slide 2-3: Enabling Learning Objectives

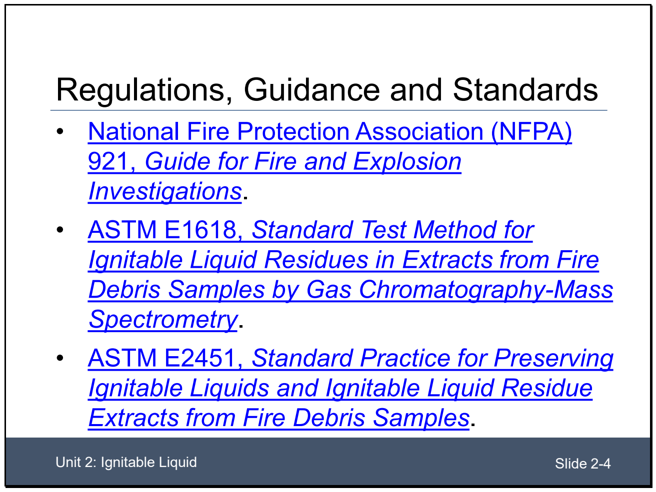


Key Information

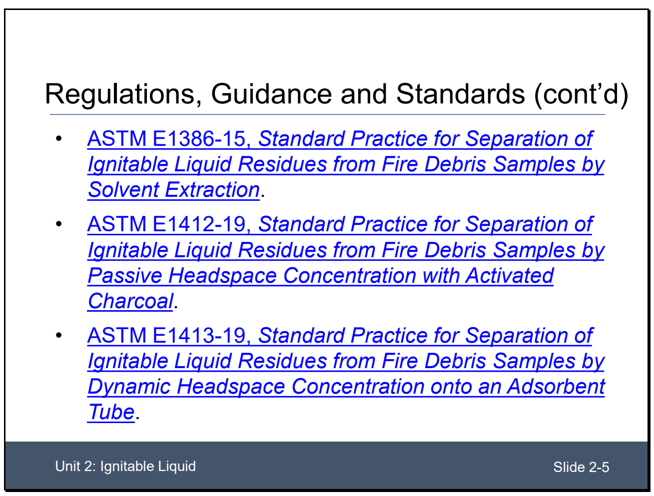
After completing this unit, students will be able to:

- Evaluate ignitable liquids as forensic evidence.
- Manage all aspects of ignitable liquid evidence as viable forensic evidence.
- Collect ignitable liquid as forensic evidence.
- Preserve ignitable liquid as forensic evidence.

Slide 2-4: Regulations, Guidance and Standards



Slide 2-5: Regulations, Guidance and Standards (cont'd)



Slide 2-6: Regulations, Guidance and Standards (cont'd)

Regulations, Guidance and Standards (cont'd)

- ASTM E3245-20e1, *Standard Guide for Systematic Approach to the Extraction, Analysis, and Classification of Ignitable Liquids and Ignitable Liquid Residues in Fire Debris Samples*.
- ASTM E3197-20, *Standard Terminology Relating to Examination of Fire Debris*.
- ASTM E1459-24, *Standard Guide for Physical Evidence Labeling and Related Documentation*.

Unit 2: Ignitable Liquid Slide 2-6

Key Information

Identifying and properly collecting ignitable liquids at a fire scene are critical elements of fire scene processing. Without proper collection, accurate laboratory analysis is not possible. Identifying an ignitable liquid residue in samples from a fire scene can support the field investigator's opinion regarding the origin, fuel load and incendiary nature of the fire (ASTM, 2019).

Regulations, Guidance and Standards

For the collection of ignitable liquids, essential sources of guidance include:

- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
- ASTM E1618-19, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry*.
- ASTM E2451-21, *Standard Practice for Preserving Ignitable Liquids and Ignitable Liquid Residue Extracts from Fire Debris Samples*.
- ASTM E1386-15, *Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction*.
- ASTM E1412-19, *Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration with Activated Charcoal*.

- ASTM E1413-19, *Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Dynamic Headspace Concentration onto an Adsorbent Tube*.

- ASTM E3245-20e1, *Standard Guide for Systematic Approach to the Extraction, Analysis, and Classification of Ignitable Liquids and Ignitable Liquid Residues in Fire Debris Samples*.

- ASTM E3197-20, *Standard Terminology Relating to Examination of Fire Debris*.

- ASTM E1459-24, *Standard Guide for Physical Evidence Labeling and Related Documentation*.

Slide 2-7: Terminology Review

Terminology Review

Accelerant	Any fuel or oxidizer, often an ignitable liquid, used to initiate, increase the rate of growth, or speed the spread of a fire; accelerant may be found in any state: solid, liquid or gas.
Ignitable liquids	Composed of combustible and flammable liquids.
Combustible liquids	“Any liquid that has a closed-cup flash point at or above 37.8°C (100°F)” (NFPA 921, 2024, Section 3.3.34).
Flammable liquids	Any “liquid that has a closed-cup flash point that is below 37.8°C (100°F)” (NFPA 921, 2024, Section 3.3.92).

Unit 2: Ignitable Liquid Slide 2-7

Key Information

Key terminology relevant to ignitable liquids includes:

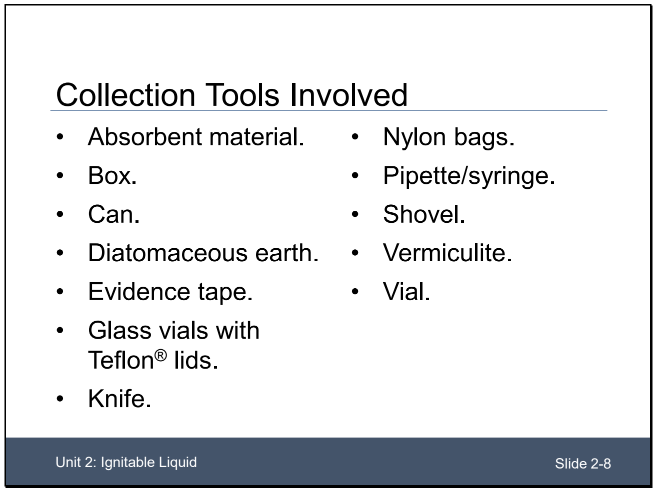
- An **accelerant** is any fuel or oxidizer, often an ignitable liquid, used to initiate, increase the rate of growth, or speed up the spread of a fire (NFPA 921, 2024, Section 3.3.2). Accelerants may be found in any state: solid, liquid or gas. Evidence for accelerant testing should be collected and tested in accordance with ASTM E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris by Gas Chromatography-Mass Spectrometry.*

- **Ignitable liquids** are composed of combustible and flammable liquids (NFPA 921, 2024, Section 3.3.116).

- **Combustible liquids** are “any liquid with a closed-cup flashpoint at or above 37.8°C (100°F)” (NFPA 921, 2024, Section 3.3.34).

- **Flammable liquids** are “liquids with a closed-cup flashpoint below 37.8°C (100°F)” (NFPA 921, 2024, Section 3.3.92).

Slide 2-8: Collection Tools Involved

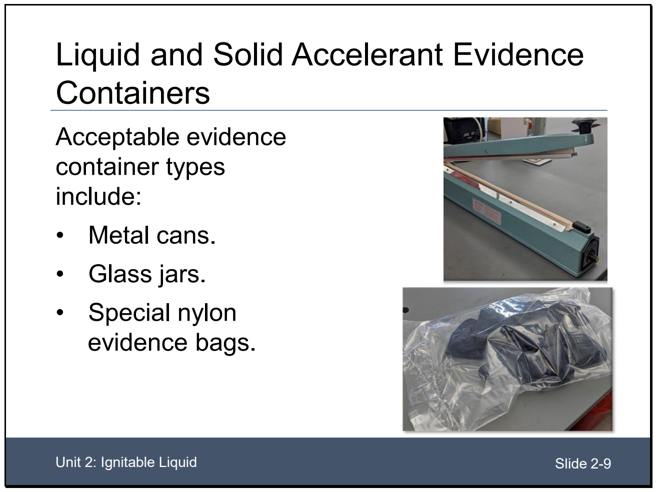


Key Information

The following items should be available at the crime scene to properly collect ignitable liquid evidence:

- Absorbent material.
- Box.
- Can.
- Diatomaceous earth.
- Evidence tape.
- Glass vials with Teflon® lids.
- Knife.
- Nylon bags.
- Pipette/syringe.
- Shovel.
- Vermiculite.
- Vial.

Slide 2-9: Liquid and Solid Accelerant Evidence Containers



Key Information

It is recommended that containers used for the collection of liquid and solid accelerant evidence be limited to three types. These include:

- Metal cans.
- Glass jars.
- Special nylon evidence bags.

The investigator should be concerned with preventing the evaporation of the accelerant and its contamination. It is important that the container is completely sealed to prohibit such evaporation or contamination.

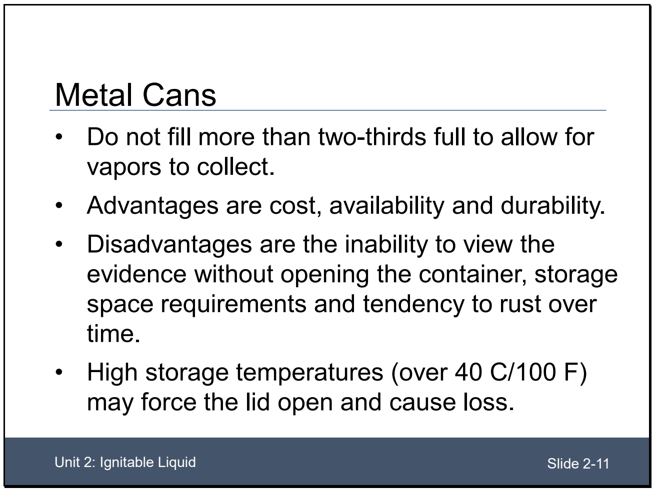
Slide 2-10: Evidence Containers

Key Information

This slide shows the three types of liquid and solid accelerant evidence containers.

Note: Glass vials should have Teflon seal caps, not rubber or plastic caps that can be destroyed by ignitable liquid.

Slide 2-11: Metal Cans



Key Information

The recommended container for collecting liquid and solid accelerant evidence is a new, clean, metal can. To allow space for vapors to collect, the can should not be more than two-thirds full.

The advantages of using metal cans include:

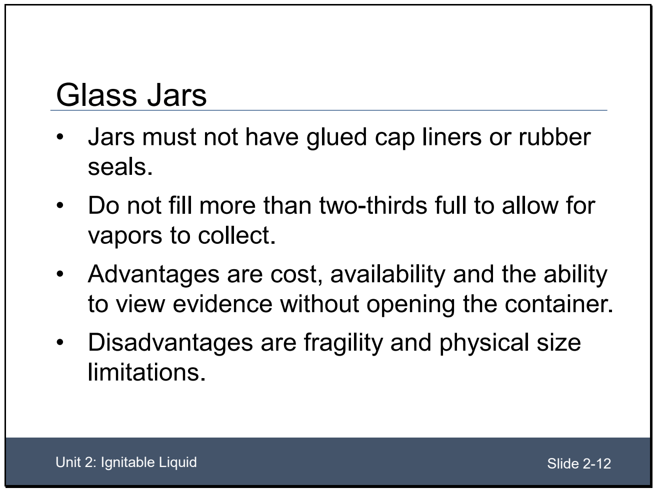
- Availability.
- Low cost.
- Durability.
- Ability to prevent the evaporation of volatile liquids.

The disadvantages of using metal cans include:

- Inability to view the evidence without opening the container.
- Space requirements for storage.
- Tendency to rust when stored for long periods.

If metal cans are used to store bulk quantities of volatile liquids, such as gasoline, high storage temperatures (above 40 C/100 F) can produce sufficient vapor pressure to force the lid open and cause a loss of the sample. For such samples, glass jars may be more appropriate.

Slide 2-12: Glass Jars



Key Information

Glass jars can also be used to collect liquid and solid accelerant evidence. It is important that the jars not have glued cap liners or rubber seals, especially when bulk liquids are collected. The glue often contains traces of solvent that can contaminate the sample, and rubber seals can soften or even dissolve in the presence of liquid accelerants or their vapors, allowing leakage or loss of the sample. In order to allow space for vapor samples to be taken during examination and testing, the glass jar should not be more than two-thirds full.

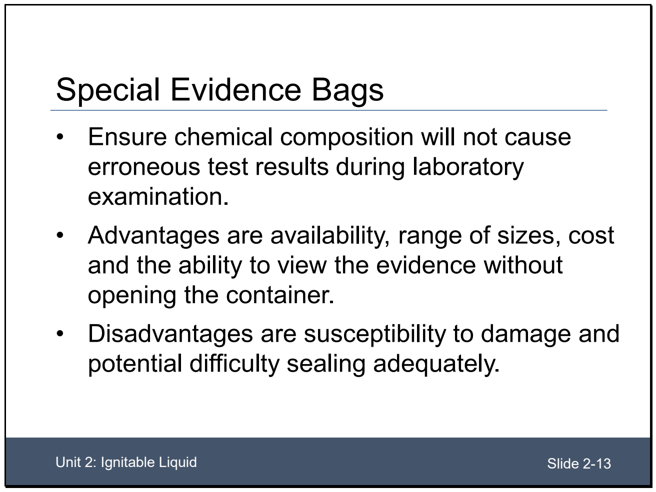
The advantages of using glass jars include:

- Availability.
- Low cost.
- Ability to view the evidence without opening the container.
- Ability to prevent the evaporation of volatile liquids.
- Lack of deterioration over long periods.

The disadvantages include:

- Fragility.
- Limited sizes available.

Slide 2-13: Special Evidence Bags



Key Information

Special bags, designed specifically for liquid and solid accelerant evidence, can also be used for collection. Unlike common plastic evidence bags, these special evidence bags do not have a chemical composition that can cause erroneous test results during laboratory examination and testing of the physical evidence contained in such bags.

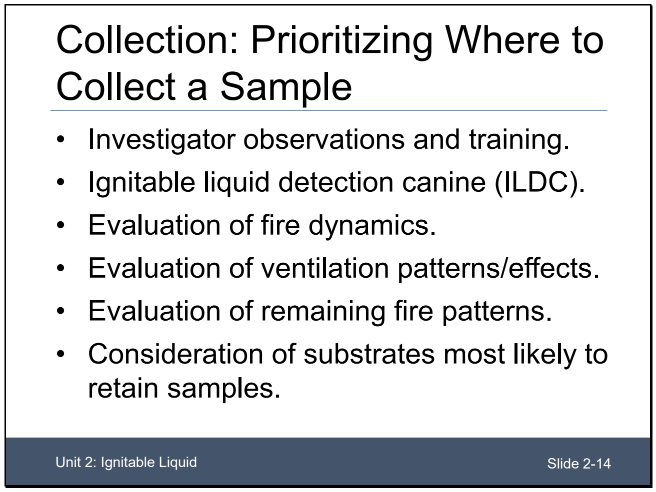
The advantages of using special evidence bags include:

- Availability in a variety of shapes and sizes.
- Low cost.
- Ability to view the evidence without opening the container.
- Ease of storage.
- Ability to prevent the evaporation of volatile liquids.

The disadvantages include:

- Susceptibility to damage resulting in contamination.
- Difficult to seal adequately.

Slide 2-14: Collection: Prioritizing Where to Collect a Sample

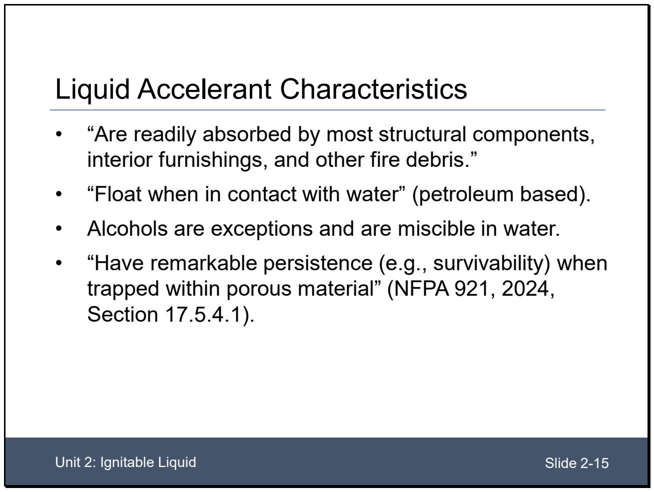


Key Information

Considerations for prioritizing where to collect a sample:

- Investigator observations and training.
- Ignitable liquid detection canine (ILDC).
- Evaluation of fire dynamics.
- Evaluation of ventilation patterns/effects.
- Evaluation of remaining fire patterns.
- Consideration of substrates most likely to retain samples.

Slide 2-15: Liquid Accelerant Characteristics

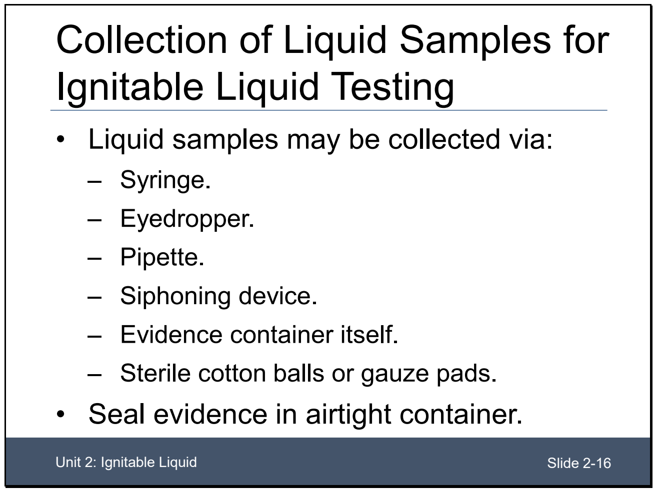


Key Information

“Liquid accelerants have unique characteristics directly related to their collection as physical evidence” (NFPA 921, 2024, Section 17.5.4.1). In general, liquid accelerants:

- “Are readily absorbed by most structural components, interior furnishings, and other fire debris.”
- “Float when in contact with water” (petroleum based).
- Alcohols are exceptions and are miscible in water.
- “Have remarkable persistence (e.g., survivability) when trapped within porous material.”

Slide 2-16: Collection of Liquid Samples for Ignitable Liquid Testing



Key Information

When a possible ignitable liquid is found in a liquid state, it can be collected using various methods. If readily accessible, the liquid may be collected with a new syringe, eyedropper, pipette, siphoning device or the evidence container itself.

Sterile cotton balls or gauze pads may also be used to absorb the liquid. This method of collection results in the liquid becoming absorbed, at which point, the cotton balls/gauze pads and their absorbed contents become the physical evidence that should be sealed in an airtight container and submitted to the laboratory for examination and testing.

Slide 2-17: Liquid Samples

Liquid Samples

- **Preferred method:**
  - Pipette 2 to 4 milliliters into clean glass vials w/Teflon cap.
  - Place vial in steel can or evidence bag with packing material to prevent breakage.

Unit 2: Ignitable Liquid Slide 2-17

Slide 2-18: Liquid Samples (cont'd)

Liquid Samples (cont'd)

- **Alternative method:**
  - Absorb onto gauze or cotton and place in steel can or fire debris evidence bag.
  - Absorbent materials (e.g., cat litter, diatomaceous earth, etc.) may be used.
  - Submit comparison sample of absorbent.

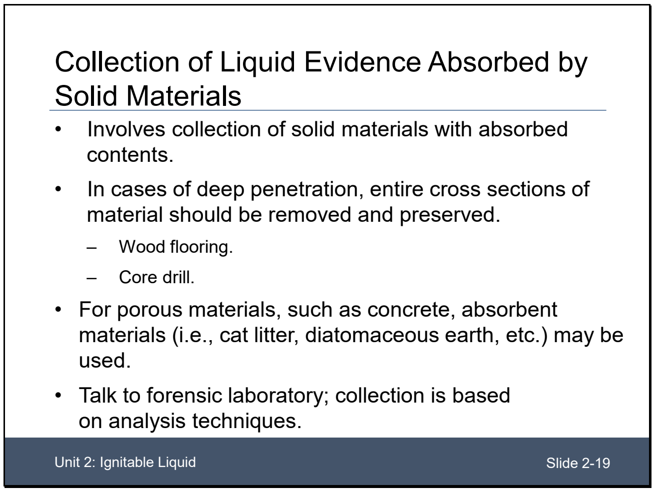
Unit 2: Ignitable Liquid Slide 2-18

Key Information

- **Preferred method:**
  - Pipette 2 to 4 milliliters into clean glass vials with a Teflon cap.
  - Place vial in steel can or evidence bag with packing material to prevent breakage.

- **Alternative method:**
  - Absorb onto gauze or cotton and place in a steel can or fire debris evidence bag.
  - Absorbent materials (e.g., cat litter, diatomaceous earth, etc.) may be used.
  - Submit a comparison sample of absorbent.

Slide 2-19: Collection of Liquid Evidence Absorbed by Solid Materials



Key Information

Often, liquid accelerant evidence may be found only where the liquid accelerant has been absorbed by solid materials, including soils and sands. In this case, the collection method merely involves collecting these solid materials with their absorbed contents.

- The collection of these solid materials may be accomplished by scooping them with the evidence container or cutting, sawing or scraping.
- Raw, unsealed or sawed edges; ends; nail holes; cracks; knot holes; and other similar areas of wood, plaster, sheetrock, mortar or concrete are particularly good areas to sample.

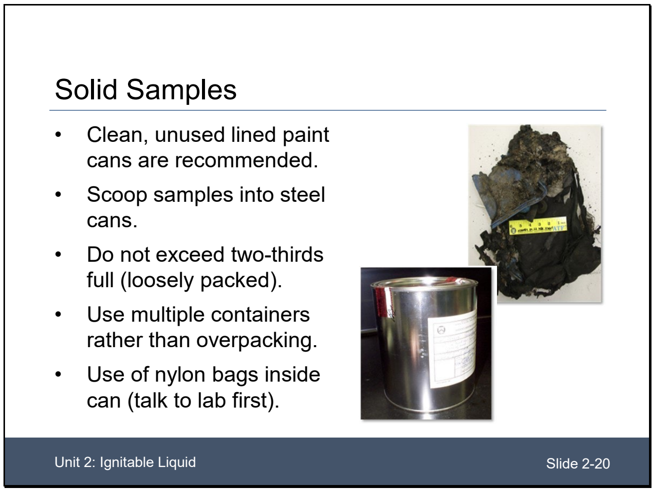
If deep penetration is suspected, the entire cross section of material should be removed and preserved for laboratory evaluation. In materials such as soil or sand, the liquid accelerant may absorb deeply. In such instances, the investigator should remove samples from a greater depth.

In situations where liquid accelerants are believed to have become trapped in a porous material, such as a concrete floor, the fire investigator may use absorbent materials such as lime, diatomaceous earth, cat litter or non-self-rising flour. This method of collection involves spreading the absorbent onto the concrete surface, allowing it to stand for 20 to 30 minutes, and securing it in a clean, airtight container. The absorbent is then extracted in the laboratory.

A sample of the unused absorbent should be preserved separately for analysis as a comparison sample.

Some accelerants may be common household materials and compounds or dangerous chemicals. Because some incendiary materials remain corrosive or reactive, care should be taken in packaging to ensure that the corrosive residues do not attack the packaging container. Corrosive or reactive materials should be handled and packaged carefully.

Slide 2-20: Solid Samples

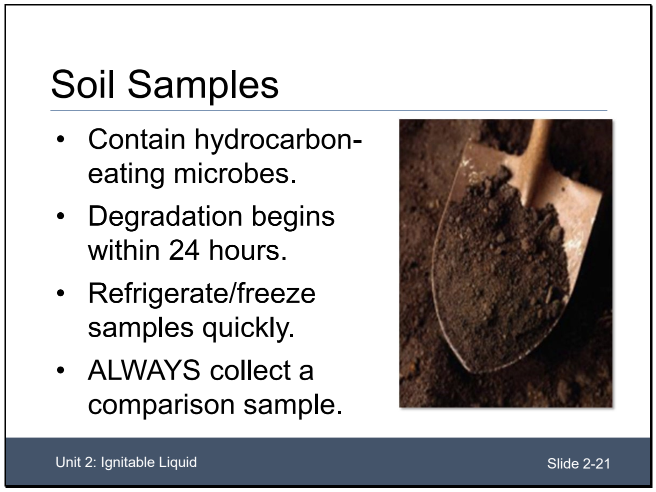


Key Information

Considerations for the collection of solid samples include:

- Clean, unused lined paint cans are recommended.
- Scoop samples into steel cans.
- Keep can loosely packed; do not exceed two-thirds full.
- Use multiple containers rather than overpacking.
- Speak with your lab before using nylon bags inside cans.

Slide 2-21: Soil Samples



Key Information

Soil sample considerations include:

- The difference in soil texture can affect the rate of metabolism of ignitable liquids due to the variance of available oxygen, nutrients and mobility of the microbial population.
- Soil samples contain hydrocarbon-eating microbes, which can cause degradation within 24 hours. Microbial degradation could lead to misclassification or the inability to identify the presence of an ignitable liquid in fire debris evidence. Refrigerate/freeze samples quickly.
- Always collect a comparison sample. As in all collections for analysis of ignitable liquids, having a comparison sample is important to assure the soil does not already have compounds that could cause a false positive.

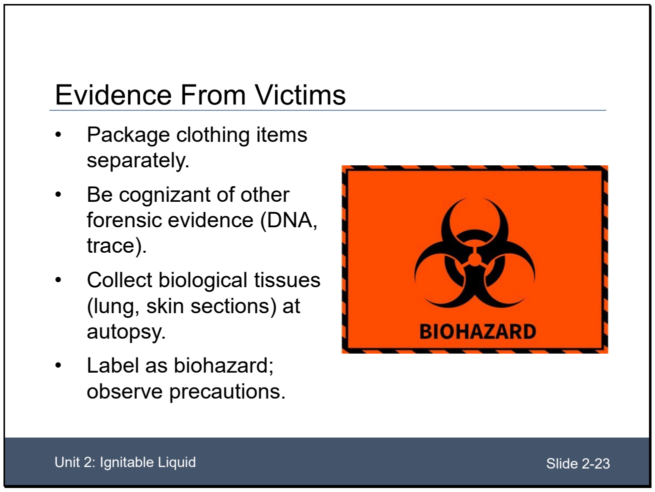
Slide 2-22: Suspect Clothing

Key Information

Considerations for the collection of suspect clothing include:

- Package each garment individually — even shoes — in a container that allows for sufficient headspace.
- Large, airtight, volatile-free evidence bags or 5-gallon metal cans are recommended.
- Cut clothing if necessary (after obtaining a search warrant).
- Use an ILDC to locate the best sample area to cut.

Slide 2-23: Evidence From Victims



Key Information

Considerations for collecting evidence from victims include:

- Package clothing items separately.
- Be cognizant of other forensic evidence (e.g., DNA, trace).
- Collect biological tissues (e.g., lung, skin sections) at autopsy.
- Collect electronic evidence on victims.
- Label as biohazard; observe precautions.

Slide 2-24: Collection: Comparison Samples

Collection: Comparison Samples

- Important for materials believed to contain ignitable liquids.
- Should be collected from an area believed to be free of accelerants.
- Allow the laboratory to evaluate possible contributions of volatile pyrolysis products and estimate the flammability properties of the normal fuel present.

Unit 2: Ignitable Liquid Slide 2-24

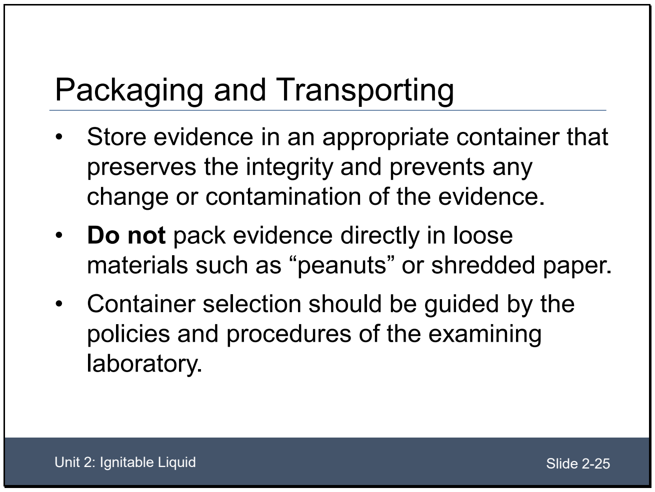
Key Information

When physical evidence is collected for examination and testing, it is often necessary to also collect comparison samples. The collection of comparison samples is especially important for materials that are believed to contain liquid or solid accelerants. For example, the comparison sample for physical evidence consisting of a piece of carpeting believed to contain a liquid accelerant would be a piece of the same carpeting that does not contain any liquid accelerant. Comparison samples allow the laboratory to evaluate the possible contributions of volatile pyrolysis products to the analysis and to estimate the flammability properties of the normal fuel present.

When collected to identify the presence of accelerant residue, the comparison sample should be collected from an area that the investigator believes is free of such accelerants, such as under furniture or in areas that have not been involved in the fire.

Assuming that the comparison sample tests negative for ignitable liquids, any ignitable liquids found in the suspect sample may be foreign to the area where the suspect sample was taken.

Slide 2-25: Packaging and Transporting



Key Information

Once collected, physical evidence should be placed and stored in an appropriate evidence container.

Like the collection of the physical evidence itself, selecting an appropriate evidence container also depends on the physical state, physical characteristics, fragility and volatility of the physical evidence. The evidence container should preserve the integrity of the evidence and should prevent any change to, or contamination of, the evidence.

- Evidence should not be packed directly in loose packing materials, such as “peanuts” or shredded paper.
- The evidence must be placed in a proper bag or container to avoid the loss of small items.
- Alternatively, the packing material can be placed in bags and packed around the evidence.

Evidence containers may be common items, such as envelopes, paper bags, plastic bags, glass containers or metal cans, or they may be containers specifically designed for certain types of physical evidence. The investigator’s selection of an appropriate evidence container should be guided by the policies and procedures of the laboratory that will examine or test the physical evidence or the use to which the evidence will be subjected.

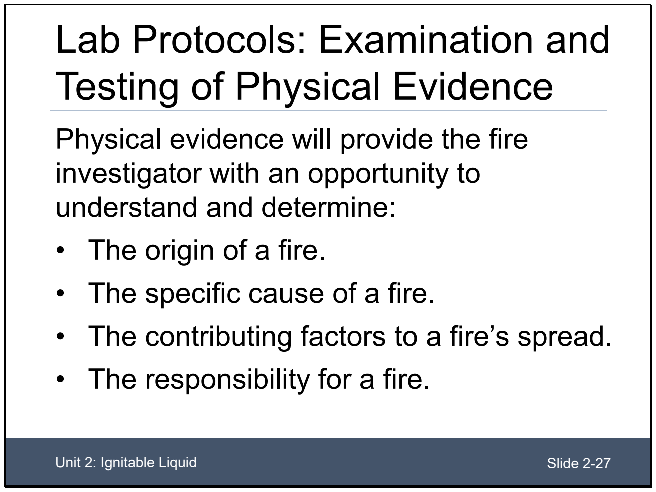
Slide 2-26: Packaging and Transporting Precautions

Key Information

Considerations for packaging and transporting include:

- Safety should always be the first priority.
- Common household items can ignite when mixed.

Slide 2-27: Lab Protocols: Examination and Testing of Physical Evidence



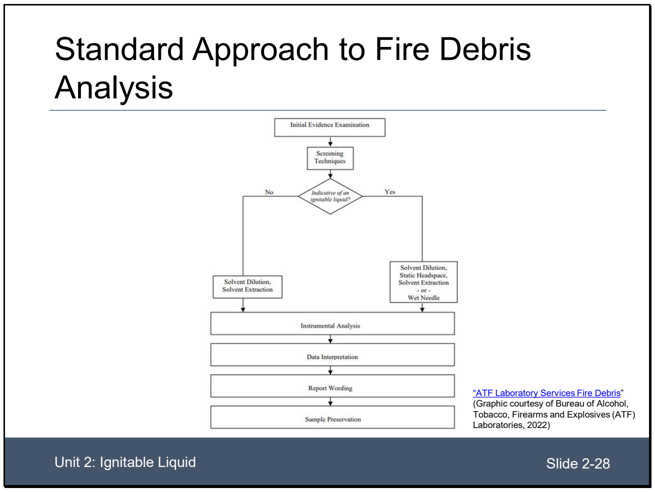
Key Information

Once collected, physical evidence is usually examined and tested in a laboratory or other testing facility. Physical evidence may be examined and tested to identify its chemical composition and establish its physical properties. This information will provide the fire investigator with an opportunity to understand and determine:

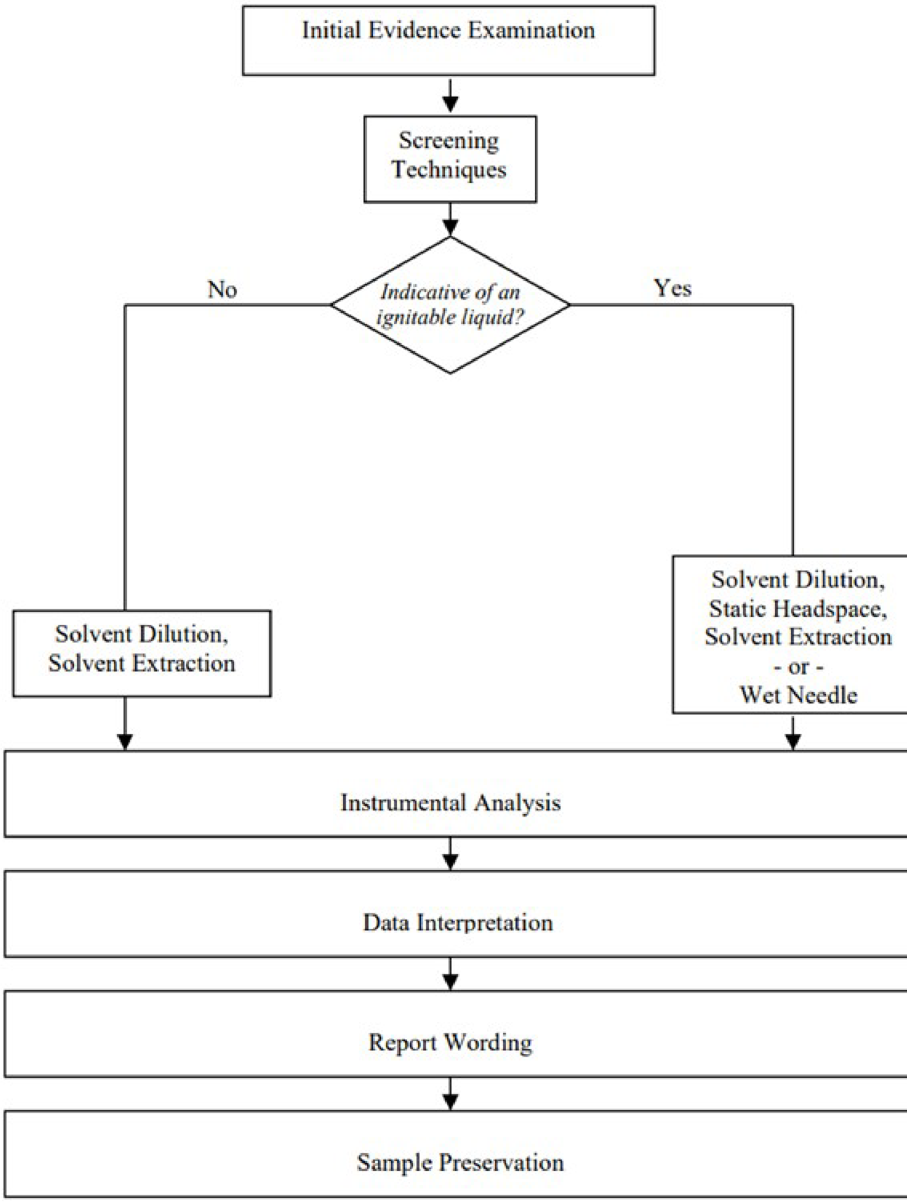
- The origin of a fire.
- The specific cause of a fire.
- The contributing factors to a fire's spread.
- The responsibility for a fire.

The investigator should consult with the laboratory or other testing facility to determine what specific services are provided and what limitations are in effect.

Slide 2-28: Standard Approach to Fire Debris Analysis



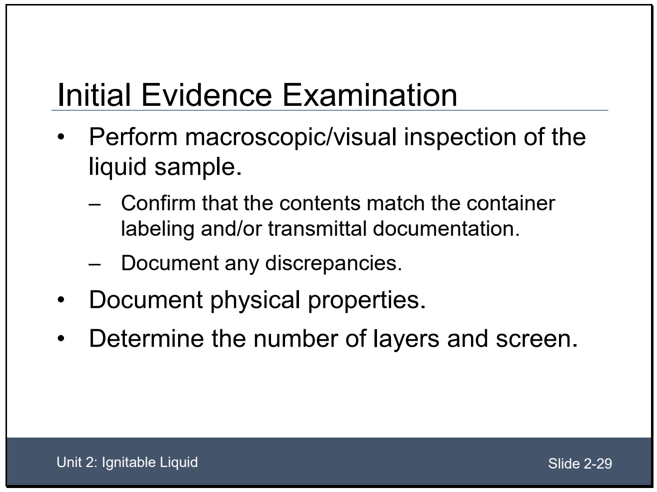
Key Information



"ATF Laboratory Services Fire Debris" (Graphic courtesy of Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) Laboratories, 2022)

The slides will review each step of this process.

Slide 2-29: Initial Evidence Examination

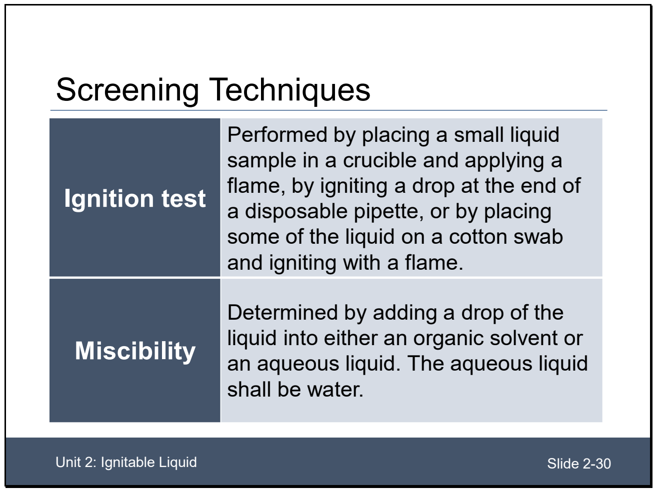


Key Information

Once the chemist obtains evidence, the examination involves several steps:

- Perform a macroscopic/visual inspection of the liquid sample:
  - Confirm that the contents match the container labeling and transmittal documentation.
  - Document any discrepancies.
- Note and document the physical properties of the sample, such as:
  - Color.
  - Clarity.
  - Viscosity.
  - Obvious odors.
- If only one layer is present, the layer is assumed to be homogeneous and shall be screened.
- If multiple layers are present, each layer is assumed to be homogeneous and, if possible, shall be screened.

Slide 2-30: Screening Techniques



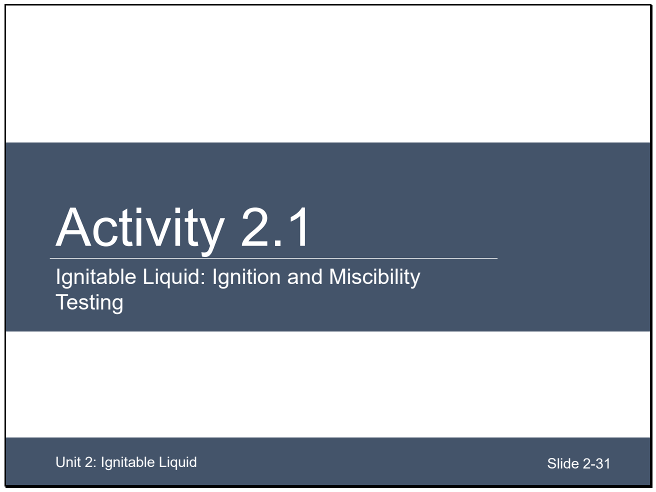
Key Information

When sufficient volume is available, at least one screening technique (ignition test or miscibility) can be performed at the examiner's discretion.

- The ignition test can be performed by placing a small sample in a crucible and applying a flame, igniting a drop at the end of a disposable pipette, or placing some of the liquid on a cotton swab and igniting with a flame.

- Miscibility is determined by adding a drop of the liquid into either an organic solvent or an aqueous liquid. The aqueous liquid shall be water.

Slide 2-31: Activity 2.1



Activity Estimated Time: 30 minutes

Activity Purpose

The purpose of this exercise is for students to practice performing ignition and miscibility testing and to interpret the results through group and class discussion.

Activity Directions: Ignition Test

1. Working in pairs, use the provided pipette to place a drop of the unknown liquid into the crucible.

2. Apply a flame to the drop.

3. Be prepared to describe your observations to the class.

   a. Do the liquid vapors ignite?

   b. If they ignite, do they have to be "warmed up" first?

Activity Directions: Miscibility Test

1. Working in pairs, pour water into the beaker.

2. Add a drop of the unknown liquid into the beaker.

3. Be prepared to describe your observations to the class; state whether the specific gravity of the unknown liquid is:

    a. = 1.

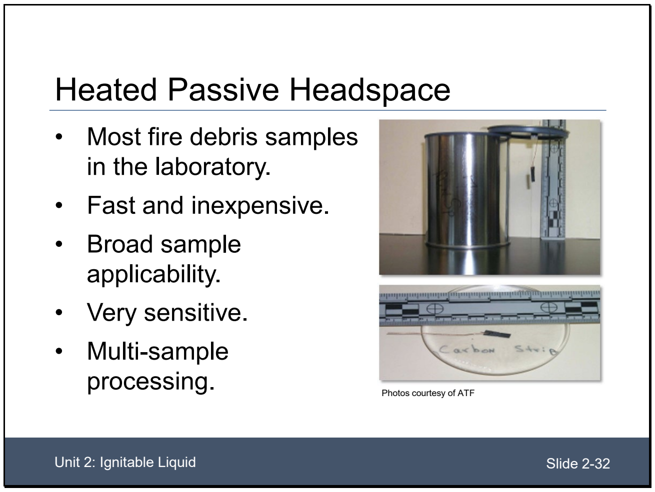
    b. < 1.

    c. > 1.

Tools

Beakers, crucibles, liquid samples, pipettes, water.

Slide 2-32: Heated Passive Headspace

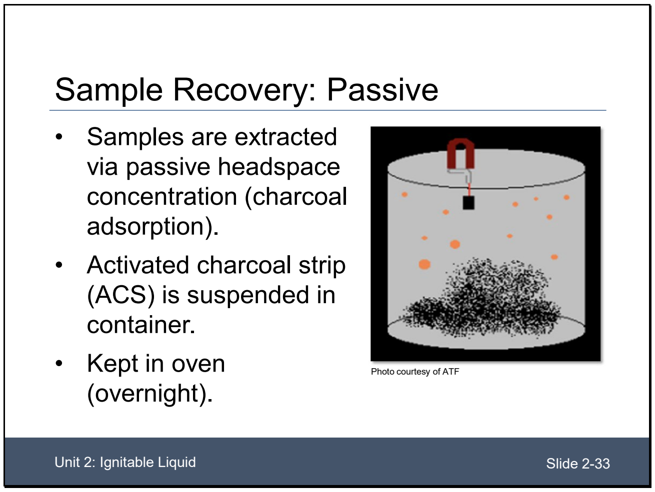


Key Information

Heated passive headspace attributes include:

- Fast and inexpensive.
- Broad sample applicability.
- Very sensitive.
- Multi-sample processing.

Slide 2-33: Sample Recovery: Passive

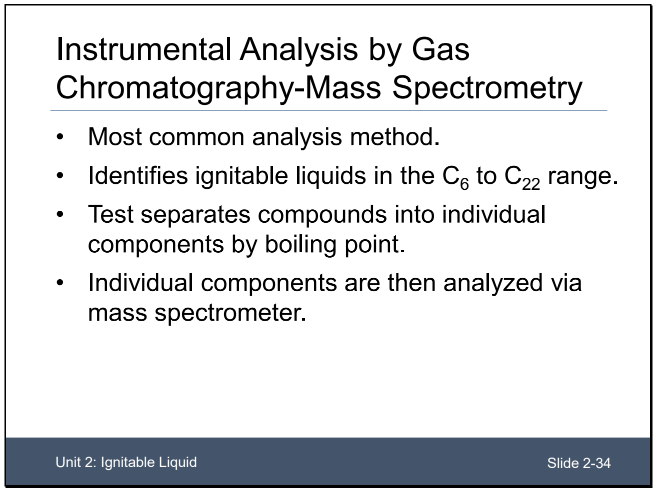


Key Information

Passive sample recovery process:

- Samples are extracted via passive headspace concentration (charcoal adsorption).
- Activated charcoal strip (ACS) is suspended in a container.
- Kept in an oven (overnight).

Slide 2-34: Instrumental Analysis by Gas Chromatography-Mass Spectrometry

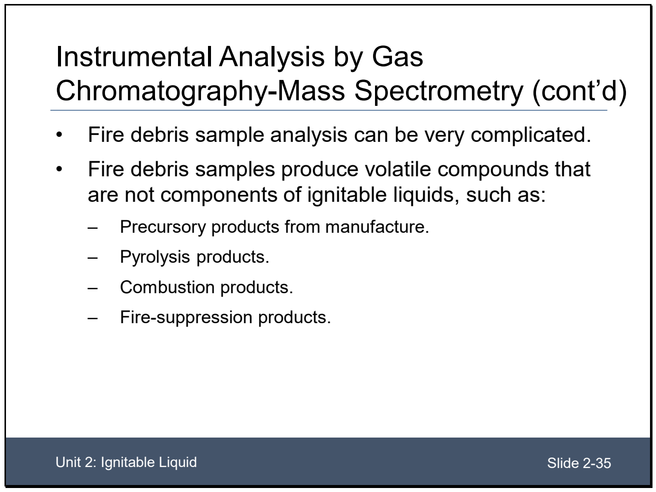


Key Information

After the initial physical examination and sample extraction (see previous slide), the next step is to perform a chemical analysis. **Gas Chromatography-Mass Spectrometry** (**GC-MS**) is used to analyze unknown liquid samples to identify ignitable liquids in the C_6 (i.e., hexane) to C_{22} (i.e., docosane) range. Most ignitable liquids are mixtures containing many different compounds. A GC-MS test separates the compounds into their individual components by boiling point, then further analyzes the individual components by providing data about the size of fragments (i.e., ions) produced in the mass spectrometer.

The ASTM E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry*, is the most common test. Chemists must classify their samples according to ASTM E1618.

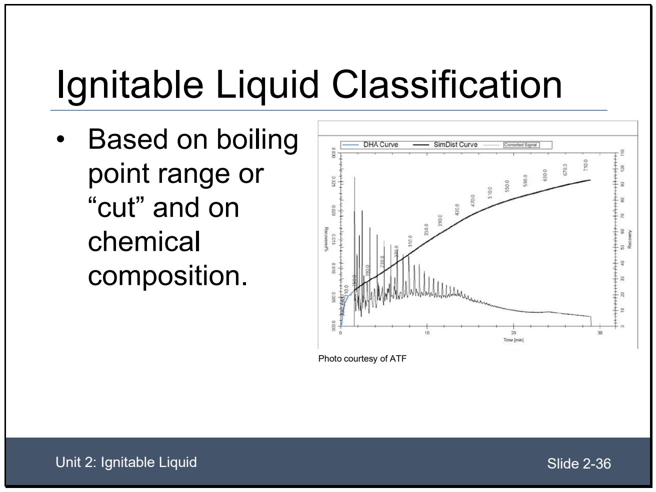
Slide 2-35: Instrumental Analysis by Gas Chromatography-Mass Spectrometry (cont'd)



Key Information

GC-MS is not a simple test. It takes a qualified chemist to understand the complex compounds often found in GC-MS analysis results.

Slide 2-36: Ignitable Liquid Classification



Key Information

Ignitable liquid classification is based on boiling point range or "cut" and chemical composition.

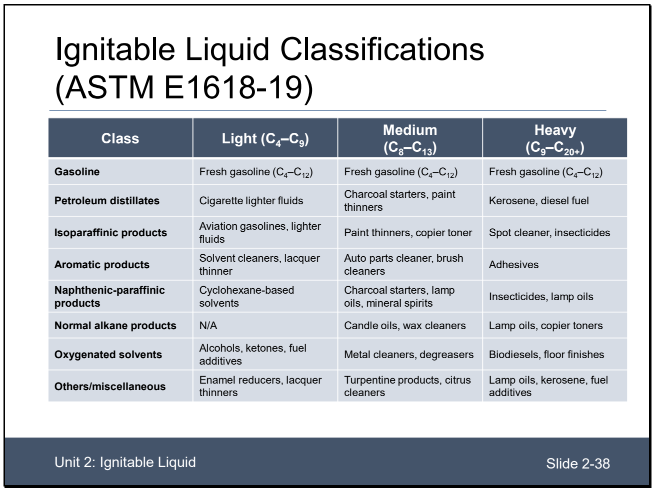
Slide 2-37: Ignitable Liquid Classification (cont'd)

Key Information

Ignitable liquid classification considerations include:

- Petroleum products are classified, not identified.
- Same product may be marketed under a variety of end uses or brand names.

Slide 2-38: Ignitable Liquid Classifications (ASTM E1618-19)



Class	Light (C_4–C_9)	Medium (C_8–C_{13})	Heavy (C_9–C_{20+})
Gasoline	Fresh gasoline (C_4–C_{12})	Fresh gasoline (C_4–C_{12})	Fresh gasoline (C_4–C_{12})
Petroleum distillates	Cigarette lighter fluids	Charcoal starters, paint thinners	Kerosene, diesel fuel
Isoparaffinic products	Aviation gasolines, lighter fluids	Paint thinners, copier toner	Spot cleaner, insecticides
Aromatic products	Solvent cleaners, lacquer thinner	Auto parts cleaner, brush cleaners	Adhesives
Naphthenic-paraffinic products	Cyclohexane-based solvents	Charcoal starters, lamp oils, mineral spirits	Insecticides, lamp oils
Normal alkane products	N/A	Candle oils, wax cleaners	Lamp oils, copier toners
Oxygenated solvents	Alcohols, ketones, fuel additives	Metal cleaners, degreasers	Biodiesels, floor finishes
Others/miscellaneous	Enamel reducers, lacquer thinners	Turpentine products, citrus cleaners	Lamp oils, kerosene, fuel additives

Key Information

Class	Light (C_4–C_9)	Medium (C_8–C_{13})	Heavy (C_9–C_{20+})
Gasoline	Fresh gasoline (C_4–C_{12})	Fresh gasoline (C_4–C_{12})	Fresh gasoline (C_4–C_{12})
Petroleum distillates	Cigarette lighter fluids	Charcoal starters, paint thinners	Kerosene, diesel fuel
Isoparaffinic products	Aviation gasolines, lighter fluids	Paint thinners, copier toner	Spot cleaner, insecticides
Aromatic products	Solvent cleaners, lacquer thinner	Auto parts cleaner, brush cleaners	Adhesives
Naphthenic-paraffinic products	Cyclohexane-based solvents	Charcoal starters, lamp oils, mineral spirits	Insecticides, lamp oils
Normal alkane products	N/A	Candle oils, wax cleaners	Lamp oils, copier toners
Oxygenated solvents	Alcohols, ketones, fuel additives	Metal cleaners, degreasers	Biodiesels, floor finishes
Others/ miscellaneous	Enamel reducers, lacquer thinners	Turpentine products, citrus cleaners	Lamp oils, kerosene, fuel additives

Table 1 describes the ASTM E1618-19 classification system. Chemical manufacturers may produce the same substance for multiple uses, so a single substance may appear in multiple classifications, depending on its manufactured properties and intended application.

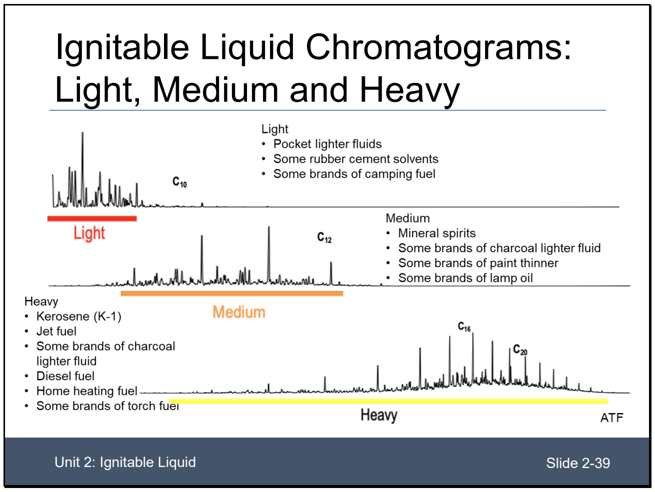
Class:

- Light (C_4-C_9).
- Medium (C_8-C_{13}).
- Heavy (C_9-C_{20+}).

Ignitable Liquids:

- Gasoline.
- Petroleum distillates.
- Isoparaffinic products.
- Aromatic products.
- Naphthenic-paraffinic products.
- Normal alkane products.
- Oxygenated solvents.
- Other/miscellaneous.

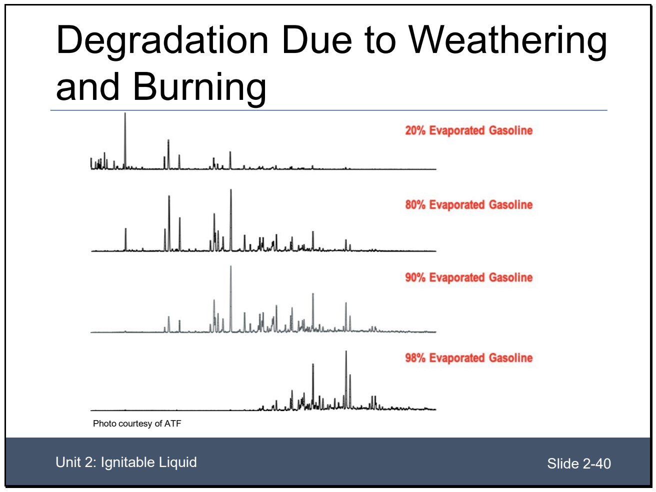
Slide 2-39: Ignitable Liquid Chromatograms: Light, Medium and Heavy



Key Information

This slide shows distillate ranges based on the number of carbons and how the products are classified.

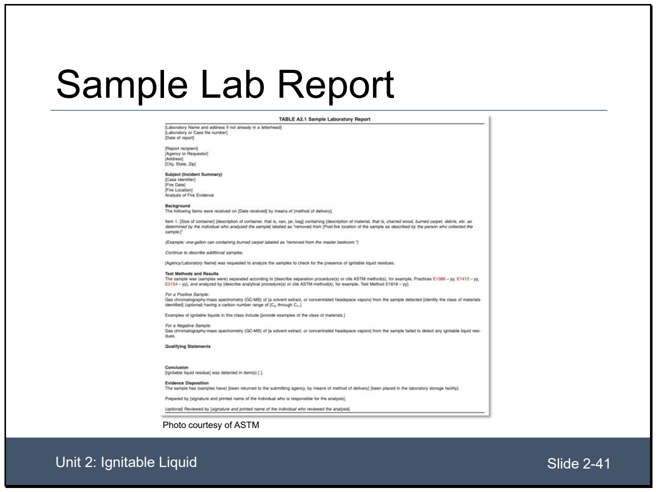
Slide 2-40: Degradation Due to Weathering and Burning



Key Information

This slide shows an example of what can occur as samples degrade and analysis classification becomes more difficult due to weathering (i.e., aging) or burning.

Slide 2-41: Sample Lab Report



Key Information

Lab report style and structure may vary depending on the laboratory and the test performed. This sample report includes:

- Laboratory identification.
- Report recipient information.
- Subject identification (incident summary).
- Background.
- Test methods and results.
- Qualifying statements.
- Conclusion.
- Evidence disposition.

Note: Once a lab analyzes a sample, a separate lab should not do the same analysis on the same sample.

Sample ASTM and ATF lab reports are provided beginning on the next page.

Example: ASTM Lab Report

E1618 – 19

A2. SAMPLE LABORATORY REPORT

A2.1 See Table A2.1.

TABLE A2.1 Sample Laboratory Report

[Laboratory Name and address if not already in a letterhead]
[Laboratory or Case file number]
[Date of report]

[Report recipient]
[Agency or Requestor]
[Address]
[City, State, Zip]

Subject (Incident Summary)
[Case Identifier]
[Fire Date]
[Fire Location]
Analysis of Fire Evidence

Background
The following items were received on [Date received] by means of [method of delivery].

Item 1. [Size of container] [description of container, that is, can, jar, bag] containing [description of material, *that is, charred wood, burned carpet, debris, etc. as determined by the individual who analyzed the sample*] labeled as "removed from [Post-fire location of the sample as *described by the person who collected the sample.*]"

(Example: one-gallon can containing burned carpet labeled as "removed from the master bedroom.")

Continue to describe additional samples.

[Agency/*Laboratory Name*] was requested to analyze the samples to check for the presence of ignitable liquid residues.

Test Methods and Results
The sample was (samples were) separated according to [describe separation procedure(s) or cite ASTM method(s), for example, Practices E1386 – yy, E1412 – yy, E2154 – yy], and analyzed by [describe analytical procedure(s) or cite ASTM method(s), for example, Test Method E1618 – yy].

For a Positive Sample:
Gas chromatography-mass spectrometry (GC-MS) of [a solvent extract, or concentrated headspace vapors] from the sample detected [identify the class of materials identified] (*optional*) having a carbon number range of [C_X through C_Y.]

Examples of ignitable liquids in this class include [provide examples of the class of materials.]

For a Negative Sample:
Gas chromatography-mass spectrometry (GC-MS) of [a solvent extract, or concentrated headspace vapors] from the sample failed to detect any ignitable liquid residues.

Qualifying Statements

Conclusion
[Ignitable liquid residue] was detected in item(s) [ ].

Evidence Disposition
The sample has (samples have) [been returned to the submitting agency, by means of method of delivery] [been placed in the laboratory storage facility].

Prepared by [signature and printed name of the individual who is responsible for the analysis].

(*optional*) Reviewed by [*signature and printed name of the individual who reviewed the analysis*].

Example: ATF Lab Report

BUREAU OF ALCOHOL, TOBACCO, FIREARMS AND EXPLOSIVES
Forensic Science Laboratory – Washington
6000 Ammendale Road
Beltsville, MD 20705
Phone: (202) 648-6100

U. S. Department of Justice

Laboratory Report

ANAB ISO/IEC 17025:2017 Accredited
Forensic Testing Laboratory

Special Agent Benny "The Jet" Franklin
Bureau of Alcohol, Tobacco, Firearms and Explosives
827 Sandlot Lane, Wendy Peffercorn Field
San Fernando, CA 91340

Date of Report: August 9, 2022
Case Number: 2022-W-000877
Submission(s): 1,2
Reference: 787055-22-0877
Title: BEAST, The
Type of Exam: Forensic Biology

The following evidence was received by the laboratory:

EXHIBITS

Submission #1 – Received July 29, 2021

Lab #	Agency #	
1	1	One .40 caliber cartridge case
1	2	One .40 caliber cartridge case
1	3	One .40 caliber cartridge case
1	4	One 9mm cartridge case
1	5	One 9mm cartridge case
2	6	One .40 caliber cartridge
3	7	One 9mm cartridge case
4	8	One .40 caliber cartridge case
4	9	One .40 caliber cartridge case
4	10	One .40 caliber cartridge case
4	11	One .45 caliber cartridge case
5	12	Known DNA sample from Bobby Lee
6	13	Known DNA sample from Anne O'Fender

Submission #2 – Received November 10, 2021

Lab#	Agency#	
7	14	Two 9mm cartridge cases
8	15	One .45 caliber cartridge case
9	16	Two .40 caliber cartridge cases
10	17	One 9x19 caliber cartridge case
11	18	One 9mm cartridge case

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12	19	Two .45 caliber cartridge cases
13	20	One .40 caliber cartridge case
14	21	One .40 caliber cartridge case

RESULTS OF EXAMINATION

This report refers to exhibits by Lab Number. The following results only apply to the items tested.

DNA Analysis

The following exhibits were sampled for DNA analysis: Exhibits 1 through 14. See Tables 1 and 2 for descriptions and results.

A known contamination profile originating from laboratory supplies was detected in Ex. 2.1. All other samples were visually evaluated, and the contaminating profile was not observed in any other samples; however, all results should be interpreted with caution.

Case #: 2021-W-000373			TABLE 1		Conclusions				
Exhibit Number	Sub-Exhibit Number	Description	Result[1]	Suitable for Comparison Purposes	Support for Inclusion of Individual(s) to Sample	Limited Support for Inclusion of Individual(s) to Sample	Limited Support for Exclusion of Individual(s) to Sample	Individual(s) Excluded as a Possible Contributor	Statistical Analysis Calculation Number[2]
5	5.1	Known DNA sample from Bobby Lee	Single source male DNA profile	Yes					
6	6.1	Known DNA sample from Anne O'Fender	Single source female DNA profile	Yes					
1	1.1	Swabs from two .40 caliber cartridge cases	Partial female DNA profile consistent with a single contributor	Yes	Anne O'Fender (Exhibit 6.1)	---	---	Bobby Lee (Exhibit 5.1)	1
	1.2	Swabs from one .40 caliber cartridge case	Male DNA profile consistent with a single contributor	Yes	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	2
	1.3	Swabs from two 9mm cartridge cases	Partial male DNA profile consistent with a single contributor	Yes	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	3
2	2.1	Swabs from one .40 caliber cartridge	Partial DNA profile consistent with at least one contributor	No, due to limited results					
3	3.1	Swabs from one 9mm cartridge case	Female DNA profile consistent with a single contributor	Yes	Anne O'Fender (Exhibit 6.1)	---	---	Bobby Lee (Exhibit 5.1)	4
4	4.1	Swabs from one .40 caliber cartridge case	Male DNA profile consistent with a single contributor	Yes	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	2
	4.2	Swabs from two .40 caliber cartridge cases	Female DNA profile consistent with a single contributor	Yes	Anne O'Fender (Exhibit 6.1)	---	---	Bobby Lee (Exhibit 5.1)	4
	4.3	Swabs from one .45 caliber cartridge case	No Results						

[1]A result of 'No DNA Detected' indicates that no measurable amount of DNA was detected; therefore, no further DNA analysis was performed. A result of 'No Results' indicates that DNA analysis was completed; however, no DNA profile was obtained.

[2]When the probabilistic genotyping software STRmix™ was used to generate a likelihood ratio, a statistical calculation number will be listed in this column for inclusionary results only. The assumptions, hypotheses, and likelihood ratio are listed by the number in this column following the results tables.

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Case #: 2021-W-000373			TABLE 2	Conclusions					
Exhibit Number	Sub-Exhibit Number	Description	Result[1]	Suitable for Comparison Purposes	Support for Inclusion of Individual(s) to Sample	Limited Support for Inclusion of Individual(s) to Sample	Limited Support for Exclusion of Individual(s) to Sample	Individual(s) Excluded as a Possible Contributor	Statistical Analysis Calculation Number[2]
7	7.1	Swabs from 9mm cartridge case	No Results						
	7.2	Swabs from 9mm cartridge case	No Results						
8	8.1	Swabs from .45 caliber cartridge case	DNA profile consistent with two contributors, at least one male present	Yes	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	5
9	9.1	Swabs from 2 .40 caliber cartridge case	Partial DNA profile consistent with at least two contributors, at least one male and one female present	Major - Yes, female DNA profile consistent with a single contributor	---	---	---	Bobby Lee (Exhibit 5.1), Anne O'Fender (Exhibit 6.1)	---
				Minor - No, due to limited results					
10	10.1	Swabs from 9x19 cartridge case	No Results						
11	11.1	Swabs from 9mm cartridge case	No Results						
12	12.1	Swabs from .45 caliber cartridge case	Male DNA profile consistent with a single contributor	Yes	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	2
	12.2	Swabs from .45 caliber cartridge case	DNA profile consistent with at least two contributors, at least one male present	Major - Yes, male DNA profile consistent with a single contributor	Bobby Lee (Exhibit 5.1)	---	---	Anne O'Fender (Exhibit 6.1)	6
				Minor - No, due to limited results					
13	13.1	Swabs from .40 caliber cartridge case	No Results						
14	14.1	Swabs from .40 caliber cartridge case	No Results						

[1]A result of 'No DNA Detected' indicates that no measurable amount of DNA was detected; therefore, no further DNA analysis was performed. A result of 'No Results' indicates that DNA analysis was completed; however, no DNA profile was obtained.

[2]When the probabilistic genotyping software STRmix™ was used to generate a likelihood ratio, a statistical calculation number will be listed in this column for inclusionary results only. The assumptions, hypotheses, and likelihood ratio are listed by the number in this column following the results tables.

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Submission(s): 1,2

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If additional comparisons to the above-mentioned DNA profiles are desired, please submit two buccal (cheek) swabs from the relevant individual(s) to the ATF National Laboratory Center.

Statistical Analysis

Statistical Analysis Calculation # 1 (Exhibit 1.1)

A partial DNA profile consistent with a single contributor was obtained from Exhibit 1.1.

A. A single individual is assumed to have contributed to the profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Anne O'Fender (Exhibit 6.1).
C. Exclusionary Hypothesis (H_E): The DNA originated from an unrelated, unknown individual.
D. The DNA profile is 999 billion times more likely if it originated from Anne O'Fender (Exhibit 6.1) than if it originated from an unrelated, unknown individual.
E. The probability of an unrelated individual in the population, who has not contributed DNA to this sample, yielding this level of support, is 1 in 999 billion.
F. Based on this calculation, there is evidentiary support for the inclusion of Anne O'Fender (Exhibit 6.1) as a possible contributor of the DNA profile obtained from Exhibit 1.1.

Statistical Analysis Calculation # 2 (Exhibits 1.2, 4.1, and 12.1)

DNA profiles consistent with a single contributor were obtained from Exhibits 1.2, 4.1, and 12.1. The statistical analysis was performed for each DNA profile individually and the lowest value is reported.

A. A single individual is assumed to have contributed to each profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Bobby Lee (Exhibit 5.1).
C. Exclusionary Hypothesis (H_E): The DNA originated from an unrelated, unknown individual.
D. The DNA profiles are at least 1 trillion times more likely if they originated from Bobby Lee (Exhibit 5.1) than if they originated from an unrelated, unknown individual.
E. The probability of an unrelated individual in the population, who has not contributed DNA to these samples, yielding this level of support, is less than 1 in one trillion.
F. Based on this calculation, there is evidentiary support for the inclusion of Bobby Lee (Exhibit 5.1) as a possible contributor of the DNA profiles obtained from Exhibits 1.2, 4.1 and 12.1.

Statistical Analysis Calculation # 3 (Exhibit 1.3)

A partial DNA profile consistent with a single contributor was obtained from Exhibit 1.3.

A. A single individual is assumed to have contributed to the profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Bobby Lee (Exhibit 5.1).
C. Exclusionary Hypothesis (H_E): The DNA originated from an unrelated, unknown individual.
D. The DNA profile is 878 billion times more likely if it originated from Bobby Lee (Exhibit 5.1) than if it originated from an unrelated, unknown individual.
E. The probability of an unrelated individual in the population, who has not contributed DNA to this sample, yielding this level of support, is 1 in 878 billion.
F. Based on this calculation, there is evidentiary support for the inclusion of Bobby Lee (Exhibit 5.1) as a possible contributor of the DNA profile obtained from Exhibit 1.3.

Statistical Analysis Calculation # 4 (Exhibits 3.1 and 4.2)

DNA profiles consistent with a single contributor were obtained from Exhibits 3.1 and 4.2. The statistical analysis was performed for each DNA profile individually and the lowest value is reported.

A. A single individual is assumed to have contributed to each profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Anne O'Fender (Exhibit 6.1).
C. Exclusionary Hypothesis (H_E): The DNA originated from an unrelated, unknown individual.

D. The DNA profiles are at least 1 trillion times more likely if they originated from Anne O'Fender (Exhibit 6.1) than if they originated from an unrelated, unknown individual.
E. The probability of an unrelated individual in the population, who has not contributed DNA to these samples, yielding this level of support, is less than 1 in one trillion.
F. Based on this calculation, there is evidentiary support for the inclusion of Anne O'Fender (Exhibit 6.1) as a possible contributor of the DNA profiles obtained from Exhibits 3.1 and 4.2.

Statistical Analysis Calculation # 5 (Exhibit 8.1)
A DNA profile consistent with a mixture of two individuals was obtained from Exhibit 8.1.

A. Two individuals are assumed to have contributed to the DNA profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Bobby Lee (Exhibit 5.1) and an unrelated, unknown individual.
C. Exclusionary Hypothesis (H_E): The DNA originated from two unrelated, unknown individuals.
D. The DNA profile is at least 1 trillion times more likely if it originated from Bobby Lee (Exhibit 5.1) and one unrelated, unknown individual than if it originated from two unrelated, unknown individuals.
E. The probability of an unrelated individual in the population, who has not contributed DNA to this sample, yielding this level of support, is less than 1 in one trillion.
F. Based on this calculation, there is evidentiary support for the inclusion of Bobby Lee (Exhibit 5.1) as a possible contributor to the DNA profile obtained from Exhibit 8.1.

Statistical Analysis Calculation # 6 (Exhibit 12.2)
A DNA profile consistent with a mixture of at least two individuals was obtained from Exhibit 12.2. The discernible major component is consistent with a single contributor.

A. Two individuals are assumed to have contributed to the DNA profile.
B. Inclusionary Hypothesis (H_I): The DNA originated from Bobby Lee (Exhibit 5.1) as the major component and an unrelated, unknown individual.
C. Exclusionary Hypothesis (H_E): The DNA originated from two unrelated, unknown individuals.
D. The DNA profile is at least 1 trillion times more likely if it originated from Bobby Lee (Exhibit 5.1) as the major component and one unrelated, unknown individual than if it originated from two unrelated, unknown individuals.
E. The probability of an unrelated individual in the population, who has not contributed DNA to this sample, yielding this level of support, is less than 1 in one trillion.
F. Based on this calculation, there is evidentiary support for the inclusion of Bobby Lee (Exhibit 5.1) as a possible contributor of the major component of the DNA profile obtained from Exhibit 12.2.

Combined DNA Index System (CODIS)

No DNA profiles meeting the eligibility requirements for CODIS entry were obtained.

These conclusions conform with the relevant Department of Justice policy on Uniform Language for Testimony and Reports available at www.justice.gov.

DISPOSITION OF EVIDENCE

The evidence will be returned to the investigating agent.

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The following DNA extracts will be retained by the ATF Laboratory: Exhibits 1.2, 1.3, 4.1, 4.2, 5.1, 6.1, 8.1, 9.1, 12.1, and 12.2.

The following DNA extracts were consumed in analysis: Exhibits 1.1, 2.1, 3.1, 4.3, 7.1, 7.2, 10.1, 11.1, 13.1, and 14.1.

NOTE: Exhibits 5 and 6 may potentially contain biological evidence subject to specific storage and preservation requirements. Please reference the current version of ATF O 3400.1 to review the storage and preservation requirements of this evidence for the purposes of possible future DNA analysis.

Scott Smalls
DNA Laboratory Specialist

Technical Reviewer:

Michael "Squints" Palledorous
Forensic Biologist

Administrative Reviewer:

Alan "Yeah-Yeah" McClennan
Chief, DNA Section I

METHODS

Exhibit ID	Analysis
1 through 4, 7 through 14	DNA Sample Collection for Cartridge Cases
5, 6	DNA Sample Collection
5.1, 6.1	Manual Qiagen® DNA Extraction
1.1, 1.2, 1.3, 2.1, 3.1, 4.1, 4.2, 4.3, 7.1, 7.2, 8.1, 9.1, 10.1, 11.1, 12.1, 12.2, 13.1, 14.1	Robotic Qiagen® DNA Extraction
1.1, 1.2, 1.3, 2.1, 3.1, 4.1, 4.2, 4.3, 5.1, 6.1, 7.1, 7.2, 8.1, 9.1, 10.1, 11.1, 12.1, 12.2, 13.1, 14.1	Quantifiler™ HP DNA Quantification Kit, GlobalFiler™ PCR Amplification Kit, Capillary Electrophoresis/Data Analysis
1.1, 1.2, 1.3, 3.1, 4.1, 4.2, 5.1, 6.1, 8.1, 9.1, 12.1, 12.2	STRmix

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Appendix:

"A Likelihood Ratio (LR) is a statistic for the comparison of the probability of the evidence (E), given two competing propositions. The inclusionary proposition (H_I) includes the person of interest (POI) and, for mixed samples, known and/or unknown, unrelated individuals. The total count of individuals included in the proposition is equal to the number of contributors interpreted to be in the sample. The exclusionary proposition (H_E) generally consists of unknown, unrelated individuals, equaling the total number of contributors interpreted to be in the sample."[1] Additional hypotheses can be considered upon request.

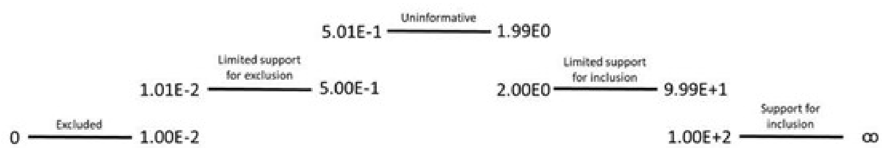
Likelihood Ratios occur on a continuum. Equal (or nearly equal) support for both propositions results in a likelihood ratio of 1, which is qualified as Uninformative. The magnitude of the LR reflects the support for one proposition over the other. LRs greater than one reflect a greater support for the inclusionary proposition. LRs less than one reflect a greater support for the exclusionary proposition.[2] The maximum LR reported is one trillion. LRs greater than one trillion are reported as "at least one trillion."

The typical assumption and propositions or hypotheses are listed below:

A. X number of individuals are assumed to have contributed to the DNA profile.
B. Inclusionary Hypothesis (H_I): POI and X-1 unknown individuals are assumed to have contributed to the DNA profile.
C. Exclusionary Hypothesis (H_E): X unknown individuals are assumed to have contributed to the DNA profile.

The assumptions and hypotheses are not listed in the report when the POI is excluded from the evidentiary profile.

The conclusions drawn from the LR are based on the scale below:



Limited Support for Inclusion/Exclusion: an examiner's conclusion that the evidence provides greater support for one hypothesis over the other, however, there is a greater risk of adventitious support (false inclusion/exclusion) in this range.[2]

Uninformative results: an examiner's conclusion that the evidence provides no greater support for either the inclusion or the exclusion of the POI as a possible contributor to the DNA typing results obtained from an evidentiary sample.[1]

[1] Department of Justice Uniform Language for Testimony and Reports for Forensic Autosomal DNA Examinations Using Probabilistic Genotyping Systems – adopted September 18, 2018, effective March 18, 2019
[2] Recommendations of the SWGDAM Ad Hoc Working Group on Genotyping Results Reported as Likelihood Ratios, approved July 12, 2018

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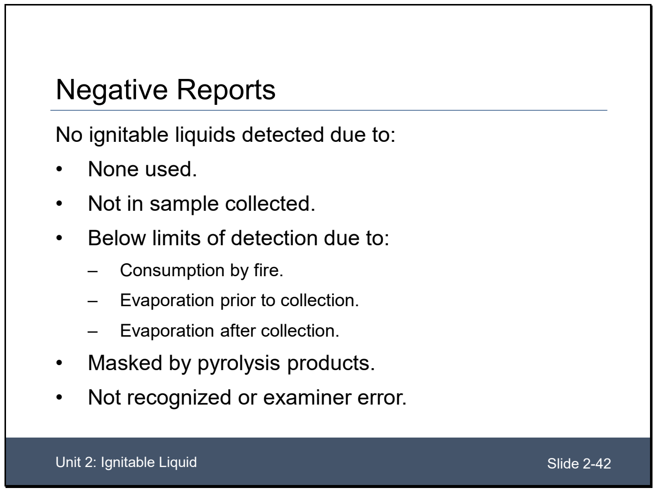
Slide 2-42: Negative Reports

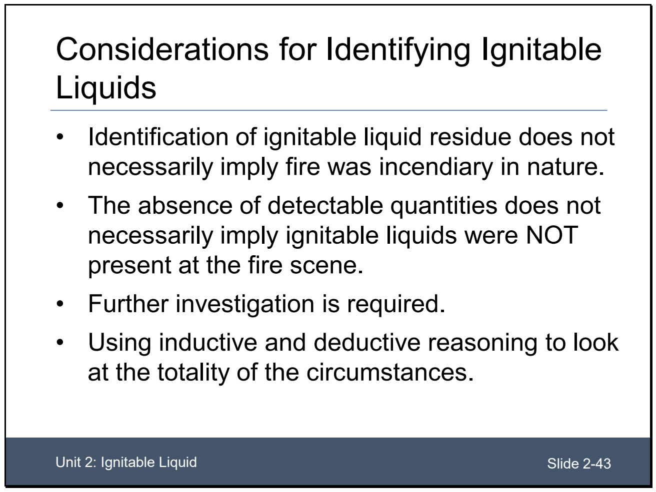


Key Information

A lab report that is negative for ignitable liquids can be caused by several reasons, including:

- None were used on the scene.
- None were present in the sample collected.
- The amount was below the limits of detection due to:
  - Consumption by fire.
  - Evaporation prior to collection.
  - Evaporation after collection.
- The ignitable liquid was masked by pyrolysis products.
- The ignitable liquid was not recognized.
- Examiner error.

Slide 2-43: Considerations for Identifying Ignitable Liquids

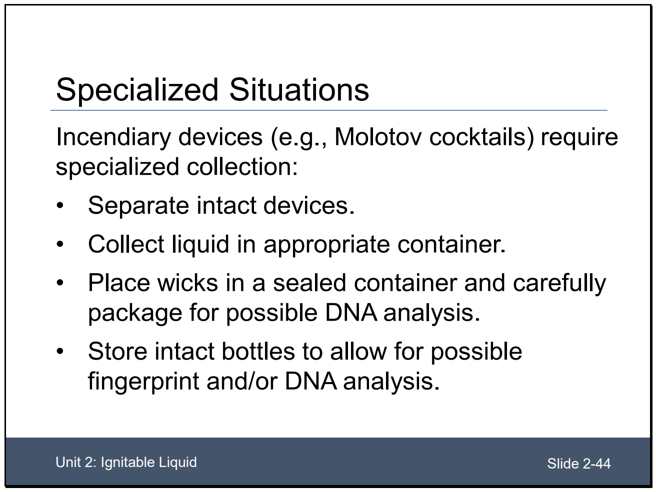


Key Information

Identifying an ignitable liquid residue in a fire scene does not necessarily lead to the conclusion that a fire was incendiary in nature. Further investigation may reveal a legitimate reason for the presence of ignitable liquid residues (see ASTM E1618-19).

Because of the volatility of ignitable liquids and variations in sampling techniques, the absence of detectable quantities of ignitable liquid residues does not necessarily lead to the conclusion that ignitable liquids were not present at the fire scene (see ASTM E1618-19).

Slide 2-44: Specialized Situations

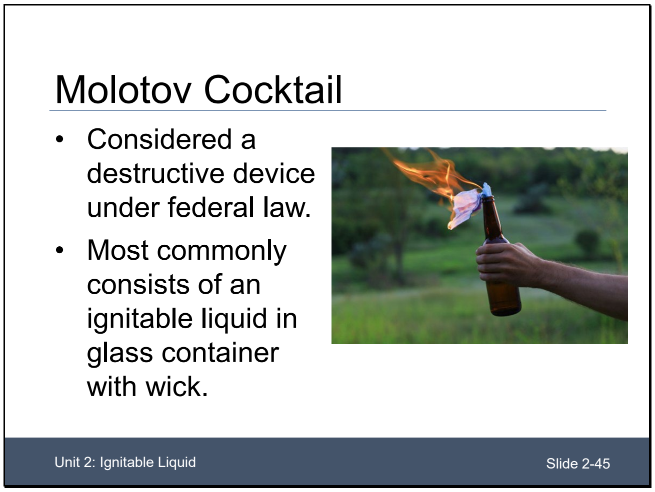


Key Information

Incendiary devices (e.g., Molotov cocktails) require specialized collection.

- Separate intact devices.
- Collect liquid in the previously described container.
- Place wicks in a sealed container and carefully package for possible DNA analysis.
- Store intact bottles to allow for possible fingerprint and DNA analysis.

Slide 2-45: Molotov Cocktail

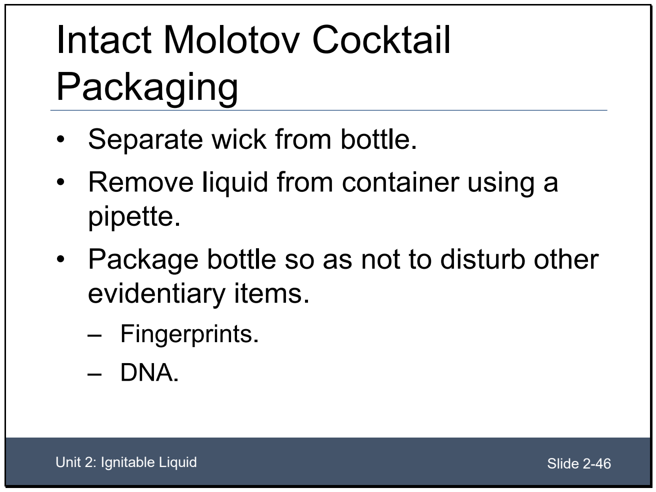


Key Information

Molotov cocktails are an example of an ignitable liquid that may be found on scene.

- Considered a destructive device under federal law.
- Most commonly consists of an ignitable liquid in a container with a wick.

Slide 2-46: Intact Molotov Cocktail Packaging



Key Information

To package an intact Molotov cocktail:

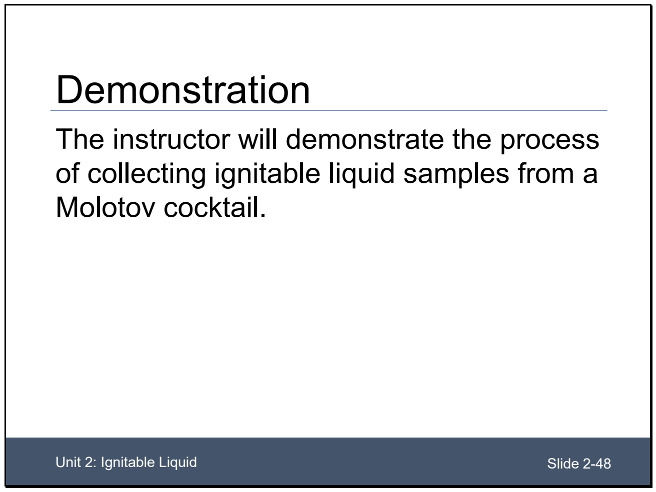
- Separate the wick from the bottle.
- Remove the liquid from the container using a pipette.
- Package the bottle so as not to disturb other existing evidentiary items.
  - Fingerprints.
  - DNA.

Slide 2-47: Broken Molotov Cocktail

Key Information

- The neck is the strongest portion of the bottle and is often found intact. May also include portions of the wick.
- Preserve for other possible evidentiary items such as DNA, fingerprints or ignitable liquid from the wick.
- Glass remnants may help in the federal determination of a destructive device.

Slide 2-48: Demonstration



Key Information

The instructor will demonstrate the process of collecting ignitable liquid samples from a Molotov cocktail.

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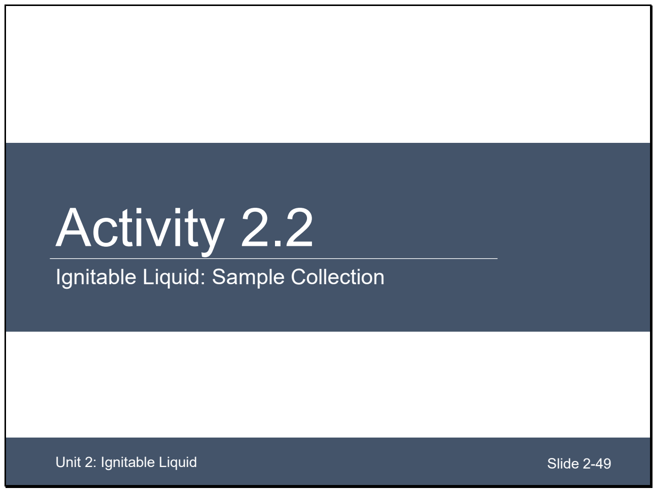
Slide 2-49: Activity 2.2



Activity Estimated Time: 30 minutes

Activity Purpose

The purpose of this exercise is for students to use problem-solving skills to determine and demonstrate the best way to collect ignitable liquid samples based on the evidence provided.

Activity Directions

1. Each group will be assigned a piece of evidence with the provided evidence collection kits.

2. Student groups will work to determine the best collection method and then package the evidence. Groups will have 10 minutes.

3. Each group will designate a group member to explain the group’s collection process and reasoning. Each group will have five minutes to report out.

Tools

Absorbent material, cardboard box, cans (one one-pint can, one one-gallon can), evidence tape, knife, pipette/syringe, shovel, vermiculite, vials, wire ties.

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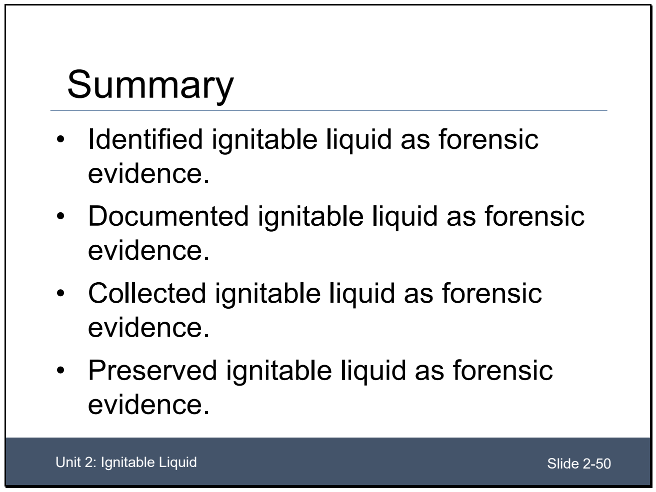
Slide 2-50: Summary



Key Information

Students should now be able to:

- Identify ignitable liquid as forensic evidence.
- Document ignitable liquid as forensic evidence.
- Collect ignitable liquid as forensic evidence.
- Preserve ignitable liquid as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 3: Digital Evidence

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Select proper identification, documentation, collection and preservation techniques for sources of digital evidence.

Unit Enabling Learning Objectives (ELOs)

3.1 Explain the role of digital evidence analysis in forensic investigations.
3.2 Identify sources of digital forensic evidence.
3.3 Document sources of digital forensic evidence.
3.4 Collect sources of digital forensic evidence.
3.5 Preserve sources of digital forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Select proper identification, documentation, collection and preservation techniques for sources of digital evidence.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Explain the role of digital evidence analysis in forensic investigations.	Class dialogue/ facilitated discussion	Final Exam
Identify sources of digital forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Document sources of digital forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect sources of digital forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve sources of digital forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	40 min.
Demonstration	20 min.
Summary	5 min.

Audiovisual

Slides 3-1 to 3-21

Videos: “Computer”
“Cellular Phone/PDA/Mobile Device”

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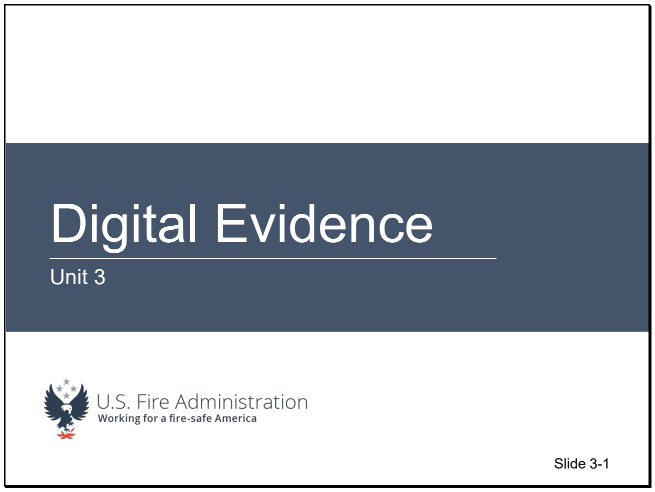
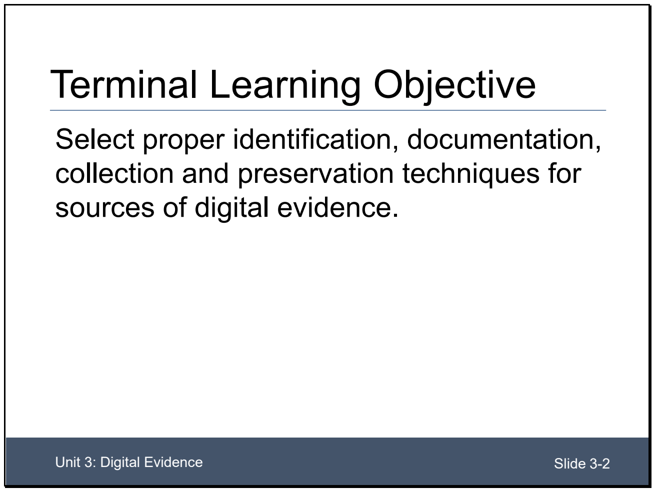
Slide 3-1: Digital Evidence



Key Information

Welcome to Unit 3: Digital Evidence!

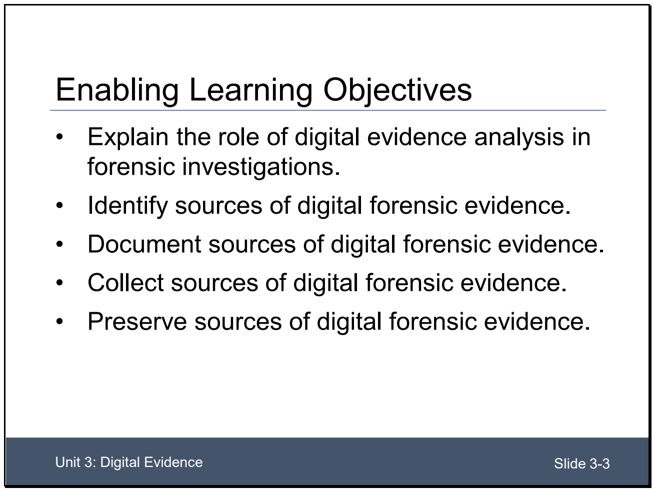
Slide 3-2: Terminal Learning Objective



Key Information

Select proper identification, documentation, collection and preservation techniques for sources of digital evidence.

Slide 3-3: Enabling Learning Objectives



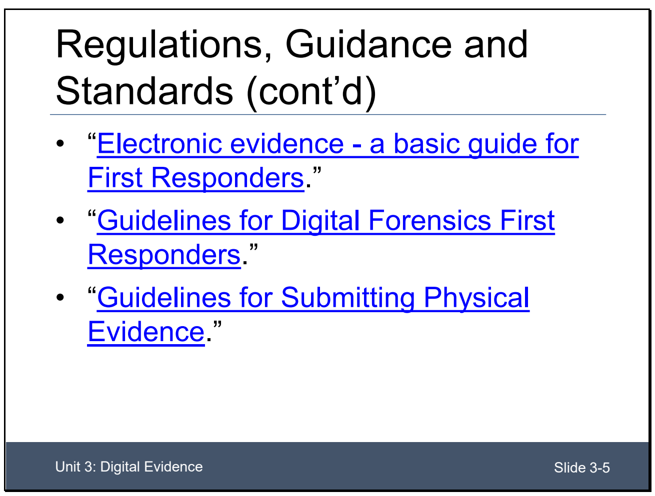
Key Information

After completing this unit, students will be able to:

- Explain the role of digital evidence analysis in forensic investigations.
- Identify sources of digital forensic evidence.
- Document sources of digital forensic evidence.
- Collect sources of digital forensic evidence.
- Preserve sources of digital forensic evidence.

Slide 3-4: Regulations, Guidance and Standards

Slide 3-5: Regulations, Guidance and Standards (cont'd)



Key Information

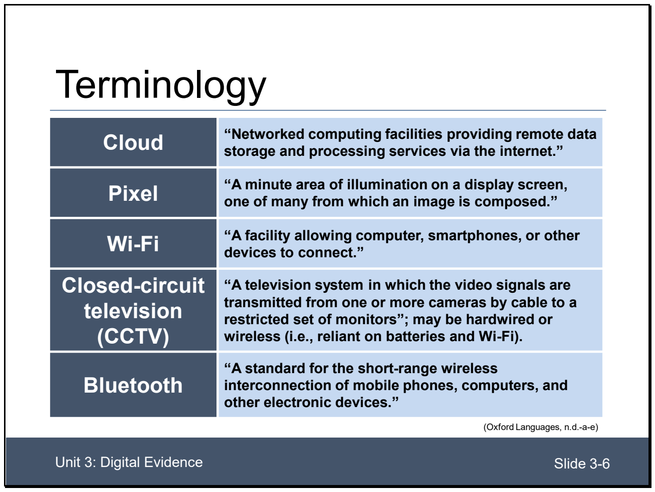
In investigating crimes, digital technology has become a valuable contributor to usable evidence. Investigators with knowledge of the different types of electronic technology can seek out usable evidence to assist with determining a sequence of events or occurrences related to the criminal act. Investigators should know all statutory obligations to collect and seize digital evidence.

Regulations, Guidance and Standards

For the collection of digital evidence, important sources of guidance include:

- "A Simplified Guide to Digital Evidence."
- "Crime Laboratory Evidence Submission Manual."
- "Digital Evidence in the Courtroom: A Guide for Law Enforcement and Prosecutors."
- "Electronic Crime Scene Investigation: A Guide for First Responders, Second Edition."
- "Electronic evidence - a basic guide for First Responders."
- "Guidelines for Digital Forensics First Responders."
- "Guidelines for Submitting Physical Evidence."

Slide 3-6: Terminology

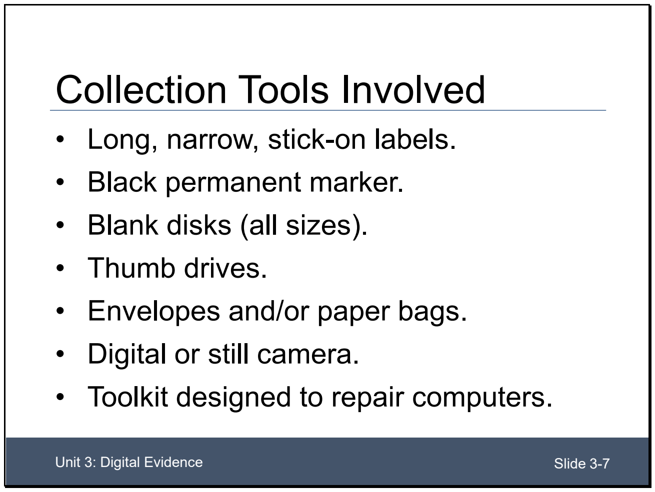


Key Information

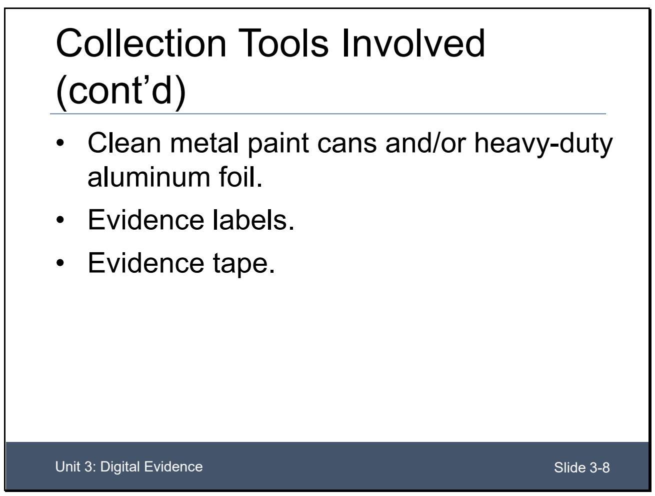
Key terminology relevant to the collection of digital evidence includes these terms, as defined by Oxford Languages (n.d.-a-e):

- **Cloud:** “networked computing facilities providing remote data storage and processing services via the internet.”
- **Pixel:** “a minute area of illumination on a display screen, one of many from which an image is composed.”
- **Wi-Fi:** “a facility allowing computers, smartphones, or other devices to connect to the internet or communicate with one another wirelessly within a particular area.”
- **Closed-circuit television (CCTV):** “a television system in which the video signals are transmitted from one or more cameras by cable to a restricted set of monitors”; may be hardwired or wireless (i.e., reliant on batteries and Wi-Fi, which can limit the number of cameras the system can hold and can reduce the quality of the images).
- **Bluetooth:** “a standard for the short-range wireless interconnection of mobile phones, computers, and other electronic devices.”

Slide 3-7: Collection Tools Involved



Slide 3-8: Collection Tools Involved (cont'd)



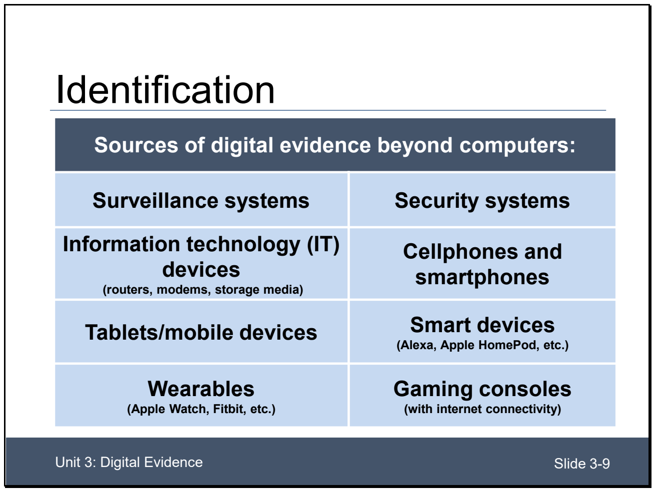
Key Information

These items should be available at the crime scene to properly collect digital evidence:

- Long, narrow, stick-on labels.
- Black permanent marker.
- Blank disks (all sizes, for legacy devices).
- Thumb drives.
- Envelopes and/or paper bags.
- Digital or still camera.
- Toolkit designed to repair computers.

- Clean metal paint cans and/or heavy-duty aluminum foil.
- Evidence labels.
- Evidence tape.

Slide 3-9: Identification

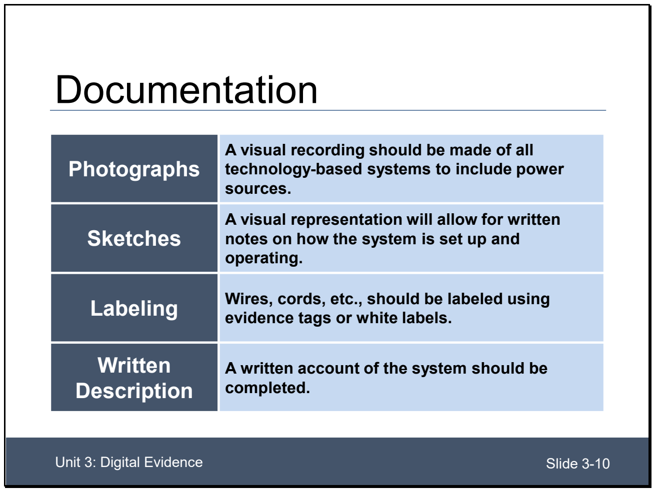


Key Information

There are many sources of digital evidence beyond computers, including:

- Surveillance systems: Be sure to conduct a neighborhood canvas for cameras (e.g., next-door neighbors, businesses, etc.).
- Security systems (e.g., on-site, monitored or cloud-based services).
- Information technology (IT) (e.g., modems, Wi-Fi routers, storage devices, etc.).
- Cellphones/smartphones.
- Tablets/mobile devices.
- Smart devices (e.g., Amazon Alexa, Apple HomePod, etc.).
- Wearables (e.g., Apple Watch, Fitbit, etc.).
- Gaming consoles with internet connectivity.

Slide 3-10: Documentation



Key Information

Full and accurate documentation of the technology collected is required for future examination and testing. The investigator should know how the technology is set up and operates. To complete this, the investigator should document the components of the system through:

- **Photographs:** A visual recording should be made of all technology-based systems, including power sources.
- **Sketches:** Like sketching a crime scene, the visual representation will allow for written notes on the system's setup and operation.
- **Labeling:** Wires, cords, etc., should be labeled using evidence tags or white labels.
- **Written description:** A written account of the system should be completed.

Slide 3-11: Collection

Collection

- Prioritize collection based on the crime and information needs.
- Location of the evidence will impact the collection process.
- Damage to evidence (thermal or physical) will impact collection.
- Secure system components.
- Use critical thinking throughout the collection process.

Unit 3: Digital Evidence Slide 3-11

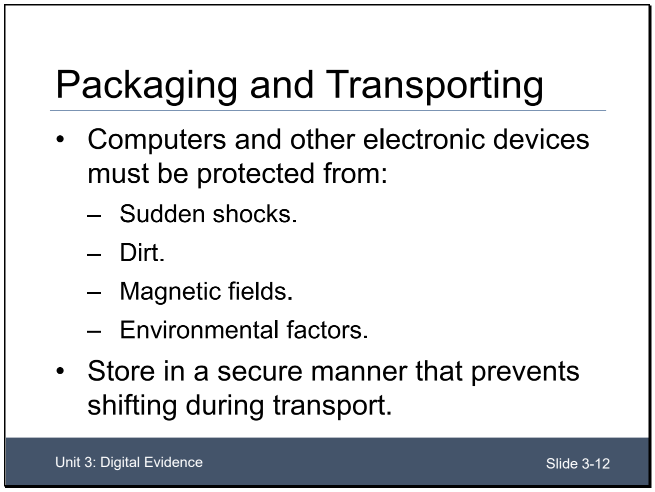
Key Information

The collection of digital evidence (e.g., latent prints, computer images, touch DNA, etc.) should be prioritized based on the crime being investigated and the need to identify important information. The location of the evidence (e.g., local, cloud-based) will impact the collection process. Securing the system components should include using materials to protect them from rough handling and magnetic fields (e.g., radio transmitters).

The evidence may be physically damaged due to thermal insult or physical damage sustained during the fire or suppression. The investigator should apply a measured and well-reasoned approach to the documentation and collection of the damaged evidence.

Critical thinking and decision-making should inform the collection process. The investigator should be concerned with all electronic and technology-based equipment to ensure that all pertinent evidence remains intact and is not overlooked, damaged or destroyed.

Slide 3-12: Packaging and Transporting



Key Information

Computers and internal components are delicate electronic equipment and must be protected from sudden shocks, dirt, magnetic fields and other environmental factors. Computers, hard drives and optical discs should be secured to prevent shifting during transport. If the original containers are available, use them for the packaging. If possible, package the computer in a box with plastic foam or foam rubber padding to prevent shifting and damage. Thick plastic bags not easily ripped or torn are acceptable for packaging computers and media.

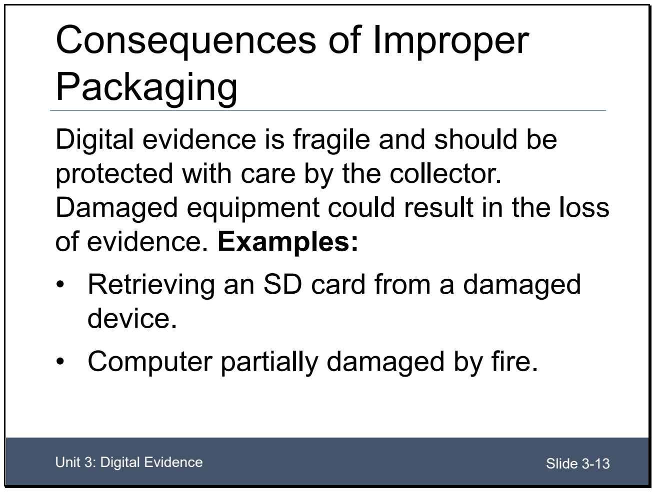
- Normally, computer manuals require no special handling. However, if the manuals contain media (e.g., CDs, floppy discs, etc.), the precautions used for computers also apply. Manuals should be sealed in boxes, plastic bags or paper bags.

- CDs, DVDs or Blu-ray discs should be placed in protective sleeves to prevent damage to the reflective film upon which the data resides.

- Evidence with the ability to receive or transmit data must be placed in protective packaging, such as a clean metal paint can or wrapped in multiple layers of aluminum foil.

- All cables for cellphones, cameras, laptops and other devices should be submitted with the evidence.

Slide 3-13: Consequences of Improper Packaging



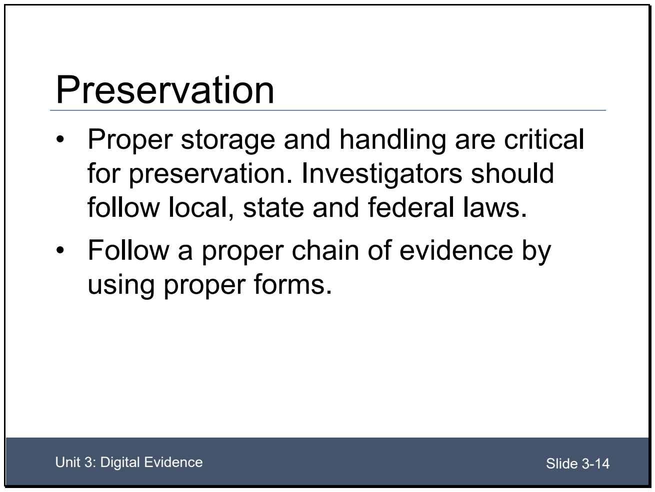
Key Information

Digital evidence is fragile and should be protected with care by the collector. Damaged equipment because of improper packaging could result in the loss of evidence.

Examples:

- SD cards can be easily damaged while attempting to retrieve from damaged electronic equipment. Exercise caution.
- A computer that has experienced some fire damage (or been in proximity to a fire) may still provide valuable electronic data. Careful consideration must be given during the collection, packaging and transporting of the computer to prevent further damage.

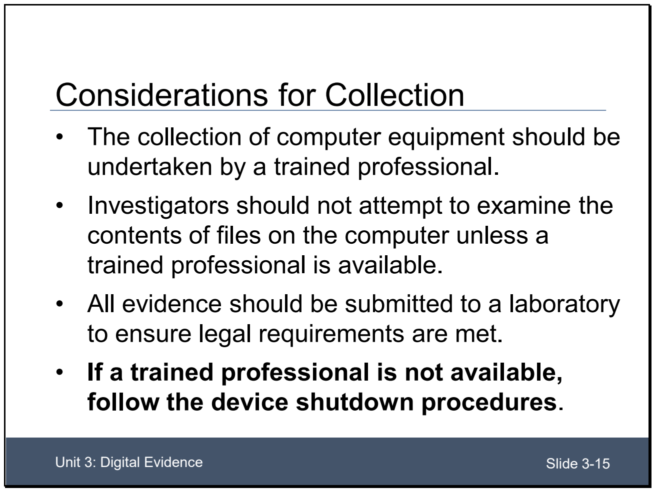
Slide 3-14: Preservation



Key Information

Proper storage and handling for examination are critical for preservation. Investigators should follow local, state and federal laws in the storage and handling of any evidence. Following a proper chain of evidence by using proper forms will ensure the evidence remains intact and accessible.

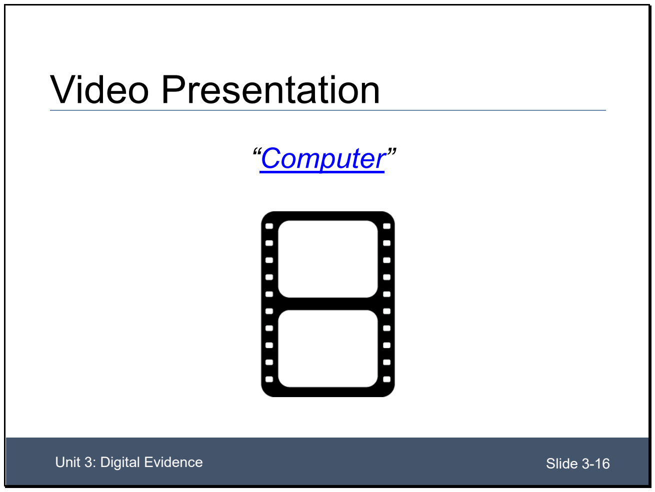
Slide 3-15: Considerations for Collection



Key Information

The collection of computer equipment should be undertaken by a trained professional. Investigators should not attempt to examine the contents of files on the computer unless a trained professional is available. All evidence should be submitted to a laboratory to ensure legal requirements are met. **If a trained professional is not available, follow the device shutdown procedures** (described in the next section).

Slide 3-16: Video Presentation



Key Information

Upon discovering a computer in the **off** position, investigators should use the following best practices:

- **Do not turn the computer on.** A laboratory examination should be conducted.
- Photograph the entire setup to include all connections to power or peripheral devices. Disconnect the power and use adhesive labels to annotate all connections and cables (e.g., 1-1 or A-A).
- Place clean or unformatted media into any open drive bays (e.g., disks and CDs), then tape the bay shut.
- Seize all monitors, keyboards, printers, scanners, modems and any other external devices. Ensure these items are clearly labeled. This will ensure the system can be reassembled under laboratory conditions.
- Secure all cables and place them inside a large sealable plastic bag or cardboard box.
- Label all evidence as "fragile."

Investigators should employ the following best practices upon discovering a computer in the **on** position:

- Determine if the computer has a destructive program operating. If such a program is running, disconnect the power immediately.

- If a modem or network connection is present, ensure the communications line is disconnected. This will prevent the deletion of data from a remote location.

- Photograph the screen and document any programs running. Ensure the central processing unit (CPU), monitor and keyboard are photographed.

- Disconnect the power cable and document as if the computer were **off**.

For additional information, visit "Computer" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 3-17: Other Collection Considerations

Other Collection Considerations

- Examine the area around the computer equipment for passwords, login procedures and/or manuals.
- If the mobile device has a password or PIN lock, **do not** attempt to unlock the device.
- Determine if there is an uninterruptible power supply (UPS).

Unit 3: Digital Evidence Slide 3-17

Key Information

Regardless of the computer's status (i.e., **on** or **off**), always examine the surrounding area (including peripheral devices) for passwords, login procedures and manuals to operate the equipment and software.

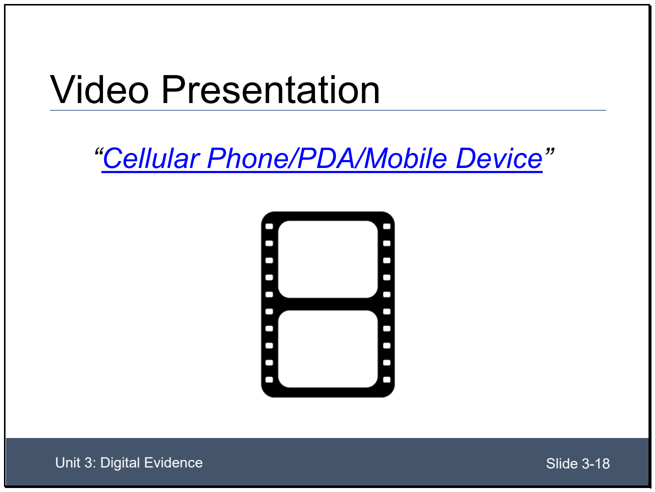
If a device is secured with a password or PIN, **do not** attempt to unlock the device. Many devices limit the number of login attempts and may irretrievably erase the data.

Finally, check if there is an uninterruptible power supply (UPS).

- If there is a UPS, then there is time to determine the best course of action for preservation and collection.

- If there is no UPS, the battery will eventually give way, and the system will shut down. Most operating systems will generally save the data in a temporary file.

Slide 3-18: Video Presentation



Key Information

When collecting cellphones, which require special handling, investigators should employ these best practices:

- If the device is powered **off**, submit it as evidence in the routine manner.
- If the device is **on** and the **passcode has been confirmed**, power **off** the device and submit in the routine manner.
- If the device is powered **on** and the **passcode is not confirmed**, isolate the device from the cellular network immediately by putting the phone into airplane mode. **Devices cannot be allowed to connect to a network.**
  - If this is not possible, remove the SIM card or place the phone within signal blocking materials, such as a Faraday Bag, or wrap it with multiple layers of aluminum foil.
  - Locked devices require the device to stay powered **on**.
  - Locate a charger, charge the device and submit immediately.
- Always mark the package as "Cellphone, RUSH."

It is important that the device **not** be turned **off**, restarted or the battery allowed to drain. If possible, the investigator should obtain the device passcode. Passcode recovery is not available for all models of devices. **If the device is off when collected, do not turn it on.** Devices that have been powered **off** or have a dead battery may be submitted to the laboratory; however, the lock bypass may not be effective.

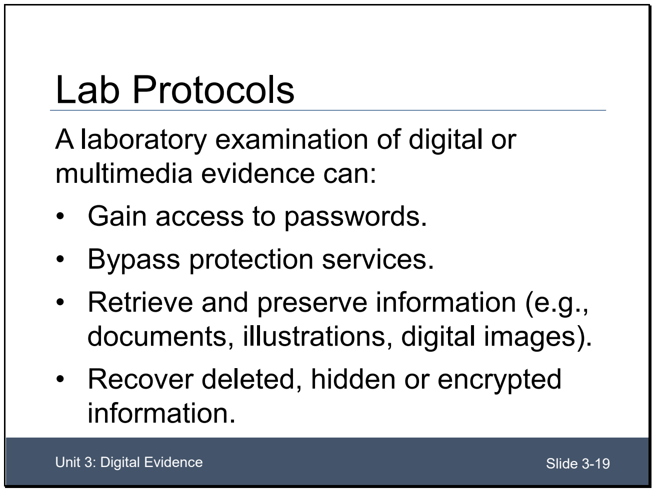
Note: Items should be packaged separately (e.g., one phone per Faraday Bag).

Additional types of devices include:

- Surveillance cameras (e.g., CCTV, wired, wireless, Bluetooth, smart devices).
- GPS.
- Cloud-based systems for data storage.
- Home/personal entertainment/information systems (e.g., Siri, Apple Watch, Google Assistant, Alexa).

For more information, visit "Cellular Phone/PDA/Mobile Device" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 3-19: Lab Protocols



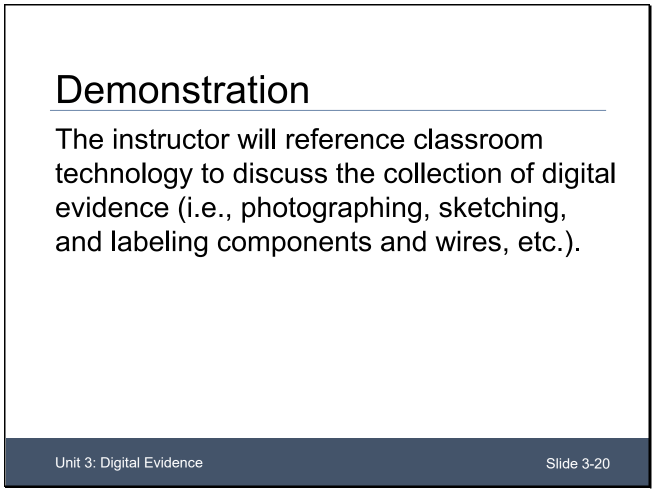
Key Information

Evidence contributors should always contact the laboratory before submitting any digital evidence to ensure an examination can occur. Not all laboratories conduct specialty (e.g., digital evidence) examinations, particularly fire/explosion debris analysis-based labs. For example, the Florida Bureau of Forensic Services (BFS) analyzes fire and explosion debris for an ignitable liquid. However, to obtain digital data from the evidence, the investigator would need to submit the digital evidence for extraction of information to the Florida Department of Law Enforcement (FDLE) Laboratory. Most laboratories have protocols to ensure the evidence is collected and maintained to allow for the best possible examination.

A laboratory examination of digital or multimedia evidence can:

- Gain access to passwords.
- Bypass protection services.
- Retrieve and preserve information (e.g., documents, illustrations, digital images).
- Recover deleted, hidden or encrypted information.

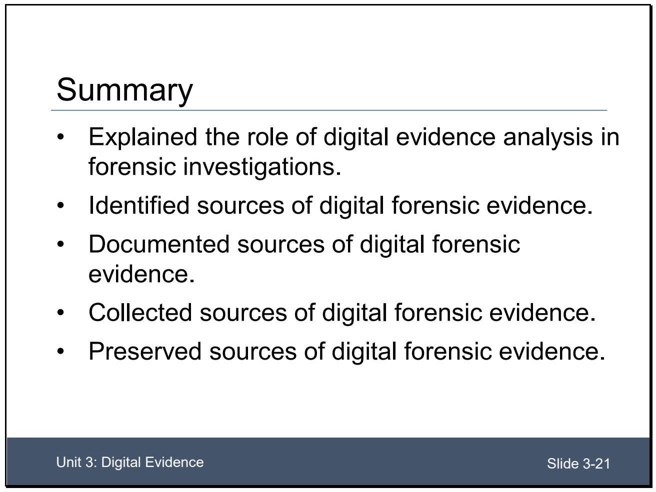
Slide 3-20: Demonstration



Key Information

The instructor will use the classroom computer to explain digital evidence collection. The instructor will show the process of photographing, sketching, and labeling components and wires, etc.

Slide 3-21: Summary



Key Information

Students should now be able to:

- Explain the role of digital evidence analysis in forensic investigations.
- Identify sources of digital forensic evidence.
- Document sources of digital forensic evidence.
- Collect sources of digital forensic evidence.
- Preserve sources of digital forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 4: Hair/Fiber

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Choose the correct process that will enable the collection of hair and fiber evidence suitable for laboratory submission.

Unit Enabling Learning Objectives (ELOs)

4.1 Identify sources of hair and fiber evidence.
4.2 Document sources of hair and fiber evidence.
4.3 Choose the appropriate methodology for hair and fiber evidence collection.
4.4 Apply proper collection processes for hair and fiber evidence.
4.5 Demonstrate preservation of hair and fiber evidence.
4.6 Discuss the role that hair and fiber evidence play in forensic investigations.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Choose the correct process that will enable the collection of hair and fiber evidence suitable for laboratory submission.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify sources of hair and fiber evidence.	Class dialogue/ facilitated discussion	Final Exam
Document sources of hair and fiber evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Choose the appropriate methodology for hair and fiber evidence collection.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Apply proper collection processes for hair and fiber evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Demonstrate preservation of hair and fiber evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Discuss the role that hair and fiber evidence play in forensic investigations.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	40 min.
Demonstration	20 min.
Summary	5 min.

Audiovisual

Slides 4-1 to 4-18

Videos: “Hair”

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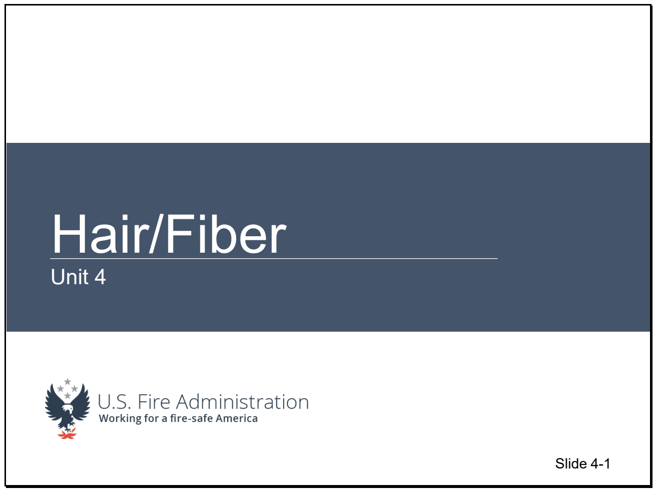
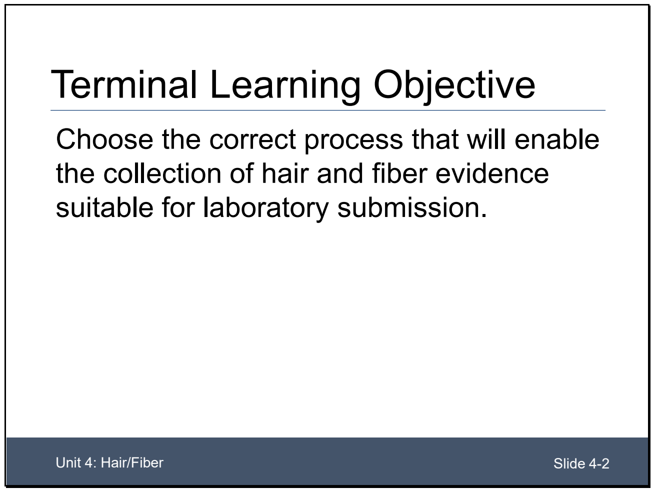
Slide 4-1: Hair/Fiber



Key Information

Welcome to Unit 4: Hair/Fiber!

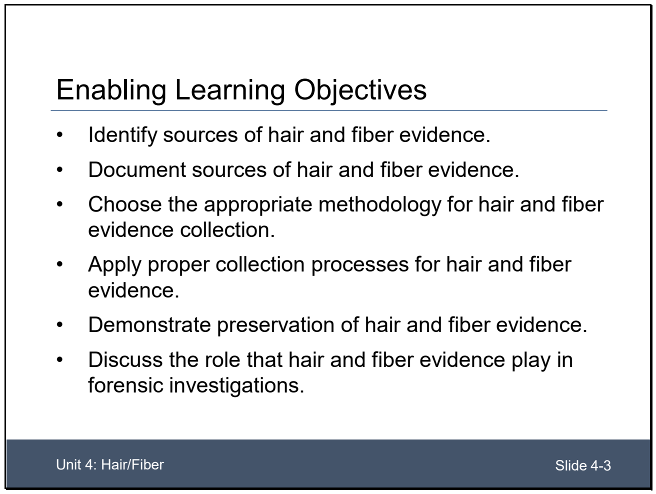
Slide 4-2: Terminal Learning Objective



Key Information

Choose the correct process that will enable the collection of hair and fiber evidence suitable for laboratory submission.

Slide 4-3: Enabling Learning Objectives

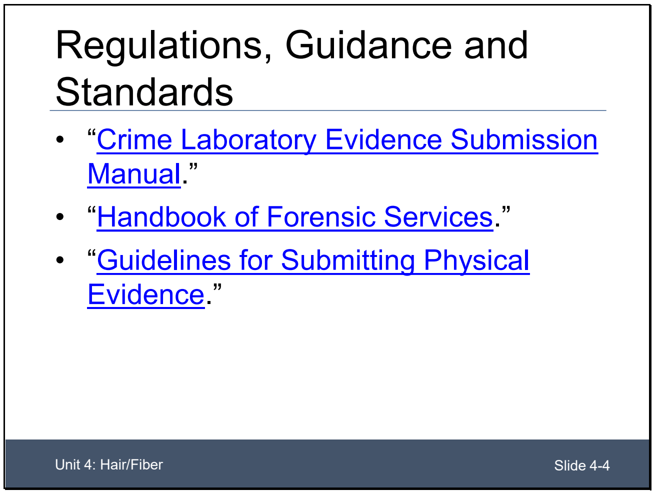


Key Information

After completing this unit, students will be able to:

- Identify sources of hair and fiber evidence.
- Document sources of hair and fiber evidence.
- Choose the appropriate methodology for hair and fiber evidence collection.
- Apply proper collection processes for hair and fiber evidence.
- Demonstrate preservation of hair and fiber evidence.
- Discuss the role that hair and fiber evidence play in forensic investigations.

Slide 4-4: Regulations, Guidance and Standards



Key Information

Locating physical evidence can be difficult whether the scene is large or small. Physical evidence such as hair and fiber can be transferred during contact with another object or person. "The identification and comparison of human and animal hairs can be helpful in demonstrating physical contact with a suspect, victim, and crime scene. Hairs can provide investigators with valuable information for potential leads" (Deedrick & Koch, 2004).

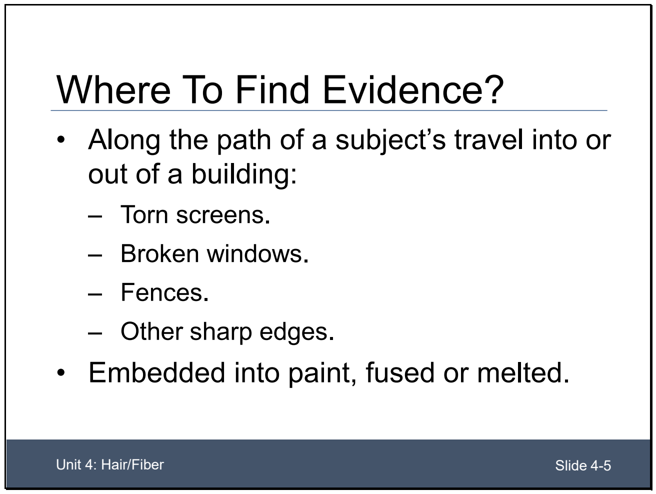
Keeping in mind Locard's Exchange Principle (i.e., when two materials met one another, there will be a transfer of each material to the other), trace evidence such as hair and fibers can be extremely useful. Investigators with knowledge of this type of transfer involving hair and fiber evidence (e.g., types and locations) can be invaluable in assisting the crime investigation.

Regulation, Guidance and Standards

Regulation and guidance standards for hair and fibers include:

- "Crime Laboratory Evidence Submission Manual."
- "Handbook of Forensic Services."
- "Guidelines for Submitting Physical Evidence."

Slide 4-5: Where To Find Evidence?



Key Information

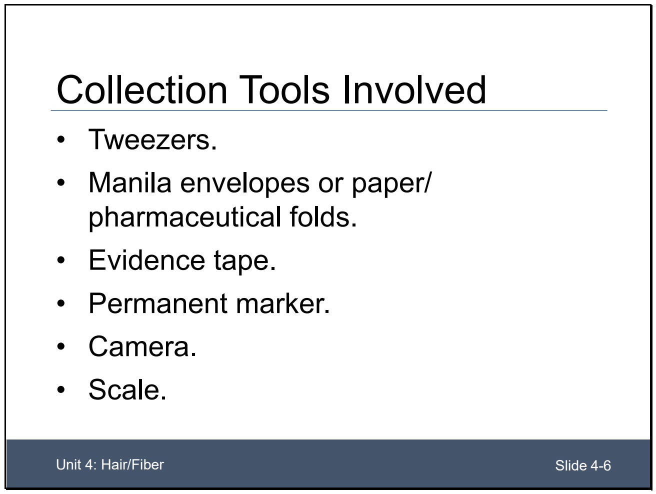
Considerations for finding hair and fiber evidence include:

- Examine along the path of a subject's travel into or out of a building. Opportunities for collection are numerous, such as:

  - Torn screens.
  - Broken windows.
  - Fences.
  - Other sharp edges.

- Hair and fibers may be embedded into the paint, fused or melted. As such, these may be difficult to examine; use side lighting (e.g., a flashlight) or a magnifying lens to help identify.

Slide 4-6: Collection Tools Involved

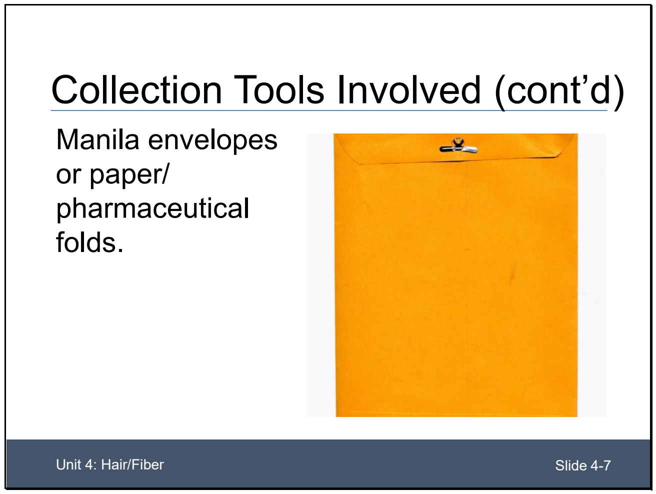


Key Information

These items should be available at the crime scene to properly collect hairs and fibers:

- Tweezers.
- Manila envelopes or paper/pharmaceutical folds.
- Evidence tape.
- Permanent marker.
- Camera.
- Scale.

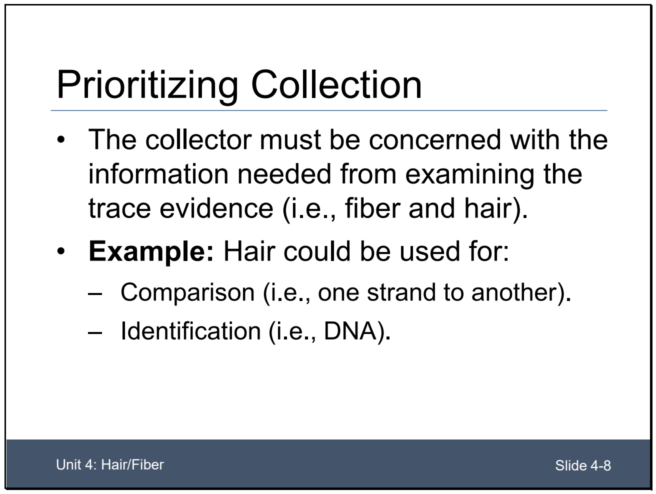
Slide 4-7: Collection Tools Involved (cont’d)



Key Information

Manila envelopes or paper/pharmaceutical folds may be used.

Slide 4-8: Prioritizing Collection



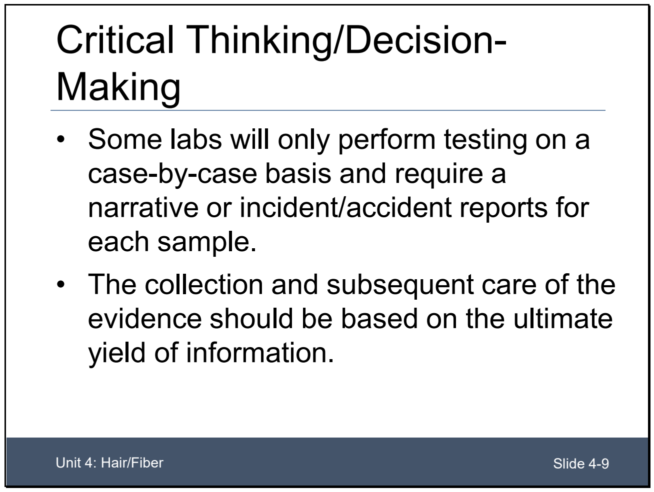
Key Information

Hair analysis can determine whether the sample is animal or human in origin. The investigator should be concerned with the information needed from examining the trace evidence (e.g., fiber and hair).

Example: A sample can be analyzed for:

- Comparison (one strand to another).
- Identification (DNA).

Slide 4-9: Critical Thinking/Decision-Making



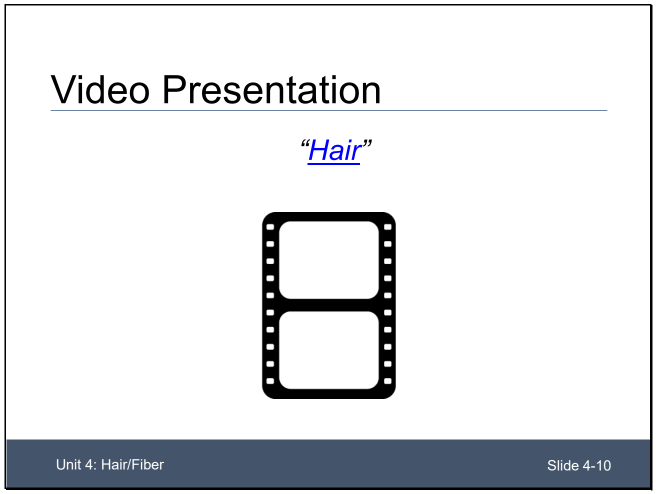
Key Information

Some labs will only perform testing on a case-by-case basis and require a narrative or incident/accident reports for each sample. The investigator will have the best vantage point to understand why a fiber or hair could help solve a case. The collection and subsequent care of the evidence should be based on the ultimate yield of information.

Some areas to consider in the development of a subject before submission of hair or fiber include:

- Other probative evidence that has been developed (e.g., latent prints).
- Reliable witnessed contact between the person(s) or object(s) involved has been established (e.g., eyewitness).

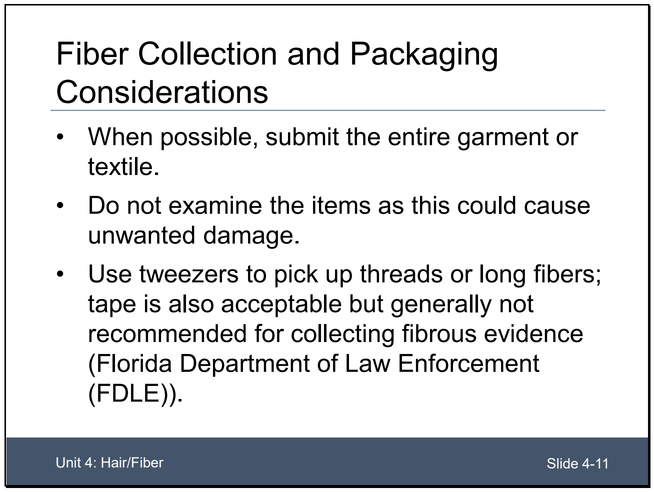
Slide 4-10: Video Presentation



Key Information

For additional information visit "Hair" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 4-11: Fiber Collection and Packaging Considerations

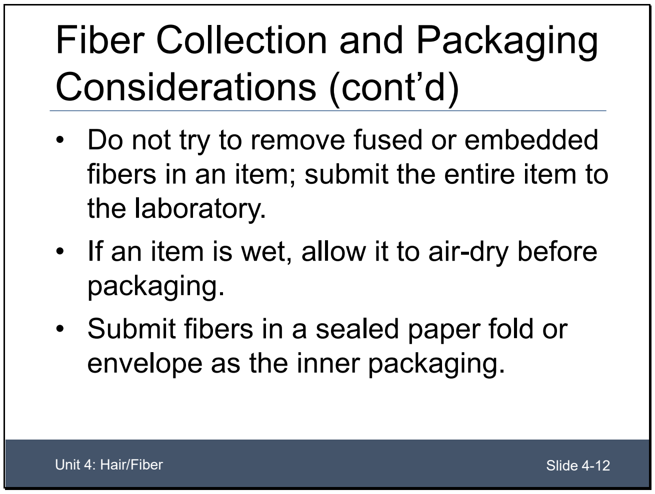


Key Information

Collection and packaging considerations for fibers include:

- When possible, submit the entire garment or textile.
- Do not examine the items as this could cause unwanted damage.
- Use tweezers to pick up threads or long fibers. Tape lifts are also an acceptable method for collecting hairs and fibers. However, tape lifts are generally not recommended for collecting fibrous evidence because the collection and recovery of items of evidence can be time-consuming and tedious compared to other methods (Florida Department of Law Enforcement (FDLE)).

Slide 4-12: Fiber Collection and Packaging Considerations (cont’d)



Key Information

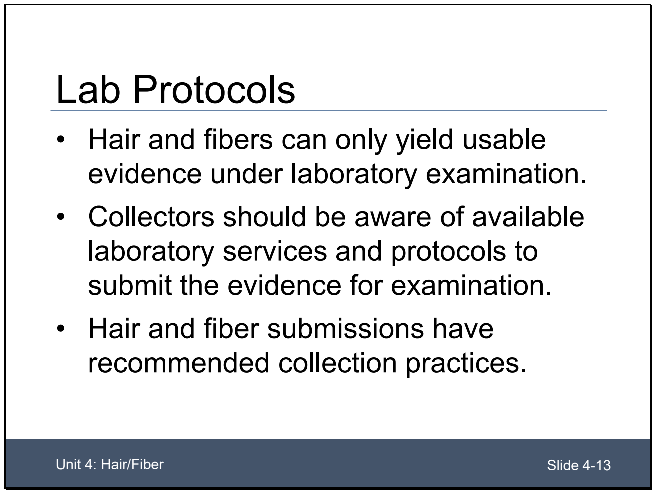
Collection and packaging considerations for fibers include:

- Do not try to remove fused or embedded fibers in an item. Submit the entire item to the laboratory.

- If an item is wet, allow it to air-dry before packaging.

- Submit fibers in a sealed paper fold or envelope as the inner packaging.

Slide 4-13: Lab Protocols

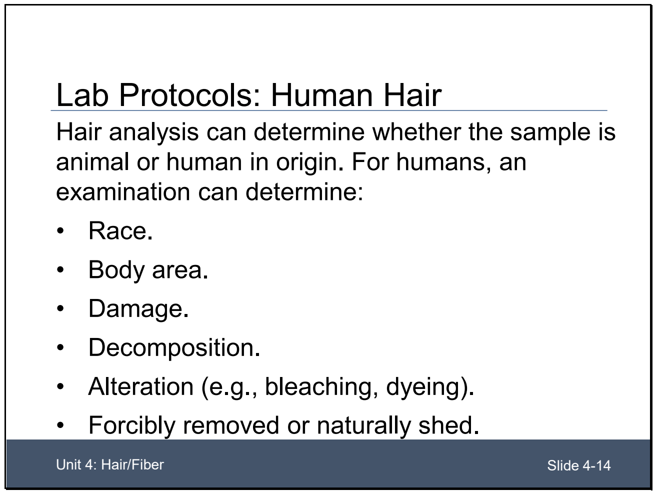


Key Information

Hair and fibers can only yield usable evidence under laboratory examination. Investigators should be aware of available laboratory services and protocols to submit the evidence for examination.

Hair and fiber submissions have recommended collection practices, which we will review in this unit. Investigators should be aware of those practices and subsequent protocols for the submitted evidence.

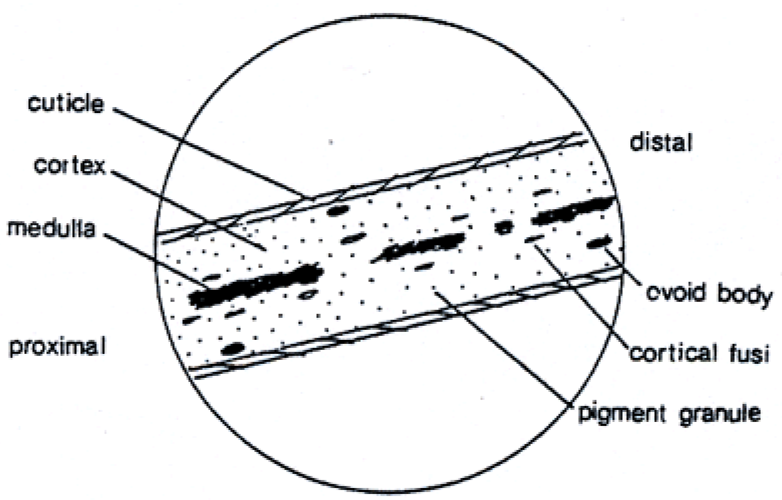
Slide 4-14: Lab Protocols: Human Hair



Key Information

Basic Structure of Hair

Hair can be defined as a slender, thread-like outgrowth from a follicle in the skin of mammals. Composed of mainly keratin, it has three morphological regions: cuticle, medulla and cortex (Deedrick & Koch, 2004).



(Deedrick & Koch, 2004)

Human hair examination can yield such characteristics as:

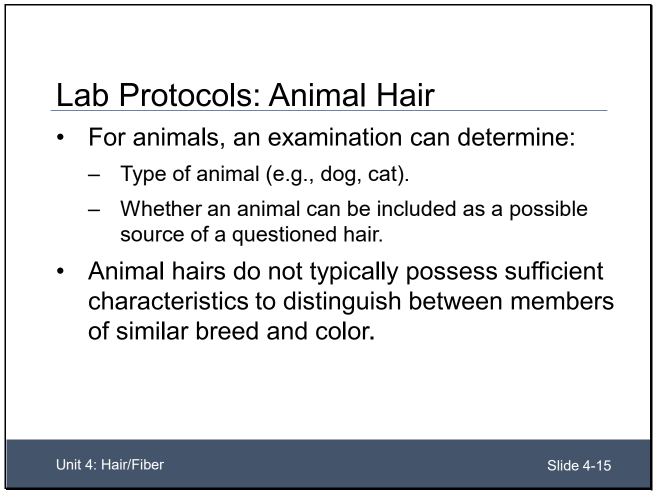
- Race.
- Body area.

- Association to a scene.
- Decomposition.
- Alteration (e.g., bleaching, dyeing).
- Forcibly removed or naturally shed.

Court cases involving hair comparison:

- FBI/Department of Justice (DOJ) “Microscopic Hair Comparison Analysis Review.”
- National Association of Criminal Defense Lawyers (NACDL) — “Microscopic Hair Comparison Analysis.”

Slide 4-15: Lab Protocols: Animal Hair



Key Information

Human hairs are distinguishable from hairs of other mammals. Animal hairs are classified into three basic types:

- Guard hairs that form the outer coat of an animal and provide protection.
- Fur or wool hairs that form the inner coat of an animal and provide insulation.
- Tactile hairs (whiskers) found on animals' heads provide sensory functions.

Other hairs found on animals include tail hair and mane hair (horse). Human hair is not so differentiated and might be described as a modified combination of the characteristics of guard hairs and fur hairs (Deedrick & Koch, 2004).

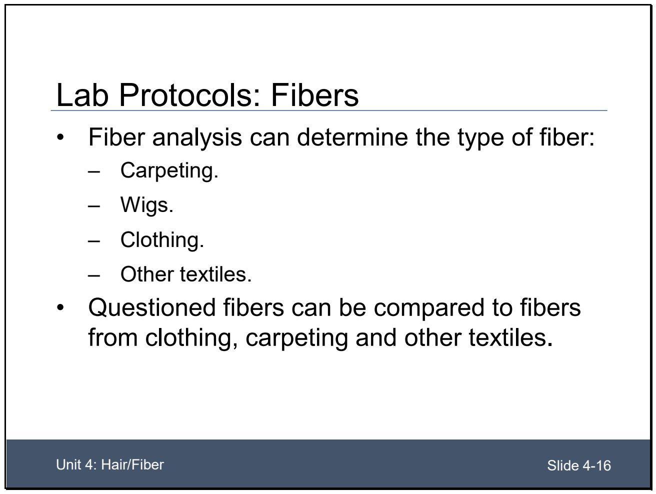
Human hairs are generally consistent in color and pigmentation throughout the length of the hair shaft, whereas animal hairs may exhibit radical color changes — called banding — in a short distance. The distribution and density of pigment in animal hairs can also be identifiable features. The pigmentation of human hairs is evenly distributed or slightly denser toward the cuticle, whereas the pigmentation of animal hairs is more centrally distributed, although denser toward the medulla (Deedrick & Koch, 2004).

Animal hair examination can yield such characteristics as:

- Type of animal (e.g., dog, cat).
- Whether an animal can be included as a possible source of questioned hair.

Animal hairs do not typically possess sufficient characteristics to distinguish between members of similar breed and color.

Slide 4-16: Lab Protocols: Fibers



Key Information

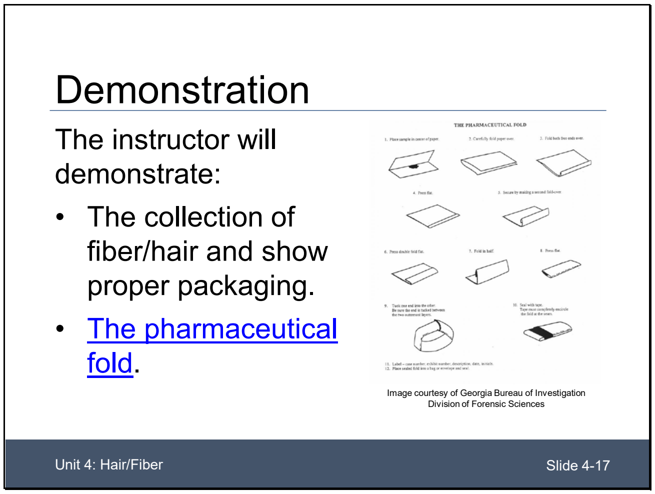
Fiber analysis can determine the type and composition (e.g., wool, cotton, acrylic) of the following fibers:

- Carpet.
- Wigs.
- Clothing.
- Other textiles.

Questioned fibers (i.e., found on the scene) can be compared to fibers from clothing, carpeting and other textiles. Fibers are similar to hair in that they can transfer from item to item. Fibers are part of the manufacturing process for a product or object. The item must be released through physical action (e.g., mechanical or chemical) to be loosened from the original items (e.g., clothing, furniture).

An example of a questioned fiber is when a chemical action has occurred and fibers may be helpful in determining the first fuels ignited. The fibers can be damaged because of the fire, but the remaining material can describe the fire’s intensity (e.g., synthetic versus cotton). Knowing the first fuel is an important first step in determining origin and cause.

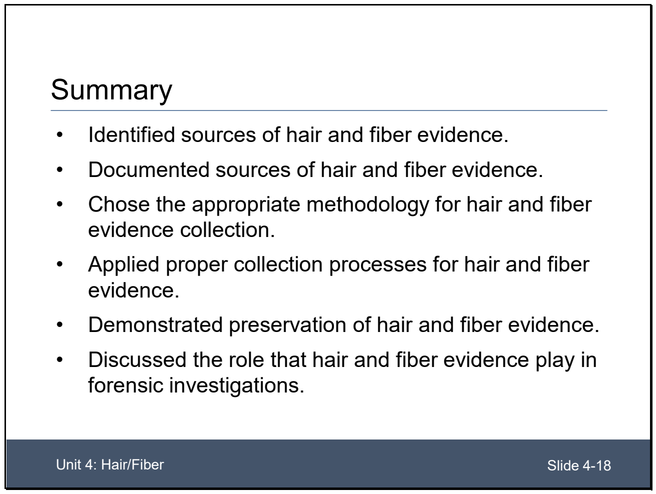
Slide 4-17: Demonstration



Key Information

The instructor will demonstrate the collection of fiber/hair and show proper packaging for examination at the laboratory. The instructor will then demonstrate the pharmaceutical fold.

Slide 4-18: Summary



Key Information

Students should now be able to:

- Identify sources of hair and fiber evidence.
- Document sources of hair and fiber evidence.
- Choose the appropriate methodology for hair and fiber evidence collection.
- Apply proper collection processes for hair and fiber evidence.
- Demonstrate preservation of hair and fiber evidence.
- Discuss the role that hair and fiber evidence play in forensic investigations.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 5: Latent Fingerprints

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Formulate the collection processes that will produce latent fingerprints suitable for laboratory submission.

Unit Enabling Learning Objectives (ELOs)

5.1 Identify sources of latent fingerprints as evidence.
5.2 Document sources of latent fingerprints as evidence.
5.3 Collect sources of latent fingerprints as evidence.
5.4 Preserve sources of latent fingerprints as evidence.
5.5 Choose the appropriate methodology for fingerprint collection.
5.6 Apply proper collection processes for latent fingerprints.
5.7 Demonstrate the role that latent fingerprints play in forensic investigations.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Formulate the collection processes that will produce latent fingerprints suitable for laboratory submission.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify sources of latent fingerprints as evidence.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Final Exam
Document sources of latent fingerprints as evidence.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation
Collect sources of latent fingerprints as forensic evidence.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation
Preserve sources of latent fingerprints as evidence.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation

Choose the appropriate methodology for fingerprint collection.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation
Apply proper collection processes for latent fingerprints.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation
Demonstrate the role that latent fingerprints play in forensic investigations.	Class dialogue/ facilitated discussion/ Activities 5.1, 5.2 and 5.3	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	40 min.
Demonstrations	20 min.
Activity 5.1: Latent Fingerprints: Tape	25 min.
Activity 5.2: Latent Fingerprints: Super Glue	25 min.
Activity 5.3: Latent Fingerprints: Dusters/Gel Lifters	40 min.
Summary	5 min.

Audiovisual

Slides 5-1 to 5-26

Videos: “Forensic Education: Lifting Fingerprints with Gel Lifters”

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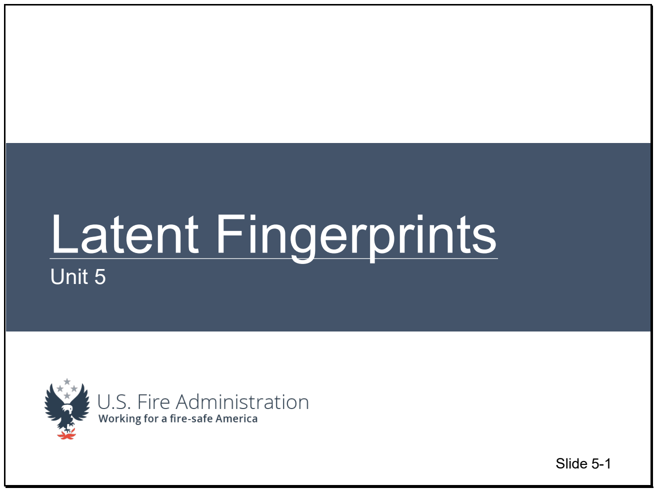
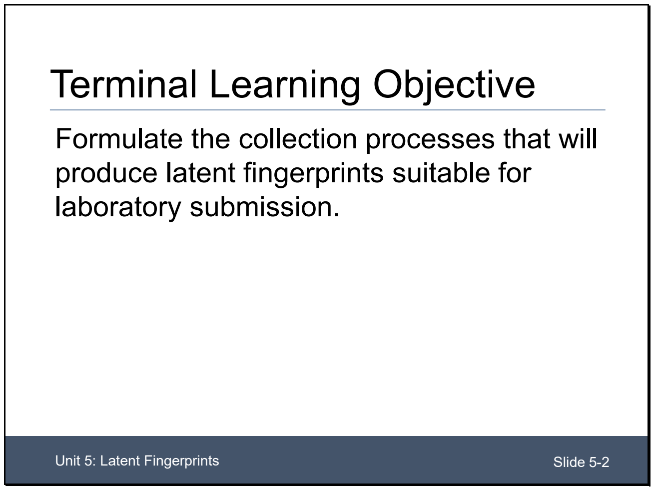
Slide 5-1: Latent Fingerprints



Key Information

Welcome to Unit 5: Latent Fingerprints!

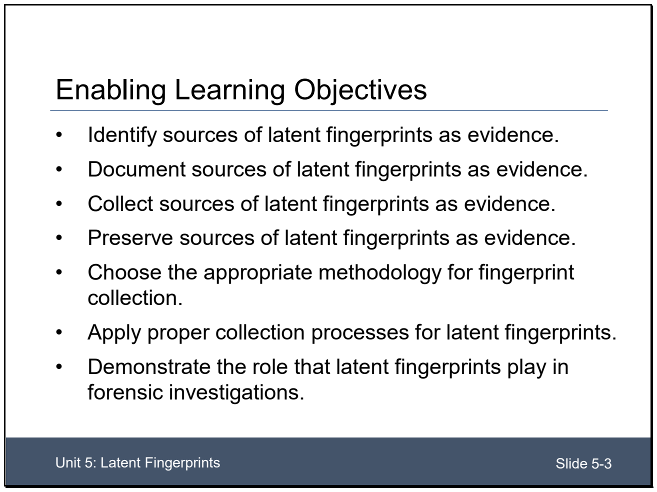
Slide 5-2: Terminal Learning Objective



Key Information

Formulate the collection processes that will produce latent fingerprints suitable for laboratory submission.

Slide 5-3: Enabling Learning Objectives



Key Information

After completing this unit, students will be able to:

- Identify sources of latent fingerprints as evidence.
- Document sources of latent fingerprints as evidence.
- Collect sources of latent fingerprints as evidence.
- Preserve sources of latent fingerprints as evidence.
- Choose the appropriate methodology for fingerprint collection.
- Apply proper collection processes for latent fingerprints.
- Demonstrate the role that latent fingerprints play in forensic investigations.

Slide 5-4: Regulations, Guidance and Standards

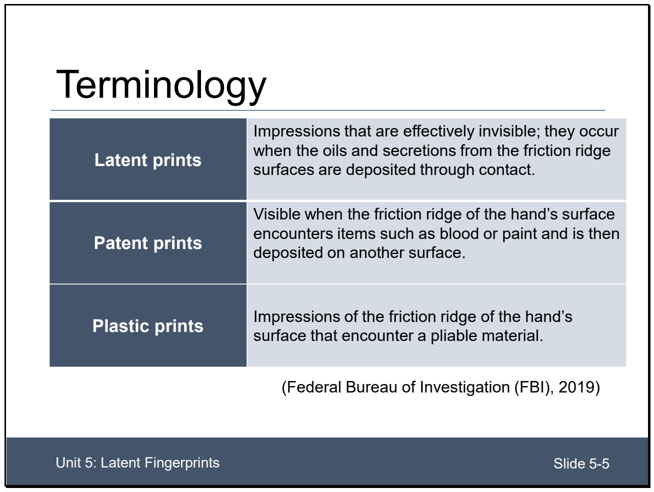
Key Information

Fingerprints are unique, as no two people have the same latent print. However, the fingerprint is not the only print available from the hand. Each section of the palm also has a unique and recordable print. This unit will review the different types of prints and the appropriate collection methods for each.

Regulations, Guidance and Standards

For the collection of latent fingerprints, important guidance includes the Handbook of Forensic Services.

Slide 5-5: Terminology



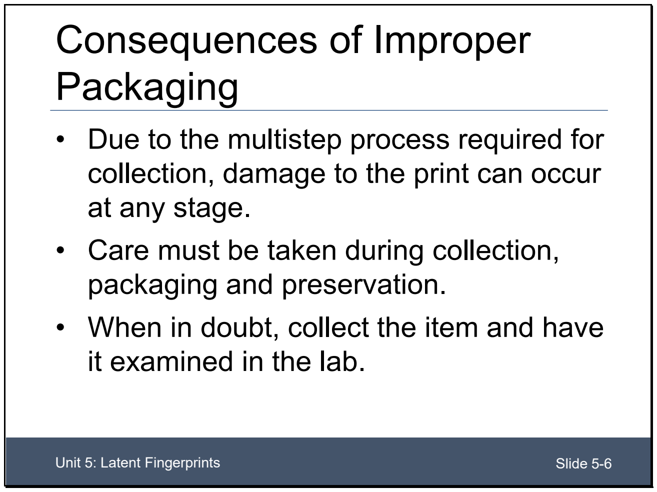
Key Information

Latent prints are impressions made from fingerprint patterns (e.g., arch, loop, whorl classification) that are effectively invisible. They occur when the oils and secretions from the friction ridge surfaces of the hand are deposited through contact (e.g., touching). The print can potentially be developed on almost any type of surface, with a greater likelihood on porous items, such as paper, and smooth, nonporous items made of plastic, metal or glass. Any item suspected of being handled should be submitted to the laboratory for examination (Federal Bureau of Investigation (FBI), 2019).

Patent prints are visible when the friction ridge of the hand's surface encounters items such as blood or paint and is then deposited on another surface (FBI, 2019).

Plastic prints are impressions of the friction ridge of the hand's surface that encounter a pliable material (e.g., wood or plastic putty) (FBI, 2019).

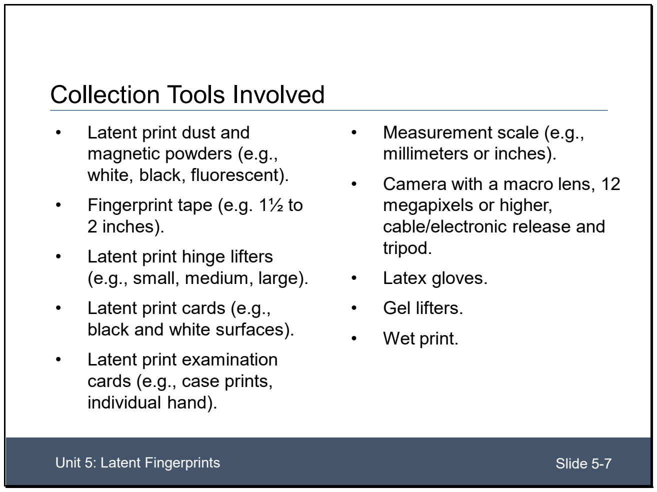
Slide 5-6: Consequences of Improper Packaging



Key Information

The number and complexity of steps involved increase the potential for damage to the latent print at any time. Investigators should be careful in collecting, packaging and preserving latent prints. When in doubt, the investigator should collect the item and examine it in a laboratory setting.

Slide 5-7: Collection Tools Involved

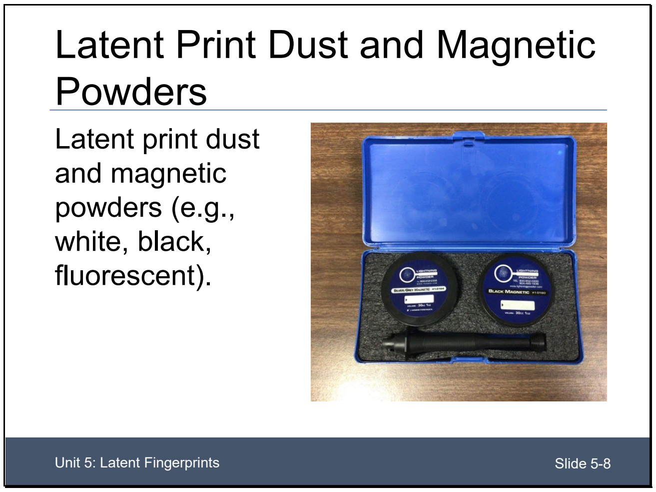


Key Information

These items should be available at the crime scene to properly collect latent prints:

- Latent print dust and magnetic powders (e.g., white, black, fluorescent).
- Fingerprint tape (e.g., 1½ to 2 inches).
- Latent print hinge lifters (e.g., small, medium, large).
- Latent print cards (e.g., black and white surfaces).
- Latent print examination cards (e.g., case prints, individual hand).
- Measurement scale (e.g., millimeters or inches).
- Camera with a macro lens:
  - Twelve or more megapixels.
  - Cable/electronic release.
  - Tripod.
- Latex gloves.
- Gel lifters.
- Wet print.

Slide 5-8: Latent Print Dust and Magnetic Powders



Key Information

Latent print dust and magnetic powders (e.g., white, black, fluorescent).

The difference between nonmagnetic latent print dust and magnetic powder involves the application process and surface to which the material can be applied.

Nonmagnetic latent print dust can be used on nonporous surfaces and is applied using a brush. This can be applied on vertical and nonvertical surfaces; however, the student must manipulate the powder by swirling it onto the print (ForensicReader.com, n.d.).

The magnetic powder applicator does not have a brush; a brush is formed by the magnetic material when the applicator picks it up. The best use of magnetic powder is on a horizontal nonporous or semi-porous surface. It is not good for vertical or magnetic surfaces (ForensicReader.com, n.d.).

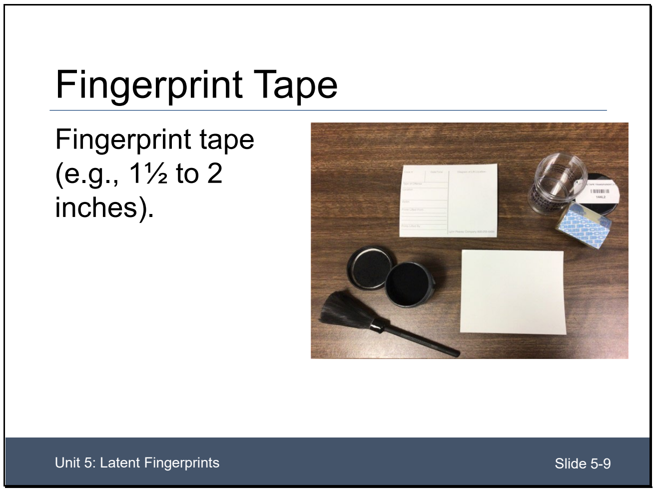
Surface Types and Powders

Surface type	Powder type	Justification
Dark surfaces	Gray/fluorescent magnetic or nonmagnetic powders	Better contrast.
Glazed ceramics	Magnetic and nonmagnetic powders	Testing required before selecting a method.
Gloves	Magnetic powders	Comparatively less pressure and resistance to fingermarks.
Highly smooth surfaces	Magnetic powders	• Much less pressure and resistance are required with a magnetic applicator. • A single heavy stroke of brush can remove the print.
Horizontal surfaces	Magnetic and nonmagnetic powders	Magnetic powder is relatively easy to apply.
Metal and metallic tapes	Nonmagnetic powders	Nonmagnetic powders
Paper	Nonmagnetic powder and chemical method	• Paper-soaked finger marks residue. • Cannot be destroyed by relatively heavy brush strokes.
Smooth surface	Magnetic and nonmagnetic powder	Best for practicing developing fingermarks.
Texture surfaces	Magnetic powders	Prints on grooves can easily be distributed with heavy brushstrokes of nonmagnetic powder.

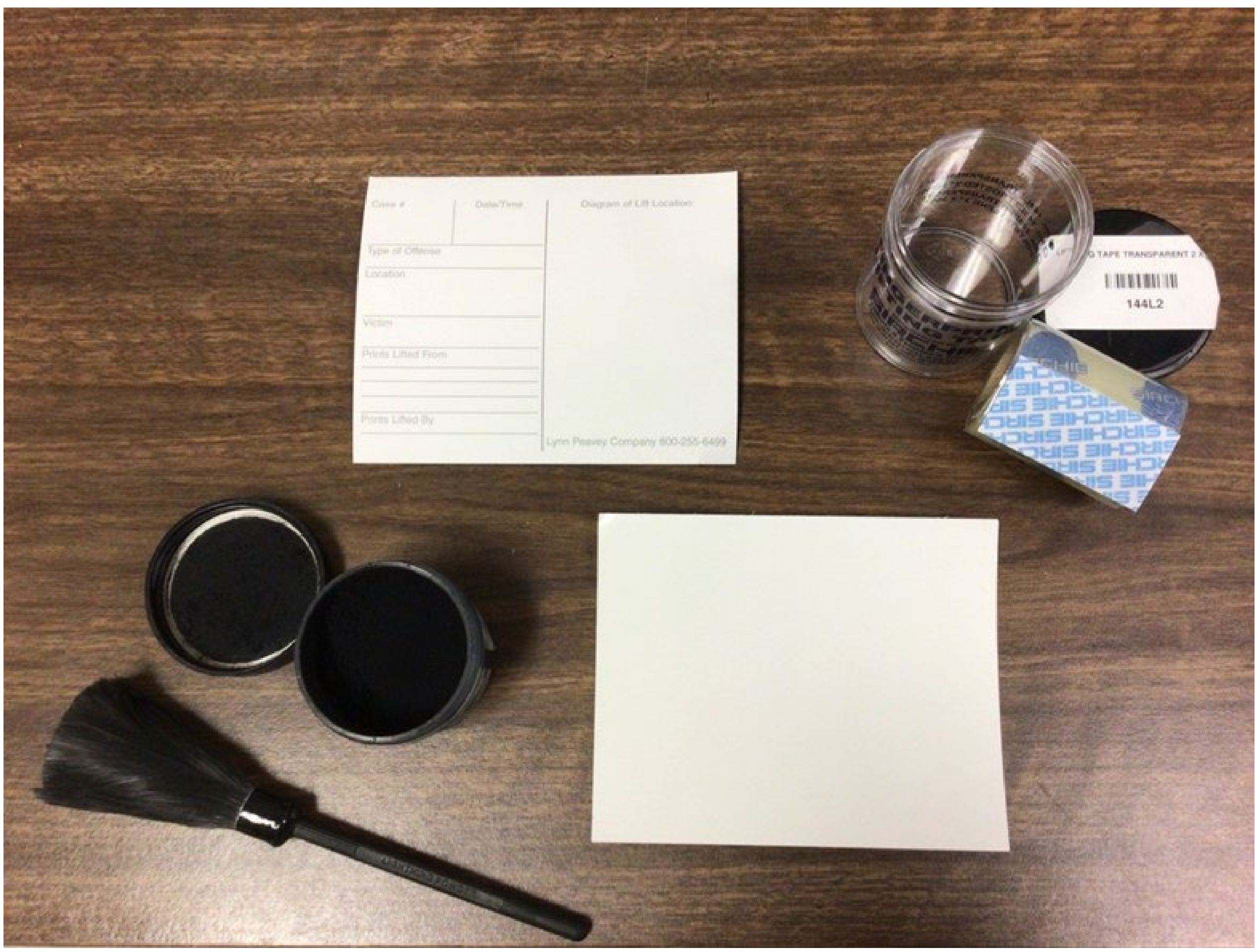
Vertical surfaces	Nonmagnetic powders	Magnetic powder tends to drop off with strokes.
Wood surfaces	Magnetic powders	Grooves can be developed with minimal resistance.

(Adapted from ForensicReader.com, n.d.)

Slide 5-9: Fingerprint Tape



Key Information



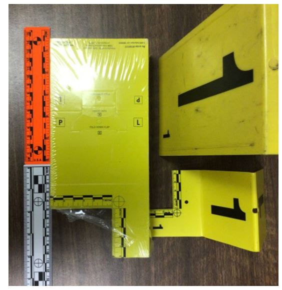
Surface	Types	Lifters	Procedure
Flat-smooth	Plastic, polished wood	Card lifters	Scoop lifters from one side to another.
Nonflat smooth	Doorknob	Tape lifters	Place on one side and make a circle in between, then scoop toward the edges.
Flat Textured	Unpolished wood	Gel tape lifters	Place gel tape on the textured surface and press it over the surface to allow the gel to fill the grooved surface.
Nonflat textured	Orange fruit	Casting materials	Use a syringe. The nozzle should not touch the impression surface.

(Adapted from ForensicReader.com, n.d.)

Slide 5-10: Measurement Scale

Measurement Scale

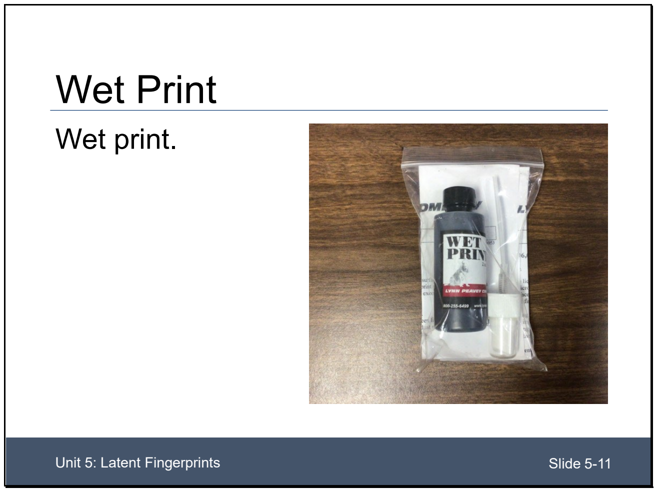
Measurement scale (e.g., millimeter or inches).



Unit 5: Latent Fingerprints Slide 5-10

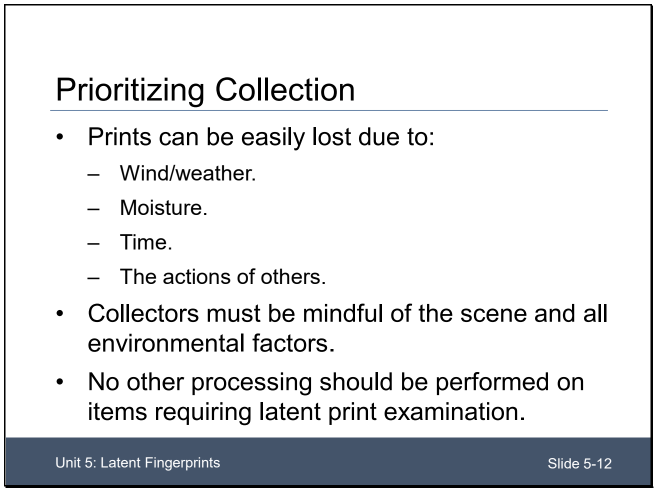
Key Information

Slide 5-11: Wet Print



Key Information

Slide 5-12: Prioritizing Collection



Key Information

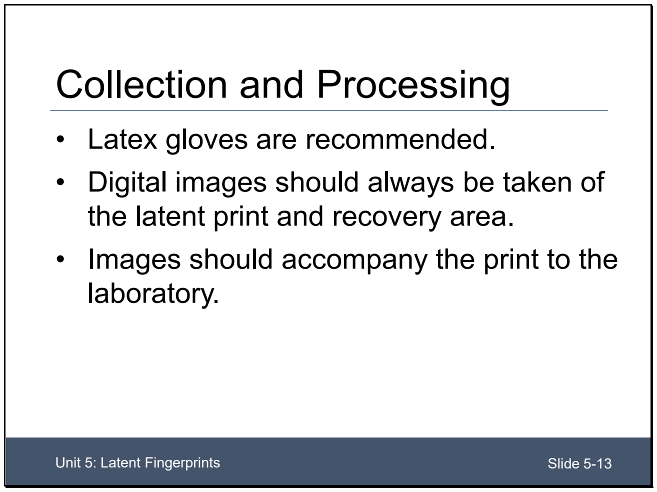
During the process of locating and collecting a latent print, the investigator should be mindful of the potential to lose the evidence. Wind, moisture, time and human interference destroy the evidence. **No other processing should be performed on items shipped to a laboratory for latent print examination.**

Before examining a particular item in a fire or explosion investigation, the investigator must consider the various types of evidence it may supply. For example, a metal gas container may hold latent prints on its exterior, which could help identify who carried the container. However, the interior would contain a possible ignitable liquid used to ignite the fire.

Discussion:

During a crime scene examination involving a death, the investigator observes a metal gas container next to the body. The room where the body is found smells heavily of what appears to be gasoline and has very little fire damage. The body shows foul play (e.g., stab wounds to the chest) with blood on the body, the area underneath the body and objects such as the gasoline container. There are three possible sources of information from the metal gasoline container: latent prints, gasoline and DNA. **In considering the collection and testing of the container, what should be processed and why?**

Slide 5-13: Collection and Processing

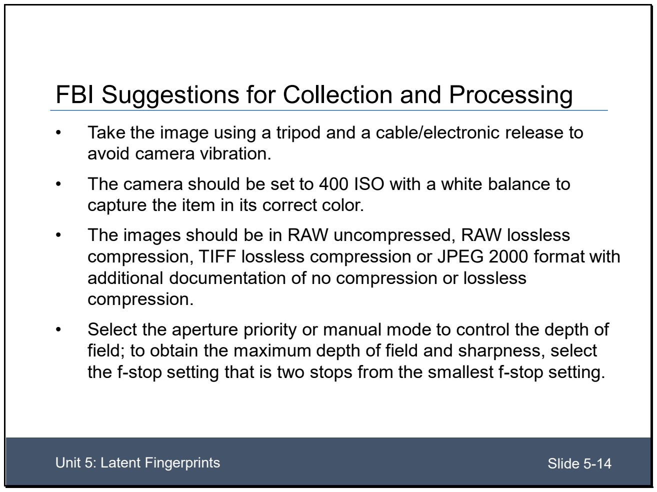


Key Information

The investigator should wear latex gloves to prevent oil or sweat from their skin from coming into contact with the latent print during the recovery process. The nitrile gloves will also protect the collector from powders and other chemicals used in latent print recovery and processing.

The investigator should take digital images of the latent print and the area from which the print was recovered (e.g., window, doorframe). It is recommended that an image be taken of the print area once identified, dusted (or another recovery process), collected, removed and packaged. These original images, not photocopies, should accompany the latent print to the laboratory.

Slide 5-14: FBI Suggestions for Collection and Processing



Key Information

Suggested settings and tools to assist with the documentation of the print include (FBI, 2019):

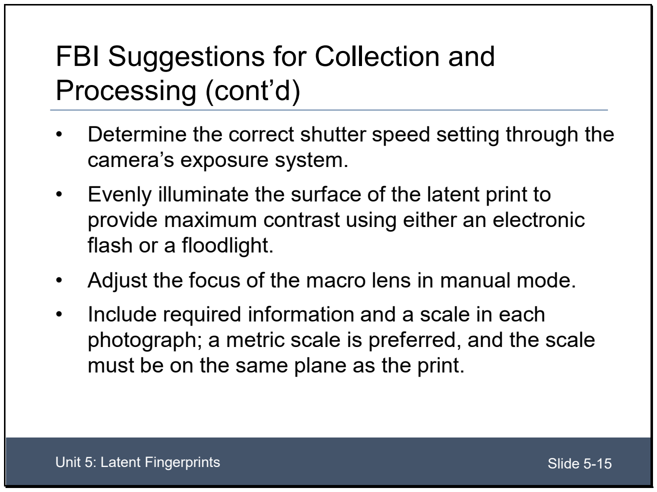
- Take the image using a tripod and a cable/electronic release to avoid camera vibration.
- The camera should be set to 400 ISO with a white balance to capture the item in its correct color. Lighting conditions control the white balance selection (e.g., daylight or tungsten lighting).
  - Digital image technology allows the settings to be controlled electronically. Before digital cameras were in use, investigators would have to take a picture based on raw data camera settings (e.g., in daylight or at night using a flash) and film. The film must be processed to determine if the image was captured correctly.
  - Today, digital cameras provide instant recognition of shutter speed, lighting and other settings through a digital display, allowing investigators to retake images or enhance the settings to ensure accurate capture.
- Photographs should be taken in RAW uncompressed, RAW lossless compression, TIFF lossless compression and JPEG 2000 format with additional documentation of no compression or lossless compression. The standard JPEG file format is not acceptable.

- Select the aperture priority or manual mode to control the depth of the field. To obtain the maximum depth of field and sharpness, select the f-stop setting that is two stops from the smallest f-stop setting. The f-stop setting indicates the aperture measurement, or how much light is let in through the camera lens.

Additional resources:

- Learn About F-Stop Photography & What It Does.
- When to use raw vs. JPEG.
- JPEG vs. TIFF vs. RAW.

Slide 5-15: FBI Suggestions for Collection and Processing (cont’d)

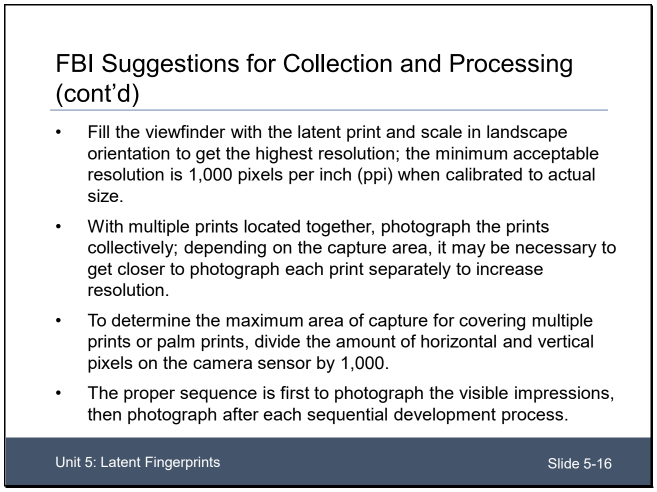


Key Information

Additional suggested settings and tools to assist with the documentation of the print include (FBI, 2019):

- Determine the correct shutter speed setting through the camera’s exposure system. Please note that overexposure or underexposure may be required to obtain maximum detail. The reflectivity of the surface should be evaluated to determine the proper exposure.
- Evenly illuminate the surface of the latent print to provide maximum contrast using either an electronic flash or a floodlight.
- Adjust the focus of the macro lens in manual mode.
- Include required information (e.g., reference number, date, investigators’ initials) and a scale in each photograph. A metric scale is preferred. The scale must be on the same plane as the print.

Slide 5-16: FBI Suggestions for Collection and Processing (cont'd)

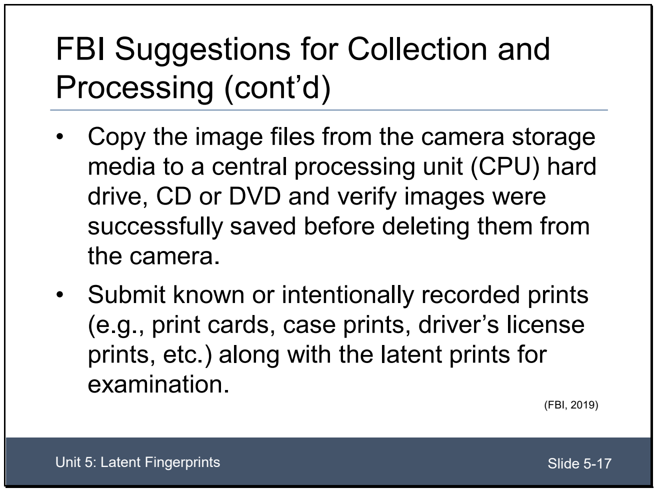


Key Information

Additional suggested settings and tools to assist with the documentation of the print include (FBI, 2019):

- Fill the viewfinder with the latent print and scale in landscape orientation to get the highest resolution. The minimum acceptable resolution is 1000 pixels per inch (ppi) when calibrated to actual size.
- With multiple prints located together, photograph the prints collectively; depending on the capture area, it may be necessary to get closer to photograph each print separately to increase resolution.
- To determine the maximum area of capture for covering multiple prints or palm prints, divide the amount of horizontal and vertical pixels on the camera sensor by 1,000. For example, the pixel resolution for a 12-megapixel sensor is 4256 by 2832. This equates to a maximum capture area of 4.256 inches by 2.832 inches (or 108 millimeters by 71 millimeters).
- The proper sequence is first to photograph the visible impressions, then photograph after each sequential development process.

Slide 5-17: FBI Suggestions for Collection and Processing (cont'd)



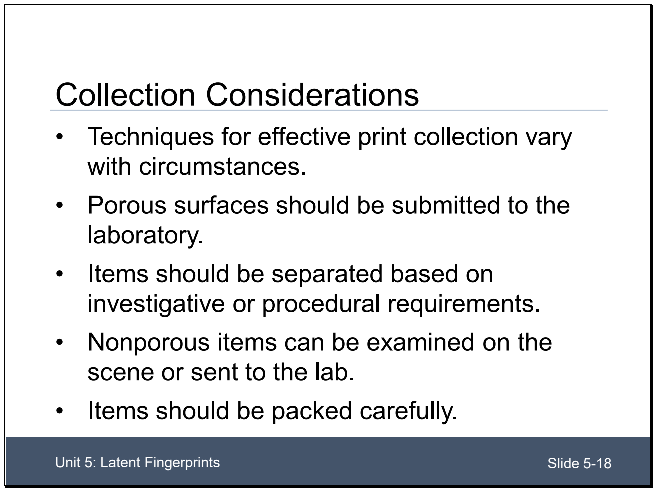
Key Information

Additional suggested settings and tools to assist with the documentation of the print include (FBI, 2019):

- Copy the image files from the camera storage media to a central processing unit (CPU) hard drive, CD or DVD and verify images were successfully saved before deleting them from the camera. When saving files to a CD or DVD, the best practice is to make at least two copies marked as "original/master" and store them separately. If possible, create two additional copies marked "original/master working copy" for viewing, processing and printing.

- Submit known or intentionally recorded prints (e.g., print cards, case prints, driver's license prints, etc.) along with the latent prints for examination.

Slide 5-18: Collection Considerations



Key Information

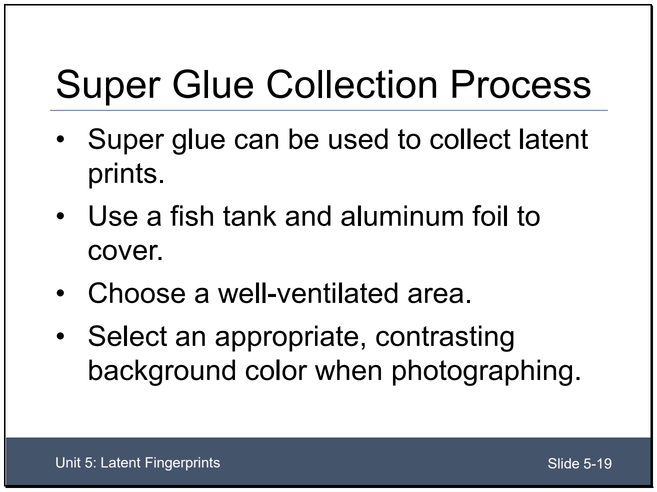
The techniques required to obtain a print effectively vary according to the circumstances.

- **Porous surfaces** (e.g., paper, cardboard, untreated wood) absorb moisture, making detecting and retrieving a latent print difficult. In these instances, the item should be submitted to a laboratory for the best opportunity to retrieve the latent print. Items can be submitted together but should be separated based on investigative or procedural requirements. The items can then be submitted in paper or plastic containers.

- **Nonporous surfaces** (e.g., vinyl, leather, textured countertops, painted surfaces, plastic surfaces, glass) do not absorb moisture. The item retrieved can be examined on the scene or in a laboratory. Items must be packaged individually and in a manner that restricts movement of the item within the packaging. The packaging can be heat-sealable plastic bags (e.g., sealed around the object), or items can be shipped in boxes utilizing zip ties to secure the item from moving.

Items submitted to the laboratory for latent print only may be processed by cyanoacrylate (e.g., super glue) fuming by trained personnel before packaging and shipping to the laboratory.

Slide 5-19: Super Glue Collection Process



Key Information

Super glue can be used to recover a latent print (e.g., finger or hand) from an item. A small fish tank with foil (or other items) can be used to cover the top. This process must be conducted in a well-ventilated area.

To properly document the print with a photograph, the investigator must be sure to use an appropriate background color for the item they wish to super glue. Glass can be any color, but black on black will be hard to see.

Slide 5-20: Lab Protocols

Lab Protocols

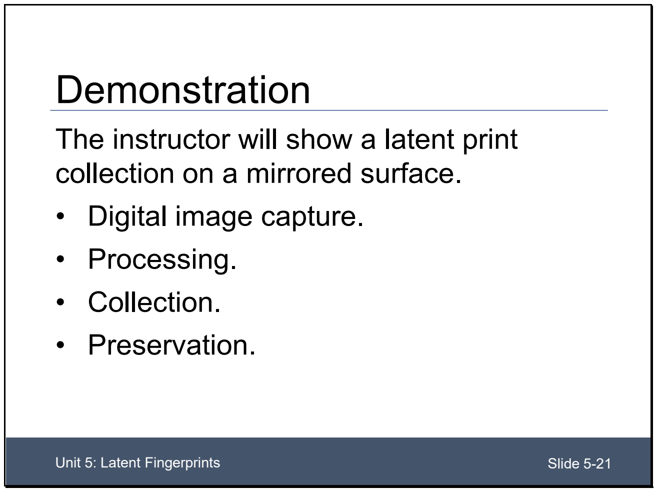
- A laboratory examination of fingerprints is possible with proper collection.
- Items containing prints may be sent to the lab for examination.
- Prints may be collected on the scene and sent to the lab.

Unit 5: Latent Fingerprints Slide 5-20

Key Information

Laboratory examination of latent prints is possible with proper collection from a crime scene. The print can be taken from a range of items. Once the item is collected, the laboratory analyst must locate, remove, examine and compare the print in question to known prints. In addition, the print can come from an investigator on the scene who removes the print from an item or area.

Slide 5-21: Demonstration



Slide 5-22: Video Presentation

Key Information

The instructor will show a latent print (e.g., finger or hand) collection on a mirrored surface. The instructor will demonstrate the steps in the traditional recovery of the latent print:

- Digital capture.
- Processing.
- Collection.
- Preservation.

The instructor will then show a video of a latent print (e.g., finger or hand) collection on an item using the duster/gel lifter. The video will show the steps in the recovery of the latent print.

For additional information, watch "Forensic Education: Lifting Fingerprints with Gel Lifters." (13:11)

Slide 5-23: Activity 5.1

Activity Estimated Time: 25 minutes

Activity Purpose

Provided a nonporous surface (e.g., door and doorframe, windows, desktop within the classroom area), each student will collect a latent print following the demonstrated process. The student will place a latent print in an area (e.g., exterior window) visible to them. The student will then follow the directions below to recover the print using print cards and tape/hinge lifters.

Activity Directions

1. Identify latent prints through the application of traditional means with the powder and brush.

2. Document the findings using standard crime scene techniques (e.g., digital image, sketching, written notes).

3. Collect latent prints using traditional print cards and tape/hinge lifters.

4. Preserve the evidence by packaging the items collected.

Tools

Latent print dust and magnetic powders (e.g., white, black, fluorescent), fingerprint tape (e.g., 1½ to 2 inches), latent print hinge lifters (e.g., small, medium, large), latent print cards (e.g., black and white surfaces), latent print examination cards (e.g., case prints, individual hand), measurement scale (e.g., millimeters or inches), camera with a macro lens (12 megapixels minimum, cable/electronic release, tripod), nitrile gloves, gel lifters, and wet print.

Slide 5-24: Activity 5.2

Activity Estimated Time: 25 minutes

Activity Purpose

Provided a nonporous surface (e.g., soda cans, bottles, glass, etc.), each team/table will recover a latent print from the object. The team will place a latent print in an area of the object visible to them. The student will then follow the directions to recover the print using super glue.

Activity Directions

1. Identify latent prints through the application of a gluing method.

2. Document the findings using standard crime scene techniques (e.g., digital image, sketching, written notes).

3. Collect latent prints using the traditional powder and brush technique, print cards and hinge lifters.

4. Preserve the evidence by packaging the items collected.

Tools

Six 10-gallon fish tanks with lids, super glue, latent print hinge lifters (e.g., small, medium, large), latent print cards (e.g., black and white surfaces), latent print examination cards (e.g., case prints, individual hand), measurement scale (e.g., millimeters or inches), camera with a macro lens (12 megapixels minimum, cable/electronic release, tripod), nitrile gloves, gel lifters, and wet print.

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Slide 5-25: Activity 5.3

Activity Estimated Time: 40 minutes

Activity Purpose

Provided a porous surface (e.g., textured surfaces), each student will collect a latent print through the demonstration process. The student will place a latent print in an area (e.g., tabletop) visible to them. The student will then follow the directions below to recover the print using dusters/gel lifters.

Activity Directions

1. Identify latent prints by applying traditional means of powder and brush.

2. Document the findings using standard crime scene techniques (e.g., digital image, sketching, written notes).

3. Collect the latent prints using the duster/gel lifter.

4. Preserve the evidence by packaging the items collected.

Tools

Latent print dust and magnetic powders (e.g., white, black, fluorescent), fingerprint tape (e.g., 1½ to 2 inches), latent print hinge lifters (e.g., small, medium, large), latent print cards (e.g., black and white surfaces), latent print examination cards (e.g., case prints, individual hand), measurement scale (e.g., millimeters or inches), camera with a macro lens (12 megapixels minimum, cable/electronic release, tripod), nitrile gloves, gel lifters, and wet print.

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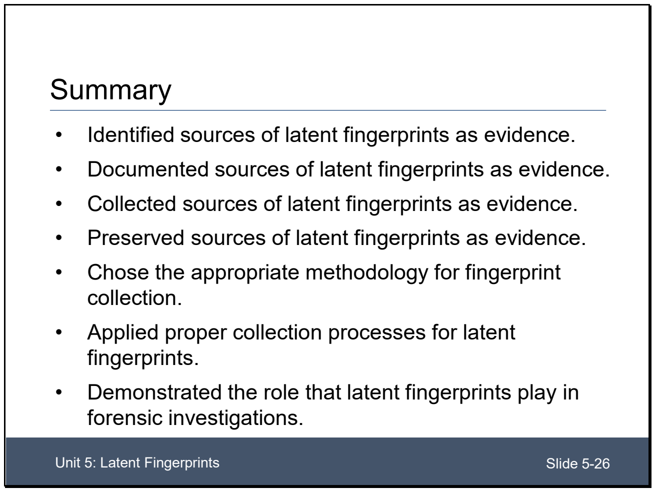
Slide 5-26: Summary



Key Information

Students should now be able to:

- Identify sources of latent fingerprints as evidence.
- Document sources of latent fingerprints as evidence.
- Collect sources of latent fingerprints as evidence.
- Preserve sources of latent fingerprints as evidence.
- Choose the appropriate methodology for fingerprint collection.
- Apply proper collection processes for latent fingerprints.
- Demonstrate the role that latent fingerprints play in forensic investigations.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 6: Blood/Bodily Fluids/ DNA

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Produce useable, properly identified and packaged samples from a variety of blood, bodily fluids and DNA sources.

Unit Enabling Learning Objectives (ELOs)

6.1 Identify blood, bodily fluids and DNA as forensic evidence.
6.2 Document blood, bodily fluids and DNA as forensic evidence.
6.3 Collect blood, bodily fluids and DNA as forensic evidence.
6.4 Preserve blood, bodily fluids and DNA as forensic evidence.
6.5 Discuss the relevance of blood, bodily fluids and DNA as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Produce useable, properly identified and packaged samples from a variety of blood, bodily fluids and DNA sources.	Practicum Part I: Crime Scene Investigation

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify blood, bodily fluids and DNA as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 6.1	Final Exam
Document blood, bodily fluids and DNA as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 6.1	Practicum Part I: Crime Scene Investigation
Collect blood, bodily fluids and DNA as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 6.1	Practicum Part I: Crime Scene Investigation
Preserve blood, bodily fluids and DNA as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 6.1	Practicum Part I: Crime Scene Investigation
Discuss the relevance of blood, bodily fluids and DNA as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 6.1	Practicum Part I: Crime Scene Investigation

Unit Schedule

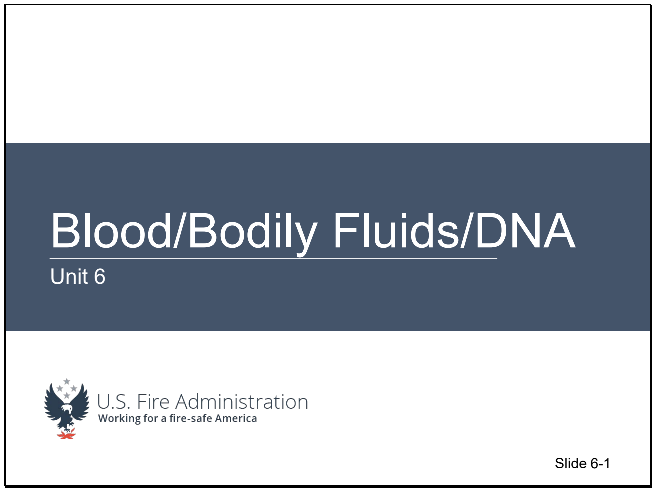
Topic	Duration
Lesson	60 min.
Demonstration	15 min.
Activity 6.1: Molotov Cocktail: Collection	20 min.
Summary	5 min.

Audiovisual

Slides 6-1 to 6-39

Video: “Bloodstain on Substrate”

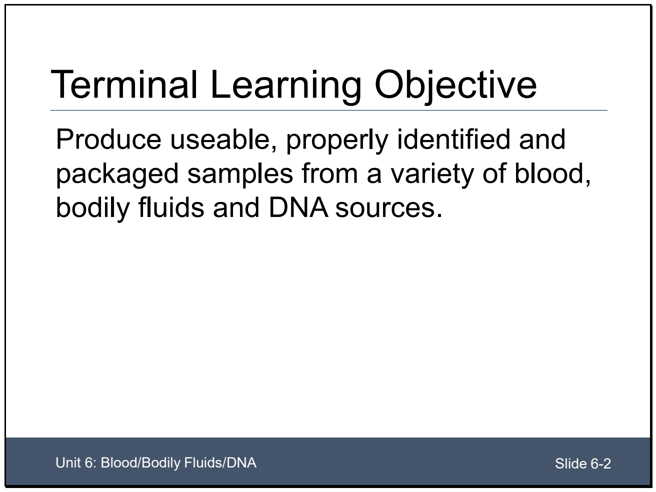
Slide 6-1: Blood/Bodily Fluids/DNA



Key Information

Welcome to Unit 6: Blood/Bodily Fluids/DNA!

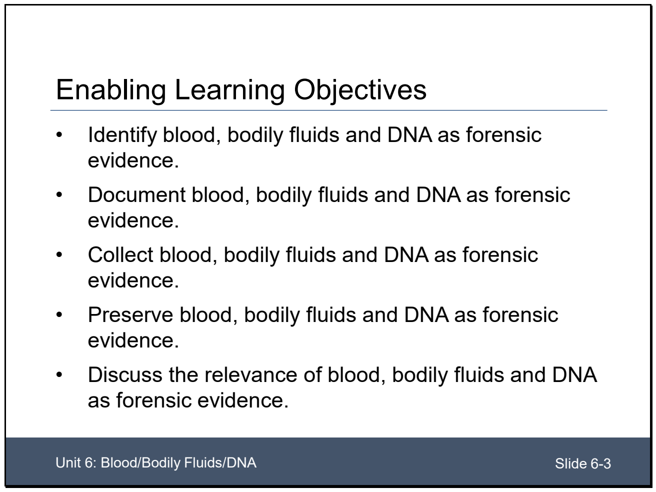
Slide 6-2: Terminal Learning Objective



Key Information

Produce useable, properly identified and packaged samples from a variety of blood, bodily fluids and DNA sources.

Slide 6-3: Enabling Learning Objectives

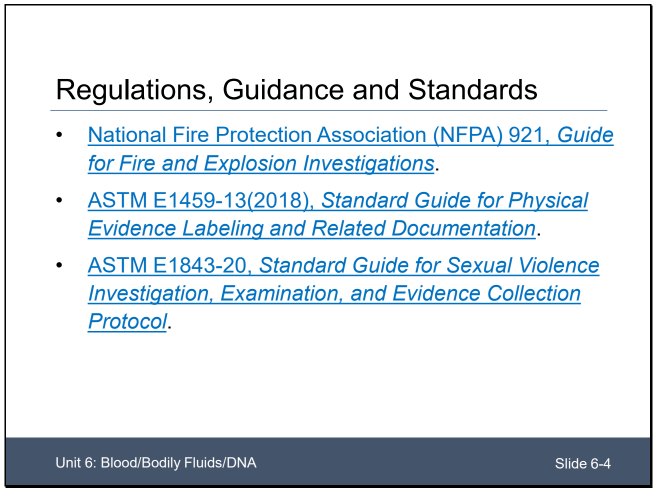


Key Information

After completing this unit, students will be able to:

- Identify blood, bodily fluids and DNA as forensic evidence.
- Document blood, bodily fluids and DNA as forensic evidence.
- Collect blood, bodily fluids and DNA as forensic evidence.
- Preserve blood, bodily fluids and DNA as forensic evidence.
- Discuss the relevance of blood, bodily fluids and DNA as forensic evidence.

Slide 6-4: Regulations, Guidance and Standards



Slide 6-5: Regulations, Guidance and Standards (cont'd)

Key Information

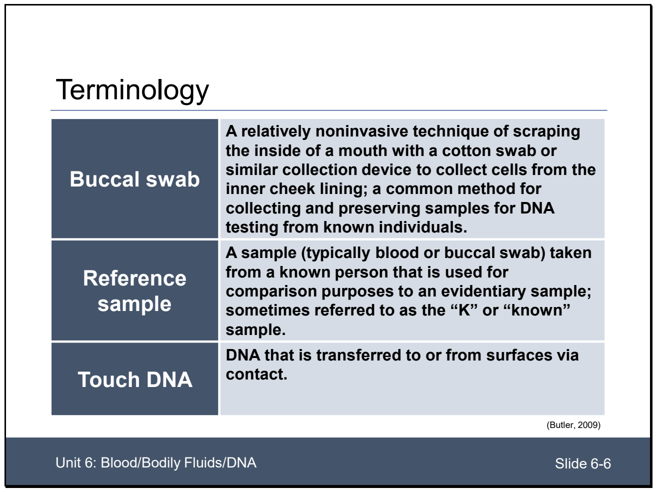
DNA is often found at fire and explosion scenes. Whether DNA is from blood or body fluids, proper collection methods must be used to identify suspects and victims and ensure that biological hazards are handled safely.

Regulations, Guidance and Standards

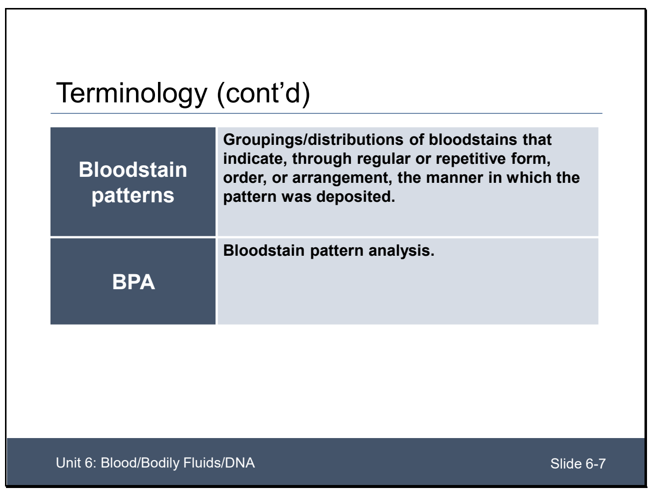
Regulations, guidance and standards for blood, bodily fluids and DNA include:

- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
- ASTM E1459-13(2018), *Standard Guide for Physical Evidence Labeling and Related Documentation*.
- ASTM E1843-20, *Standard Guide for Sexual Violence Investigation, Examination, and Evidence Collection Protocol*.
- American Academy of Forensic Sciences (AAFS) *Standard for Validation Studies of DNA Mixtures, and Development and Verification of a Laboratory's Mixture Interpretation Protocol*.
- ANSI/ASB Standard 040, *Standard for Forensic DNA Interpretation and Comparison Protocols*.
- NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*.

Slide 6-6: Terminology



Slide 6-7: Terminology (cont'd)



Key Information

A **buccal swab** is a relatively noninvasive technique of scraping the inside of a mouth with a cotton swab or similar collection device to collect cells from the inner cheek lining. This is a common method for collecting and preserving samples for DNA testing from known individuals (Butler, 2009).

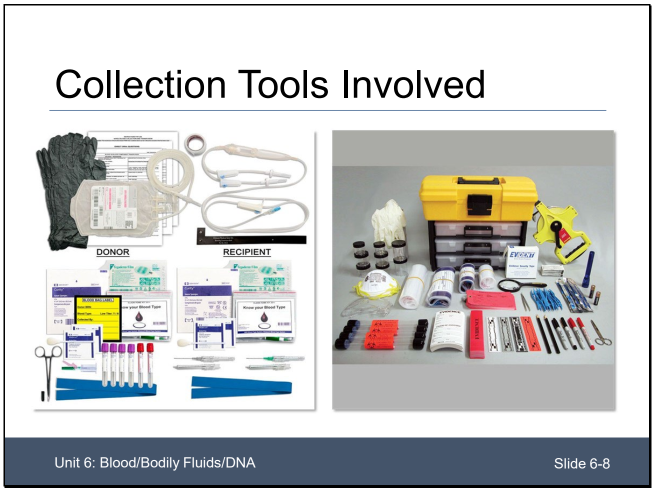
A **reference sample** is a sample (typically blood or buccal swab) taken from a known person that is used for comparison purposes to an evidentiary sample; sometimes referred to as the "K" or "known" sample (Butler, 2009).

Touch DNA is DNA that is transferred to or from surfaces via contact (Butler, 2009).

Bloodstain patterns are a groupings/distributions of bloodstains that indicate, through regular or repetitive form, order, or arrangement, how the pattern was deposited.

BPA stands for bloodstain pattern analysis.

Slide 6-8: Collection Tools Involved



Key Information

These items should be available at the crime scene to properly collect blood/bodily fluids/DNA samples:

- Personal protective equipment (PPE).
- Swabs (sterile), wooden or plastic.
- Swab boxes or another suitable container for packaging of swabs.
- Tweezers.
- Disposable razor blade or scalpel.
- Scissors.
- Distilled water.
- Biohazard labels.

Slide 6-9: Recommended Personal Protective Equipment

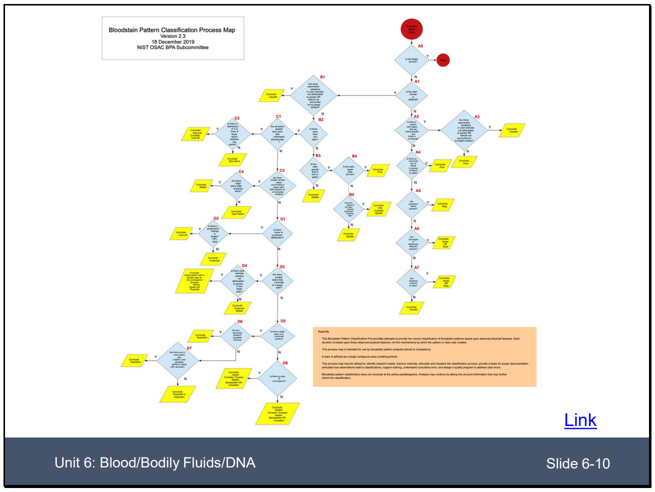
Key Information

Using PPE is not only to protect the investigator. It is equally important to protect the crime scene's integrity and prevent the transfer of evidence from the investigator to the crime scene.

PPE should also be available at the crime scene to properly collect blood/bodily fluids/DNA samples:

- Latex or nitrile gloves.
- Eye protection.
- Mask that covers nose and mouth.
- Tyvek® white paper bodysuit.
- Sleeve protectors.
- Shoe covers.

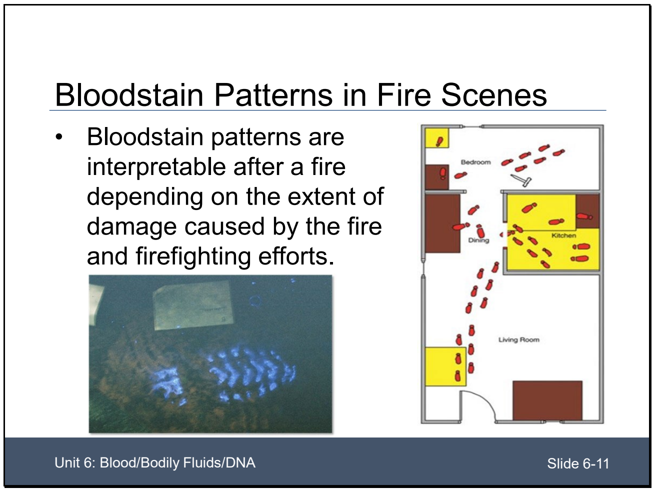
Slide 6-10: Bloodstain Pattern Classification



Key Information

The slide displays the Bloodstain Pattern Classification Process Map created by the National Institute of Standards and Technology (NIST) BPA subcommittee.

Slide 6-11: Bloodstain Patterns in Fire Scenes



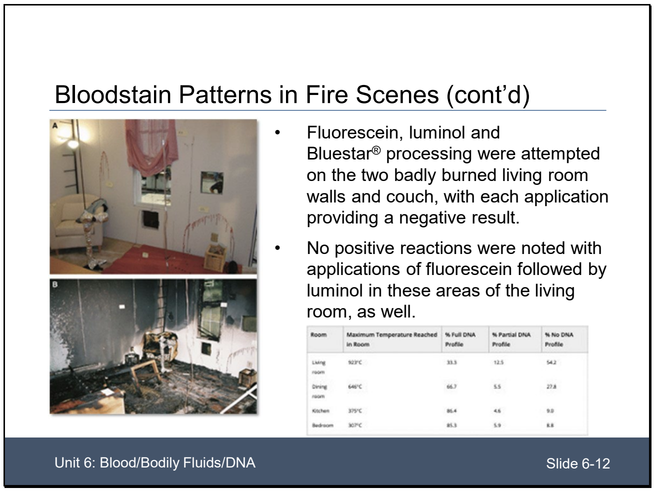
Key Information

Bloodstain patterns can be found in fire scenes but are based on the amount of damage caused by the fire and firefighting activities. Bloodstains refer to something that is covered in blood and may be classified into three different categories:

- Passive.
- Transfer.
- Projected/impact.

Blood spatter is a type of projected/impact pattern caused by blood.

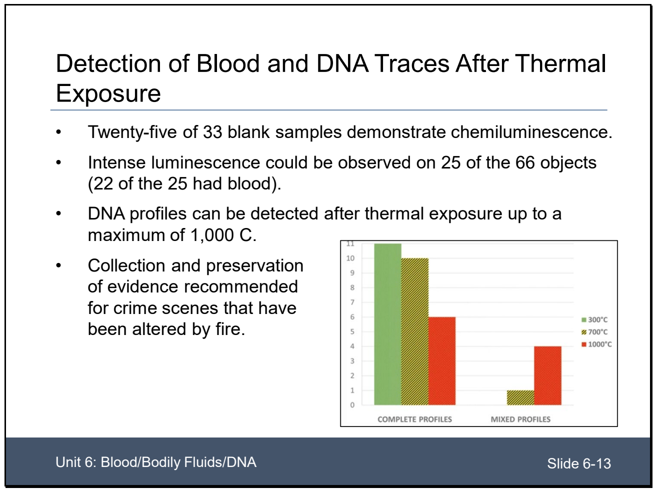
Slide 6-12: Bloodstain Patterns in Fire Scenes (cont'd)



Key Information

Normal chemicals used in determining bloodstains may or may not be helpful; it depends on the damage.

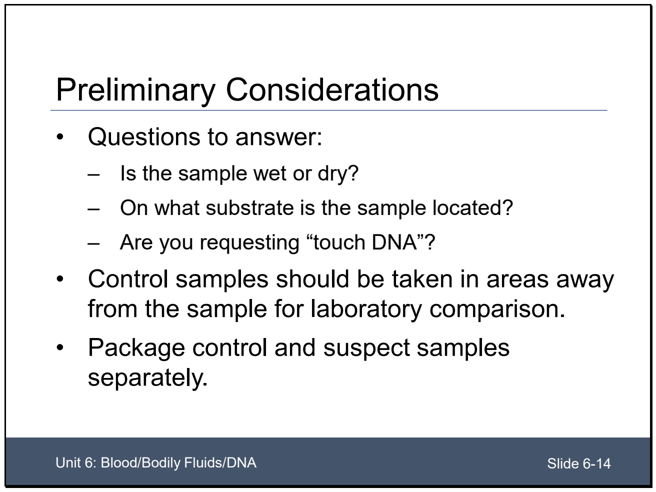
Slide 6-13: Detection of Blood and DNA Traces After Thermal Exposure



Key Information

Normal chemicals used in determining bloodstains may or may not be helpful.

Slide 6-14: Preliminary Considerations



Key Information

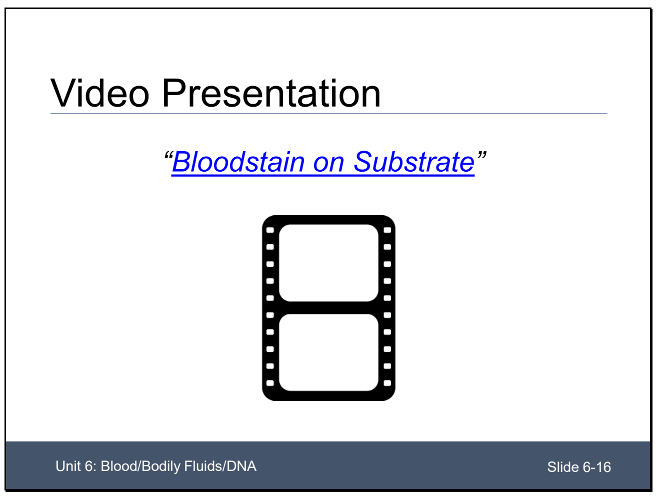
Before beginning the collection process, the collector should consider several questions:

- Is the sample wet or dry?
- On what substrate is the sample located?
- Are you requesting “touch DNA”?

Control samples should be taken in areas away from the suspect sample for laboratory comparison. **Package control and suspect samples separately.**

Slide 6-15: Collecting Bloodstain Evidence

Slide 6-16: Video Presentation

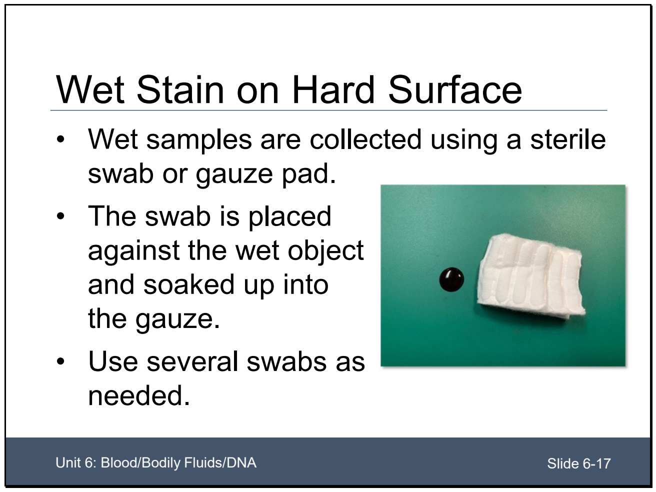


Key Information

Bloodstain collection is dependent upon the stained surface.

For more information, visit "Bloodstain on Substrate" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 6-17: Wet Stain on Hard Surface

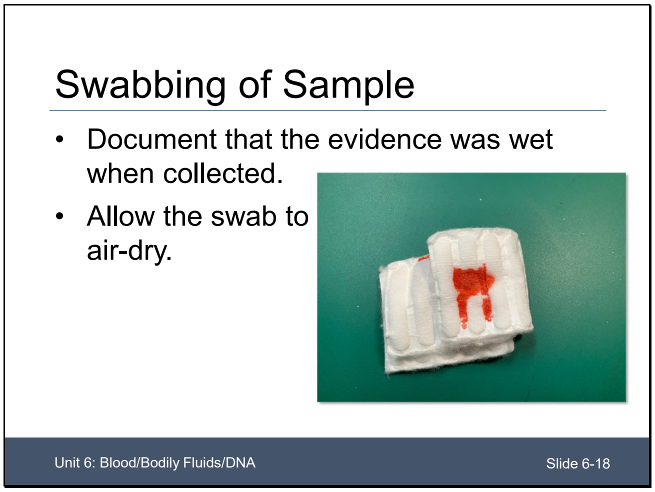


Key Information

For the collection of wet stains on hard surfaces:

- Wet samples are collected using a sterile swab or gauze pad.
- The swab is placed against the wet object and soaked into the gauze.
- Use several swabs as needed.

Slide 6-18: Swabbing of Sample

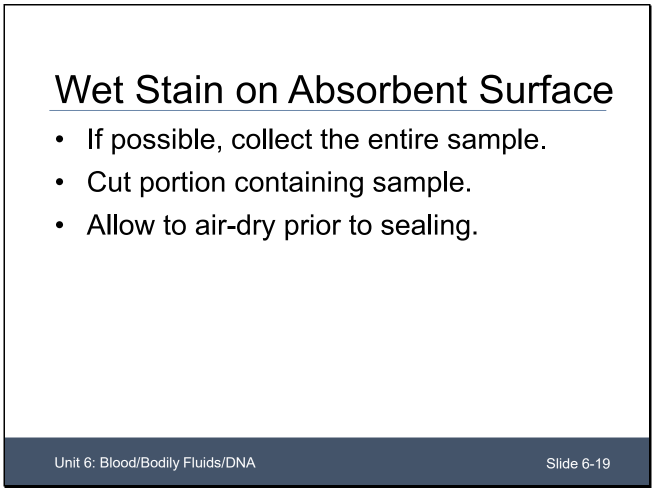


Key Information

When swabbing wet samples:

- Document that the evidence was wet when collected.
- Allow the swab to air-dry.

Slide 6-19: Wet Stain on Absorbent Surface

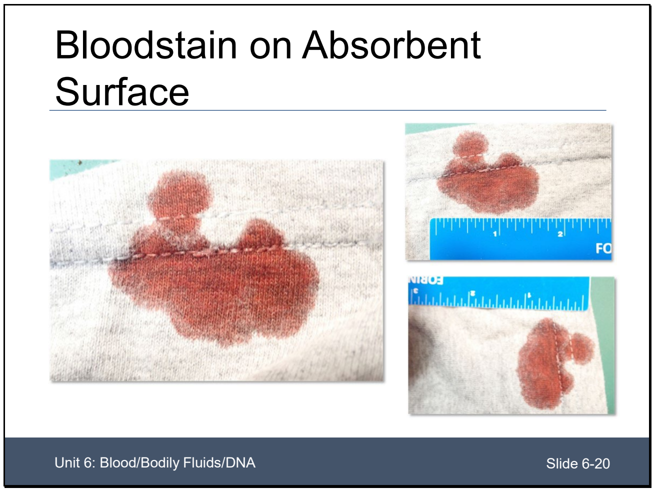


Key Information

For wet stains on absorbent surfaces:

- If possible, collect the entire sample.
- Cut the portion of the item containing the sample.
- Allow the sample to air-dry before sealing.

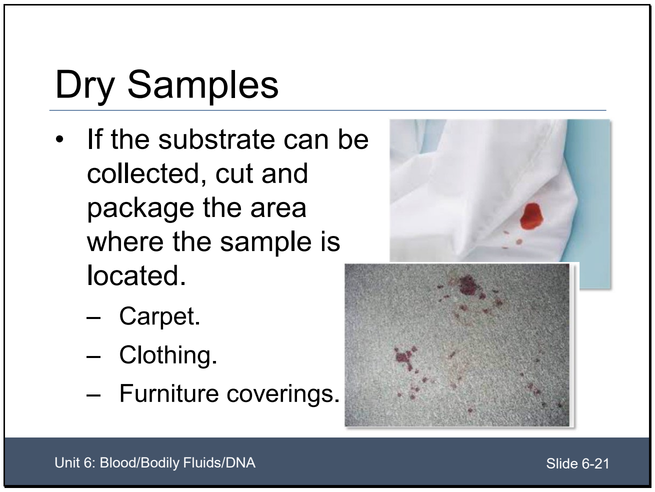
Slide 6-20: Bloodstain on Absorbent Surface



Key Information

This slide displays bloodstains found on an absorbent surface.

Slide 6-21: Dry Samples

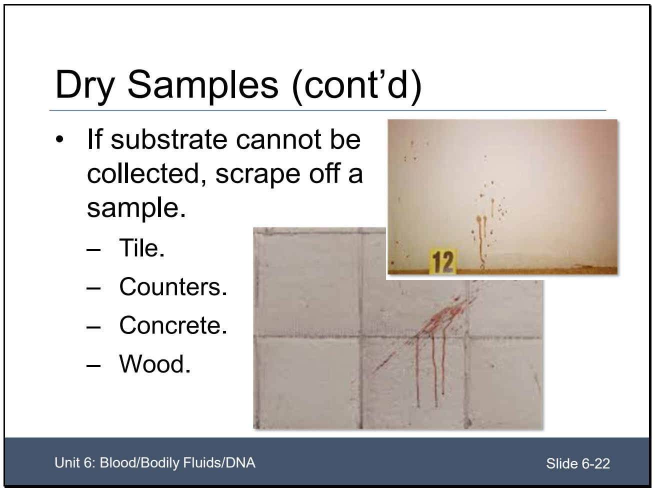


Key Information

If the substrate can be collected, cut and package the area of the substrate where the sample is located, such as on:

- Carpet.
- Clothing.
- Furniture coverings.

Slide 6-22: Dry Samples (cont'd)



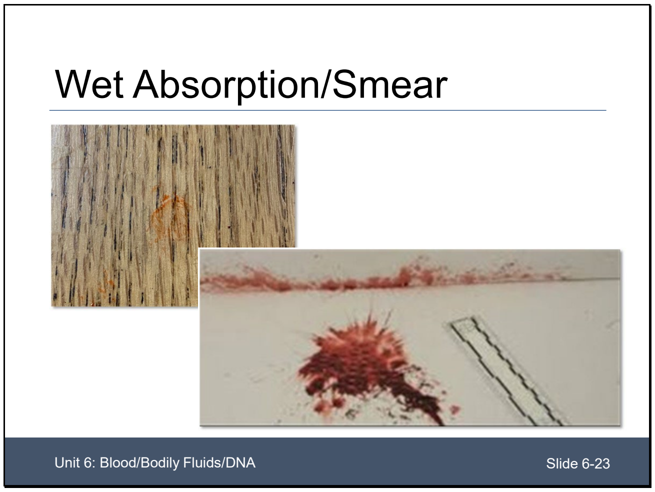
Key Information

If the substrate cannot be collected, the sample can be scraped off the medium using a sterile razor. The sample should be scraped onto sterile paper and packaged in a paper envelope.

Scrapings should occur for objects in which the item cannot be taken, such as:

- Tile.
- Counters.
- Concrete.
- Wood (can be shaved using a sterile scalpel blade).

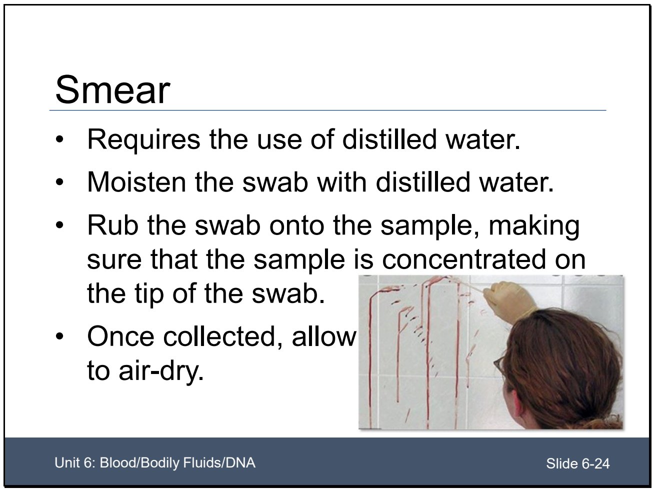
Slide 6-23: Wet Absorption/Smear



Key Information

There are instances in which you will need to take a sample through wet absorption.

Slide 6-24: Smear



Key Information

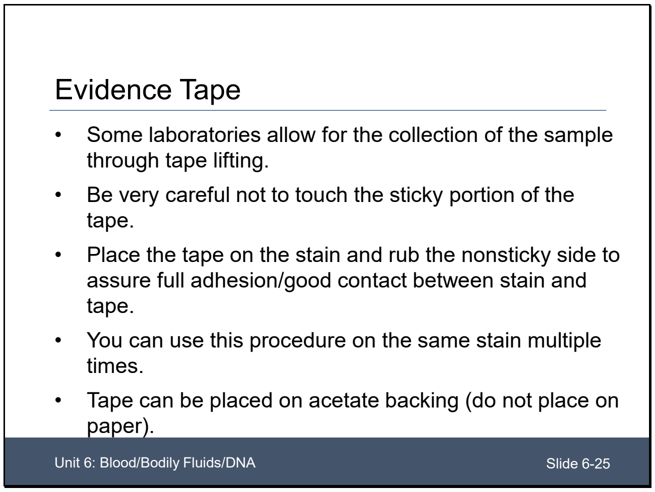
Smears are like wet absorption, using a swab/gauze moistened by distilled water.

- Moisten the swab with distilled water.
- Swab the smear, concentrating the stain on the tip of the swab.
- After collecting samples with a moistened swab, swab the area again with a dry swab.
- Allow the samples to air-dry.

If bloodstain patterns are to be analyzed for how they were created, samples should not be taken without the support of a well-trained Crime Scene Investigation (CSI) team.

- This collection involves “wiping” the material.
- The collector must be aware that this will destroy the bloodstain patterns.
- Thoroughly document the stain before collection.

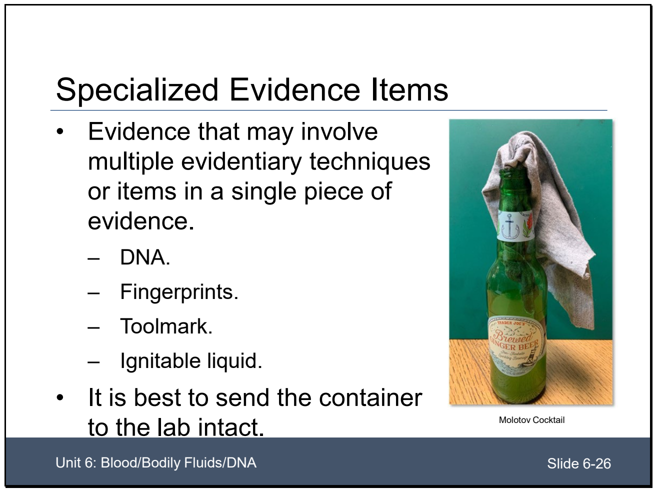
Slide 6-25: Evidence Tape



Key Information

Some laboratories allow for the collection of the sample through tape lifting; be very careful not to touch the sticky portion of the tape. Place the tape on the stain and rub the nonsticky side to assure full adhesion/good contact between stain and tape. (This procedure can be used on the same stain multiple times.) The tape can be placed on acetate backing (do not place on paper).

Slide 6-26: Specialized Evidence Items



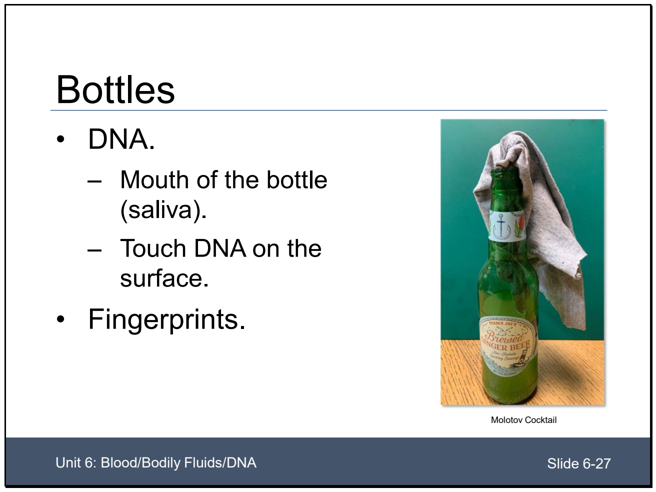
Key Information

Some evidence may involve multiple evidentiary techniques or items in a single piece of evidence. For example, a Molotov cocktail might include:

- DNA (e.g., saliva).
- Fingerprints.
- Toolmark.
- Ignitable liquid.

It is best to send the intact container to the lab; however, ignitable liquid cannot be sent to the forensic laboratory in the container.

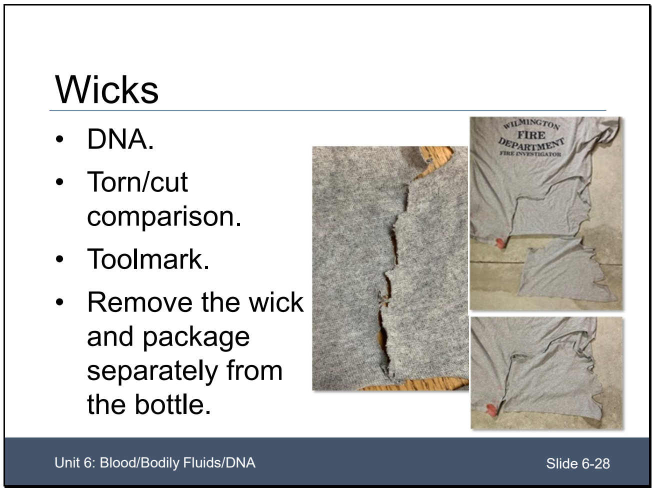
Slide 6-27: Bottles



Key Information

- DNA.
  - Mouth of the bottle (saliva).
  - Touch DNA on surface.
- Fingerprints.

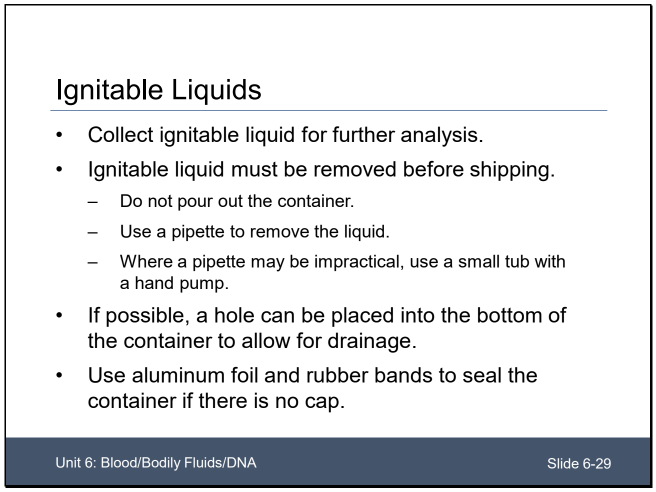
Slide 6-28: Wicks



Key Information

- DNA.
- Torn/cut comparison.
- Toolmark.
- Remove the wick and package separately from the bottle.

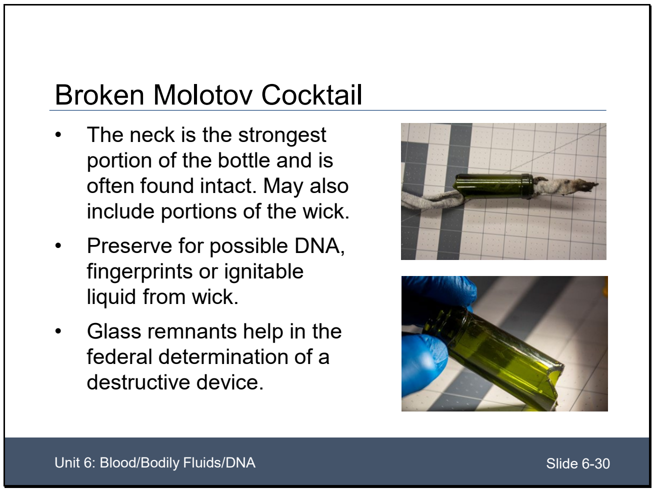
Slide 6-29: Ignitable Liquids



Key Information

Ignitable liquids within a bottle must be collected for further analysis, as discussed in Unit 2: Ignitable Liquid. Remove ignitable liquids from the bottle before shipping; do not pour out the container. Use a pipette to remove the liquid. Where a pipette may be impractical, use a small tub with a hand pump. If possible, a hole may be placed into the bottom of the container to allow for drainage. If a cap is not available to seal the container, aluminum foil may be wrapped around the lid and secured with a rubber band.

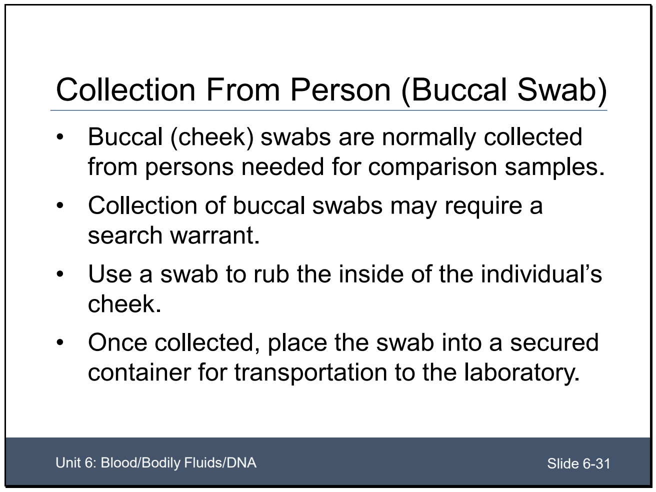
Slide 6-30: Broken Molotov Cocktail



Key Information

- The neck is the strongest portion of the bottle and is often found intact. May also include portions of the wick.
- Preserve for other possible evidentiary items such as DNA, fingerprints or ignitable liquid from the wick.
- Glass remnants may help in the federal determination of a destructive device.

Slide 6-31: Collection From Person (Buccal Swab)

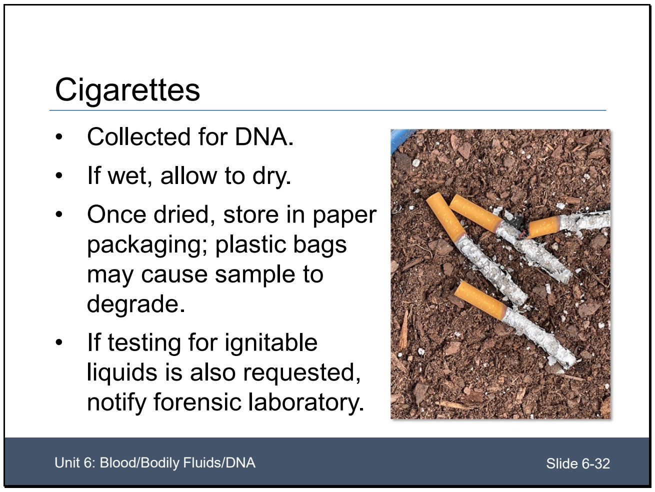


Key Information

Buccal swabs are normally collected from persons needed for reference samples. (Buccal is defined as “relating to the cheek.”) Please note: The collection of buccal swabs may require a search warrant.

To perform the collection, use a swab to rub the inside of the individual’s cheek. Once collected, place the swab into a secured container for transportation to the laboratory.

Slide 6-32: Cigarettes



Key Information

Considerations for cigarettes as evidence:

- Collected for DNA.
- If wet, allow to dry.
- Once dried, store in paper packaging (plastic bags may cause the sample to degrade).
- If testing for ignitable liquids is also requested, notify the forensic laboratory.

Slide 6-33: Packaging and Transport

Packaging and Transport

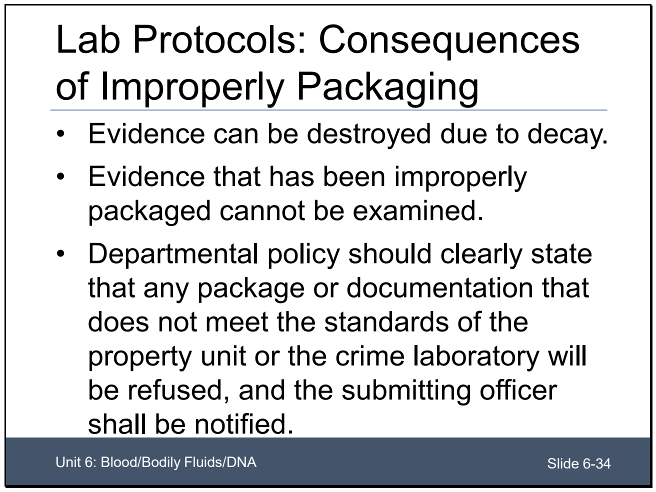
- Avoid allowing evidence to be stored in warm conditions or direct sunlight; DNA evidence should be stored in a cool, dry environment.
- Never package wet items in plastic bags.
- Never fold items over onto themselves.
- Collect a control sample whenever possible.

Unit 6: Blood/Bodily Fluids/DNA Slide 6-33

Key Information

Avoid allowing evidence to be stored in warm conditions or direct sunlight. This may cause DNA to degrade more rapidly. DNA evidence should be stored in a cool, dry environment. Never package wet items in plastic bags. Bacterial growth can occur, along with DNA degradation. Never fold items onto themselves, as this could allow cross-contamination or destroy pattern analysis. Collect a control sample whenever possible.

Slide 6-34: Lab Protocols: Consequences of Improperly Packaging

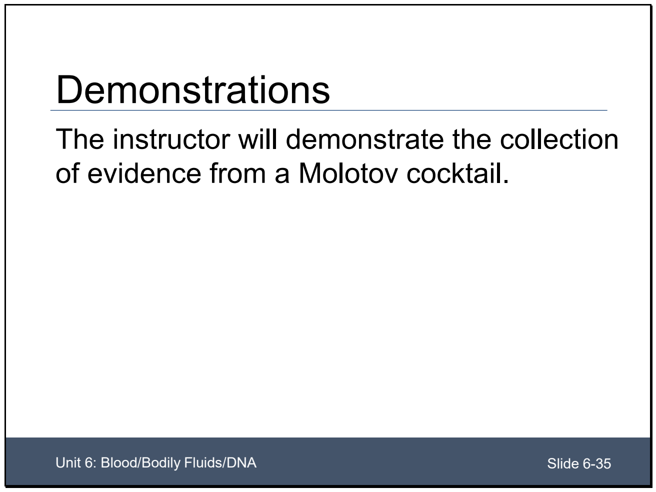


Key Information

Improper packaging can destroy evidence due to decay. In many cases, evidence that has been improperly packaged cannot be examined, as the accreditation requirements of forensic laboratories may not allow for the analysis of improperly collected or preserved evidence.

Departmental policy should clearly state that any package or documentation that does not meet the standards of the property unit or the crime laboratory will be refused, and the submitting officer shall be notified through normal channels to correct the problem. This principle is known as the “right of refusal” (NIST, 2013a).

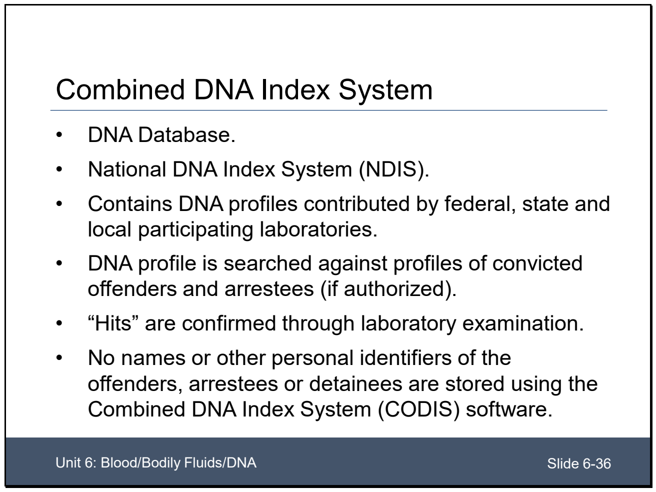
Slide 6-35: Demonstrations



Key Information

The instructor will demonstrate the process of collecting evidence from a Molotov cocktail.

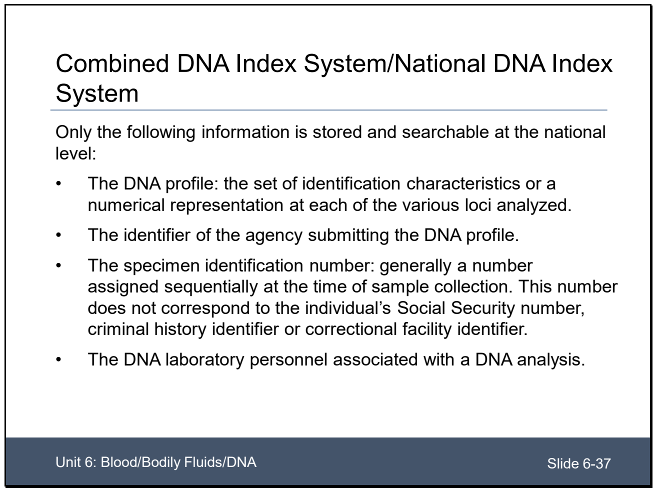
Slide 6-36: Combined DNA Index System



Key Information

- Combined DNA Index System (CODIS) is a DNA database.
- National DNA Index System (NDIS) level allows for nationwide information sharing.
- CODIS contains DNA profiles contributed by federal, state and local participating laboratories.
- DNA profile is searched against profiles of convicted offenders and arrestees (if authorized).
- “Hits” are confirmed through laboratory examination.
- No names or other personal identifiers of the offenders, arrestees or detainees are stored using the CODIS software.

Slide 6-37: Combined DNA Index System/National DNA Index System

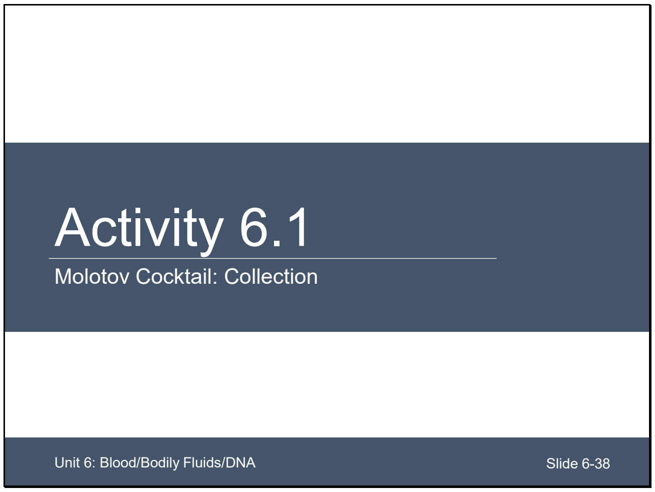


Key Information

Only the following information is stored and searchable at the national level:

- The DNA profile: the set of identification characteristics or a numerical representation at each of the various loci analyzed.
- The identifier of the agency submitting the DNA profile.
- The specimen identification number: generally a number assigned sequentially at the time of sample collection. This number does not correspond to the individual’s Social Security number, criminal history identifier or correctional facility identifier.
- The DNA laboratory personnel associated with a DNA analysis.

Slide 6-38: Activity 6.1



Activity Estimated Time: 20 minutes

Activity Purpose

The purpose of this exercise is for students to demonstrate the proper methodology for collecting ignitable liquid samples. Each of these samples can be collected differently. This activity requires students to use problem-solving skills to determine the best way to collect the sample with the items provided in the evidence box.

Activity Directions

1. Each group will be assigned a specific evidence box with different items to collect.

2. Groups will have 10 minutes to work together to determine the best method to collect and package the evidence.

3. Upon completion of the collection exercise, each group will have five minutes to explain their reasoning and collection process.

Tools

Absorbent material, cardboard box, cans (two 1-gallon, one 5-gallon), evidence tape, knife, pipette/syringe, shovel, vermiculite and a vial.

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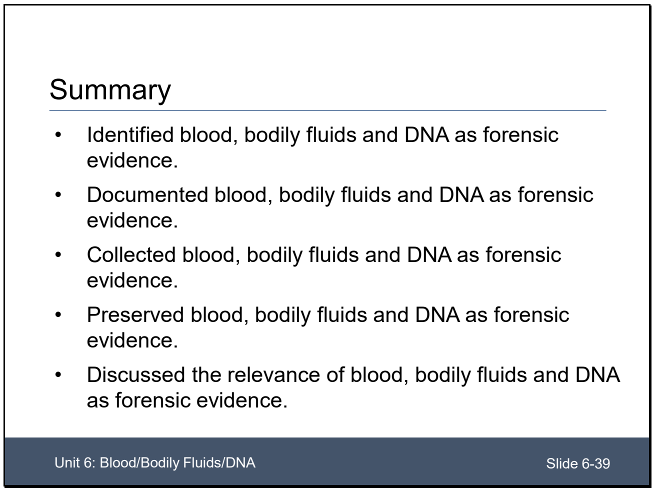
Slide 6-39: Summary



Key Information

Students should now be able to:

- Identify blood, bodily fluids and DNA as forensic evidence.
- Document blood, bodily fluids and DNA as forensic evidence.
- Collect blood, bodily fluids and DNA as forensic evidence.
- Preserve blood, bodily fluids and DNA as forensic evidence.
- Discuss the relevance of blood, bodily fluids and DNA as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 7: Glass/Physical Matches

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Integrate the physical collection and the physical match of both glass and fiber evidence as recovered from a crime scene.

Unit Enabling Learning Objectives (ELOs)

7.1 Identify glass and physical matches as forensic evidence.
7.2 Document glass and physical matches as forensic evidence.
7.3 Collect glass and physical matches as forensic evidence.
7.4 Preserve glass and physical matches as forensic evidence.
7.5 Relate the significance of sample analysis for glass and physical matches.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Integrate the physical collection and the physical match of both glass and fiber evidence as recovered from a crime scene.	Practicum Part I: Crime Scene Investigation

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify glass and physical matches as forensic evidence.	Class dialogue/ facilitated discussion	Final Exam
Document glass and physical matches as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect glass and physical matches as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve glass and physical matches as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Relate the significance of sample analysis for glass and physical matches.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topics	Duration
Lesson	60 min.
Summary	5 min.

Audiovisual

Slides 7-1 to 7-14

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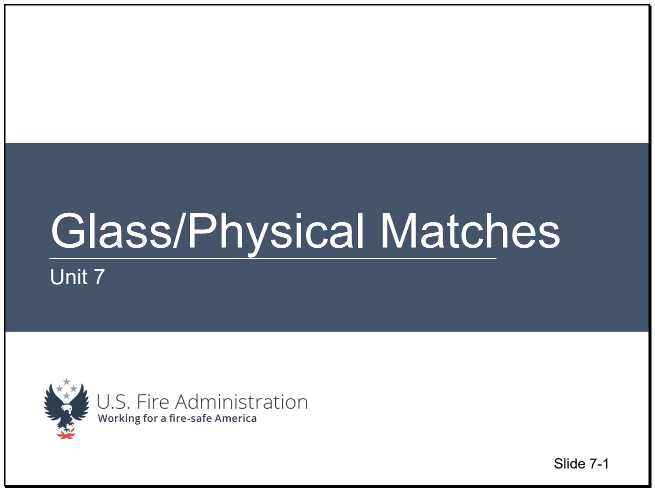
Slide 7-1: Glass/Physical Matches

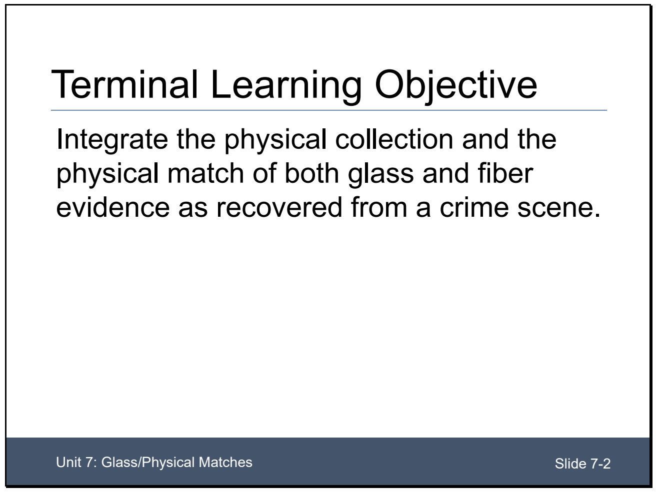


Key Information

Welcome to Unit 7: Glass/Physical Matches!

Various glass evidence is encountered at the crime scene, such as small glass fragments, broken glass pieces, windowpanes, headlights, etc. Each type of glass has a different composition, which plays an important role in the forensic analysis of glass. Glass also fractures differently; forensic analysis can determine the direction of glass fractures. Early forensic analysis includes physical techniques, microscopic techniques and elemental analysis (Kammrath et al., 2016).

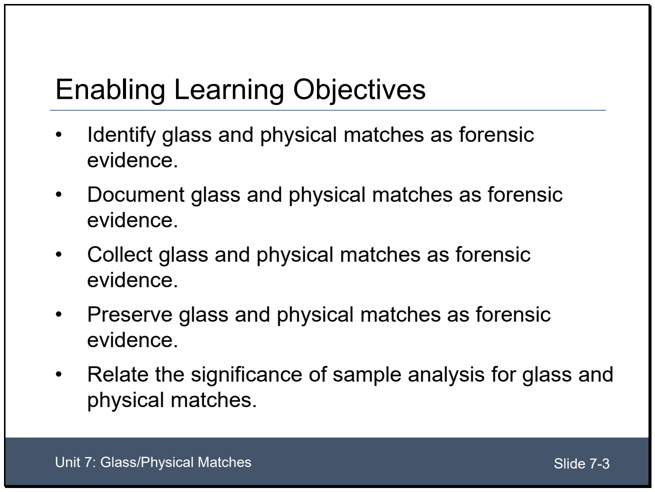
Slide 7-2: Terminal Learning Objective



Key Information

Integrate the physical collection and the physical match of both glass and fiber evidence as recovered from a crime scene.

Slide 7-3: Enabling Learning Objectives

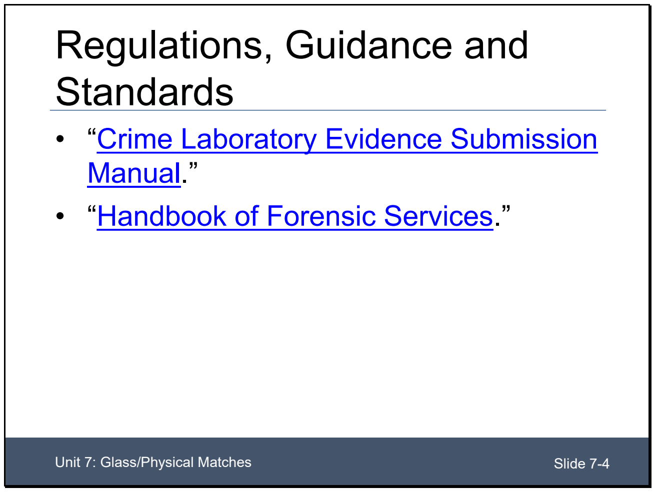


Key Information

After completing this unit, students will be able to:

- Identify glass and physical matches as forensic evidence.
- Document glass and physical matches as forensic evidence.
- Collect glass and physical matches as forensic evidence.
- Preserve glass and physical matches as forensic evidence.
- Relate the significance of sample analysis for glass and physical matches.

Slide 7-4: Regulations, Guidance and Standards



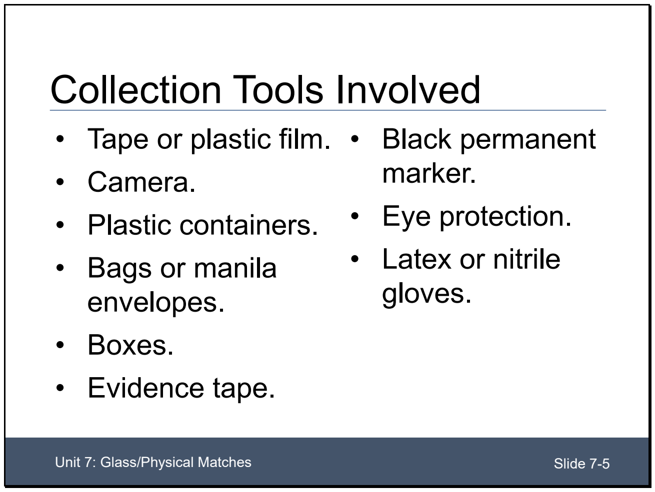
Key Information

A crime scene can provide a multitude of information to determine what has occurred. During the commission of a crime, windows in a residence, business or vehicle can be broken. Anytime this occurs, the damaged glass can be used to provide valuable clues. Investigators with knowledge of the damage can assist — and prevent inadvertently hindering — the investigation.

Regulation, Guidance and Standards

- "Crime Laboratory Evidence Submission Manual."
- "Handbook of Forensic Services."

Slide 7-5: Collection Tools Involved

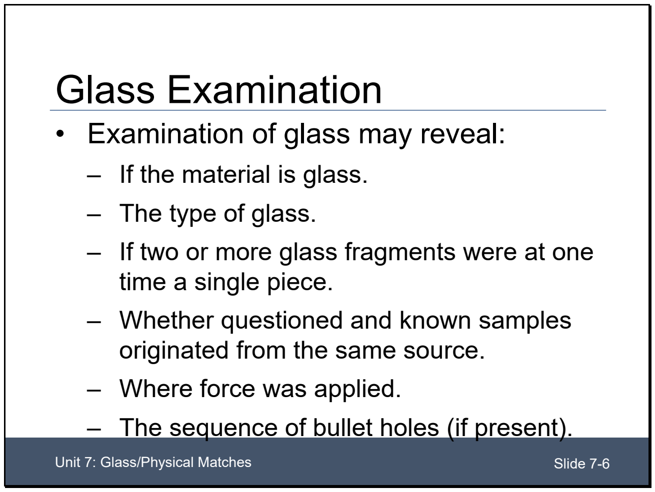


Key Information

These items should be available at the crime scene to collect glass as evidence:

- Tape or plastic film.
- Camera.
- Plastic containers.
- Bags or manila envelopes (different sizes).
- Boxes (different sizes).
- Evidence tape.
- Black permanent marker.
- Eye protection.
- Latex or nitrile gloves.

Slide 7-6: Glass Examination

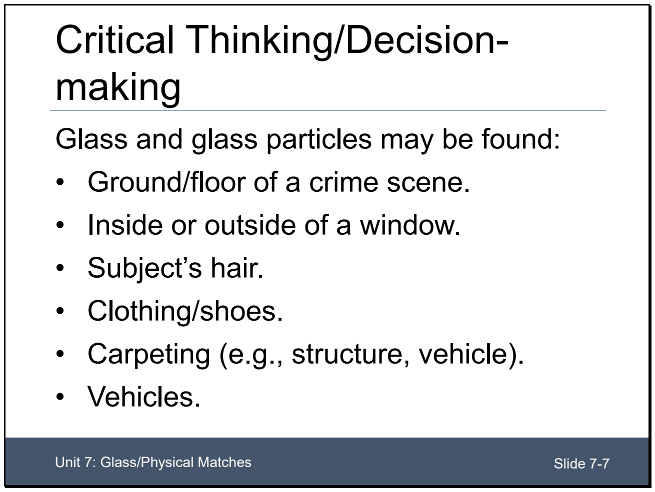


Key Information

Examination of glass evidence may reveal:

- If the material in question is glass.
- The type of glass from which a fragment originated (e.g., tempered window, nontempered window, bottle, etc.).
- If two or more glass fragments were at one time a single piece and originated from the same source (using a physical match examination).
- Whether questioned and known glass samples could have originated from the same source of broken glass.
- The side to which force was applied (in the case of broken windows or glass doors).
- The sequence of bullet holes in windows or glass doors (if present).

Slide 7-7: Critical Thinking/Decision-Making

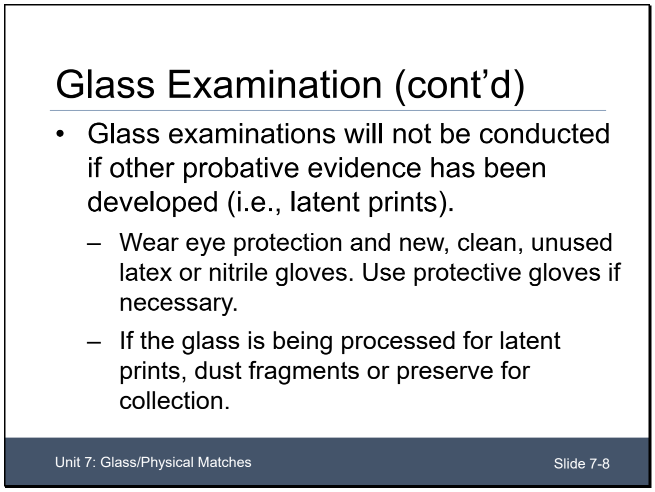


Key Information

Glass and glass particles may be found in numerous places, including:

- Ground/floor of a crime scene.
- Inside or outside of a windowpane or window frame.
- In the subject’s hair (see pharmaceutical fold).
- In clothing/shoes (e.g., belonging to the victim, witness, subject, etc.).
- Carpeting (from a structure or vehicle).
- Vehicles.

Slide 7-8: Glass Examination (cont'd)



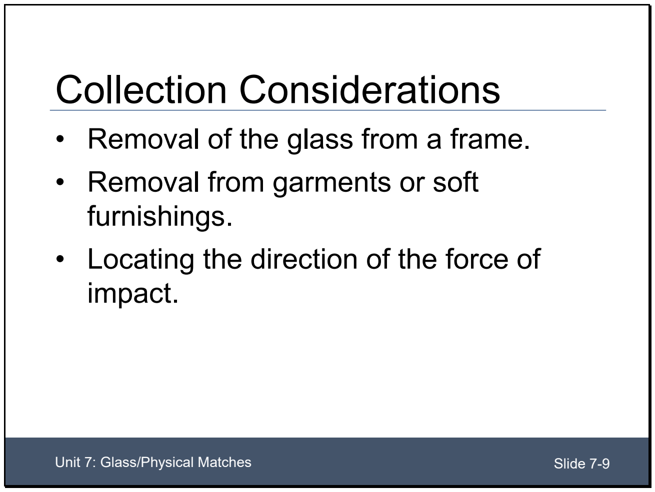
Key Information

Glass examinations will not be conducted if other probative evidence has been developed (i.e., latent prints). When examining glass evidence:

- Wear eye protection and new, unused, clean latex or nitrile gloves. Use protective gloves (properly cleaned or new) if necessary to prevent cuts from the glass.

- If the glass is being processed for latent prints, dust fragments or preserve them for print collection. If latent prints are involved, follow the procedures detailed in Unit 5: Latent Fingerprints.

Slide 7-9: Collection Considerations



Key Information

Considerations for collecting glass/physical match evidence at the scene:

- **Removal of broken glass from a frame:** The investigator should be careful in removing broken glass from a frame, as the impact or movement could cause it to be tight.

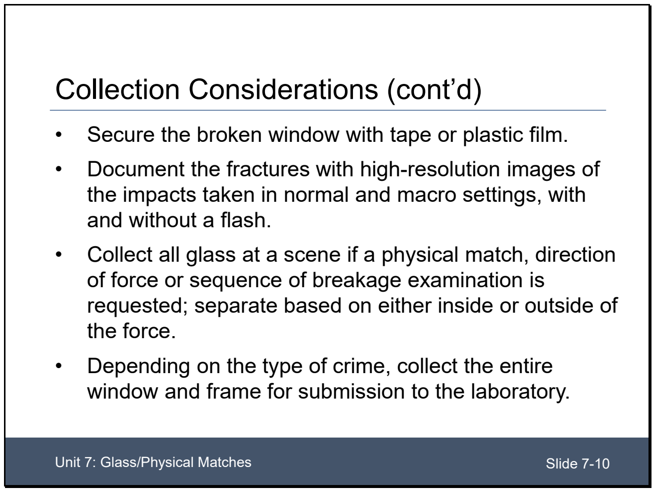
- **Removal of broken glass from garments or soft furnishings:** The investigator should exercise caution, as the fragmentation can cause sharp points, which may be hidden.

- **Locating the direction of the force of impact:** The investigator should take care in the removal of debris during the search for glass patterns caused by impact damage. The glass may be covered by ash, soot, liquid residue, etc.

Discussion

The student is investigating a scene in which a window was broken. Large pieces of glass are found on the carpet but underneath fire debris. What are some items to consider in the collection, packaging and testing of the glass?

Slide 7-10: Collection Considerations (cont'd)



Key Information

Additional considerations for collecting glass/physical match evidence:

- Secure the broken window with tape or plastic film.

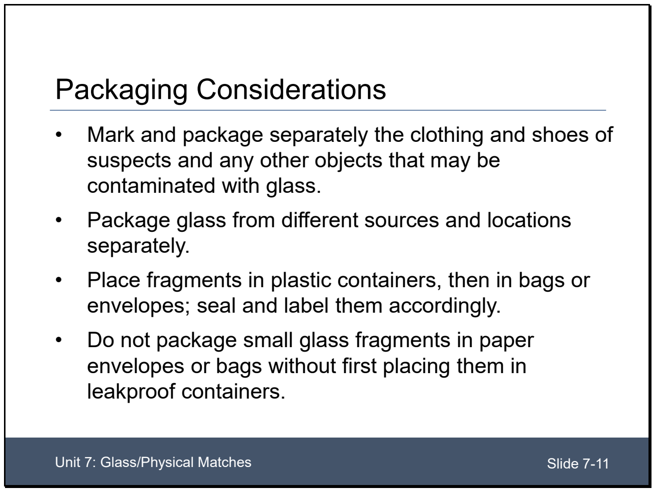
- Document the fractures with high-resolution images of the impacts taken in normal and macro settings, with and without a flash (as a flash can cause an unwanted glare).

- Collect all glass at a scene if a physical match, force direction or breakage examination sequence is requested. Separate the collected glass based on whether it came from inside or outside of the force.

- If possible, depending on the type of crime, collect the entire window and frame for submission to the laboratory.

Example: Consider a homicide scene in which a window has multiple pieces of evidence (e.g., glass fragments, hair, fiber, blood, etc.). Each type of evidence has unique preservation and collection considerations. A laboratory setting may be required to ensure the proper collection and testing methodologies are utilized.

Slide 7-11: Packaging Considerations

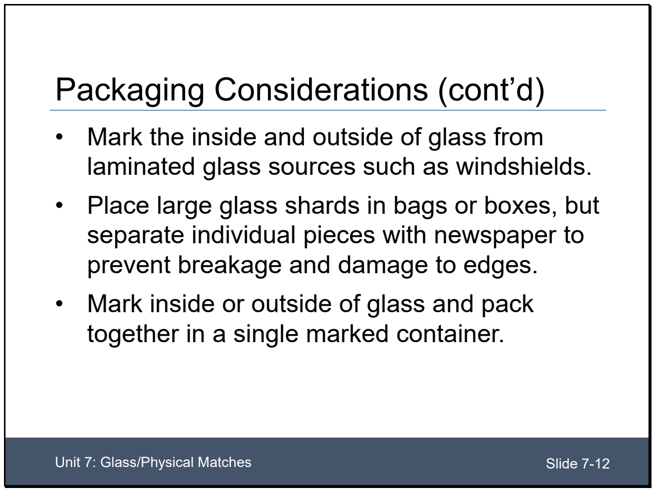


Key Information

Considerations for packaging glass evidence:

- Mark and separately package any objects that may be contaminated with glass (such as clothing or shoes).
- Separately package glass from different sources and locations.
- Place fragments in plastic containers (such as leak-proof plastic pill bottles), then place the containers in bags or envelopes. Seal and label the bags/envelopes accordingly.
- Do not package small glass fragments in paper envelopes or bags without first placing them in leak-proof containers.

Slide 7-12: Packaging Considerations (cont'd)



Key Information

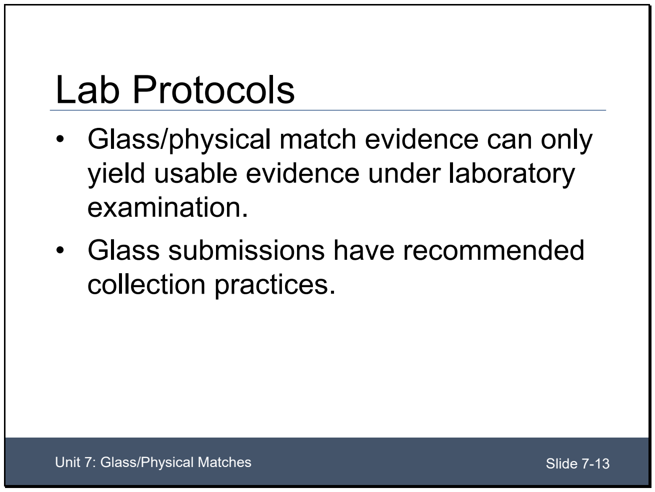
Considerations for packaging glass evidence:

- Mark the inside and outside of the glass from laminated glass sources such as windshields.

- Place large glass shards in bags or boxes, but separate individual pieces with newspaper to prevent breakage and damage to edges.

- Mark the inside or outside of the glass and pack them together in a single marked container.

Slide 7-13: Lab Protocols

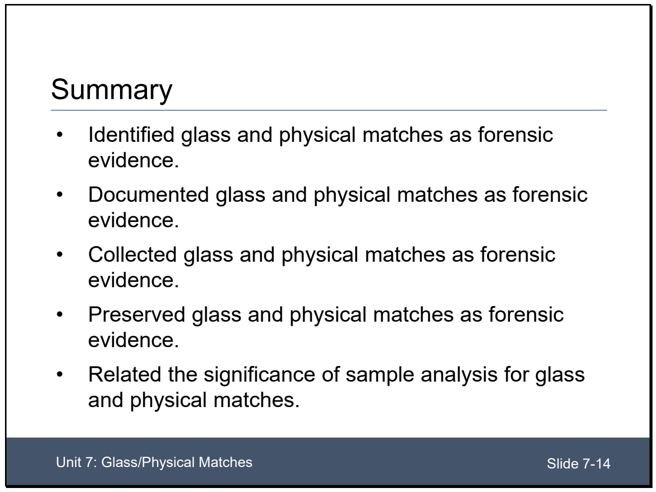


Key Information

Glass/physical matches can only yield usable evidence under laboratory examination. Investigators should know available laboratory services and protocols for submitting evidence for analysis in their jurisdiction.

Glass submissions have recommended collection practices. Before submission, the investigator should be aware of those practices and subsequent protocols to avoid damaging or contaminating evidence.

Slide 7-14: Summary



Key Information

Students should now be able to:

- Identify glass and physical matches as forensic evidence.
- Document glass and physical matches as forensic evidence.
- Collect glass and physical matches as forensic evidence.
- Preserve glass and physical matches as forensic evidence.
- Relate the significance of sample analysis for glass and physical matches.

Appendix

Glass Analysis: Types of Glass, How to Determine the Density of Glass, and Analysis of Glass Fracture Patterns

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GLASS ANALYSIS

TYPES OF GLASS, HOW TO DETERMINE THE DENSITY OF GLASS, AND ANALYSIS OF GLASS FRACTURE PATTERNS

Abstract

This document provides information on the analysis of glass evidence. It contains details on the types of glass, how to determine glass density, and how to differentiate between types of glass fractures.

Vincenzo D. Crawford
Bs. Forensic Science

By: Vincenzo D. Crawford
Bs. Forensic Science

GLASS ANALYSIS

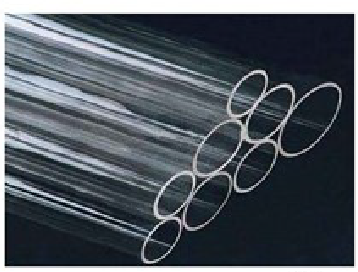
TYPES OF GLASS, HOW TO DETERMINE THE DENSITY OF GLASS, AND ANALYSIS OF GLASS FRACTURE PATTERNS

Glass can be considered as hard liquid. It is a hard material but brittle in its formation; defined by the online Oxford English dictionary as an inorganic product of fusion which has been cooled to a rigid condition to become a non-crystalline solid and which makes glass amorphous in nature. Its melting point is not definite and glass is quite complicated in its molecular composition. This laboratory experiment was executed in light of a scenario that conveyed a car accident which occurred, resulting in the breaking of the head lamp of a car owner, who was suspected to be in the wrong. Pieces of glass from the crime sceneand edges of the suspect's headlamp were collected for analysis.

There are many different glass types, some of which are:

Toughened glass (Tempered glass) – This is a type of safety glass processed by controlled thermal or chemical treatments to increase its strength compared with normal glass. Tempering puts the outer surfaces into compression and the inner surfaces into tension. The theoretical density for Toughened glass is 2.44g/cm^3.

Soda-lime glass –This glass is also called soda-lime-silica glass. It is the most prevalent type of glass, used for windowpanes, and glass containers (bottles and jars) for beverages, food, and some commodity items (Rubin, 2014).The theoretical density for Soda-lime glass is about the same as Toughened glass, which is2.44g/cm^3.



Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

Borosilicate glass (Pyrex)

– This is a type of glass with the main glass-forming constituents of silica and boron. Pyrex is made to withstand high temperatures. It is commonly used forcooking ware etc. The theoretical density for Borosilicate glass is 2.15 g/cm^3 to 2.25 g/cm^3.

Alumino-silicate glass

– This is made from materials which are minerals composed of aluminum, silicon, and oxygen, pluscounteractions. They are a major component of kaolin and other clay minerals. The density for Alumino-silicate glass is 2.36 g/cm^3.

Leaded glass (Crystal)

– This type of glass has a variety in which lead replaces the calcium content of a typical potash glass.Typical lead crystal has a density of around 3.1 g/cm^3 and high-lead glass can be over 4.0 g/cm^3 or even up to 5.9 g/cm^3

Fused silica glass

– This glass is made from a form of silicon dioxide (quartz, sand). Typical of glasses, it lacks long range order in its atomic structure. It's highly cross linked three dimensional structure gives rise to its high use temperature and low thermal expansion coefficient.(Adams, 2003). The theoretical density for Fused silica glass is 2.2 g/cm^3.

Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

Element	Type of glass				
	Fused silica	**Soda-lime silica**	**Boro-silicate glass**	**Alumino-silicate glass**	**Lead borate glass**
SiO_2	100%	60- 75%	70-81%	62%	54-65%
Al_2O_3		1%	2-7%	17%	2%
CaO		5-12%		8%	
MgO		4%		7%	
Na_2O		12-18%	4-8%	1%	13-15%
K_2O					
B_2O_3			7-13%	5%	
PbO					18-38%

Table Showing the Chemistry % by Weight of the Most Common Types of Glass

There are a variety of techniques and methods which could be utilized to analyze and make comparison between glass types; one of which is Density.Density is defined in a qualitative manner as the measure of the relative "heaviness" of objects with a constant volume(Ophardt, 2003).The Density technique was employed for this laboratory exercise. Density measurement of glass analysis entails the suspension of a glass fragment possessing a relative massin a volume of liquid, and the density is determined as a result of the liquid's displacement. Density measurement is given by the following formula;

$$\text{Density } (\rho) \text{of an object} = \frac{\text{Mass (m) of object in air}}{[\text{Volume (V) of the object in air}] - [\text{Volume (V)displaced by the object in liquid}]}$$

Inorder to carry out a density measurement on glass, there are chemicals involved which aid in the increase or decrease in the density of the liquid to equal the density of the reference glass fragment; ensuring that when submerged, the glass piece in question would properly suspend itself to provide accurate results.Conformingly, glass of different densities being submerged in the same liquid will displace different volumes of the liquid hence their experimental density values can be calculated. There are chemicals involved inorder to make the density and relative

Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

density measurement possible. Relative density, is the ratio of the density (mass of a unit volume) of a substance to the density of a given reference material. In this case of glass analysis, the relative density is with respect to water.In this laboratory experiment, bromoform and acetone were utilized for the control of the liquid's density. Bromoform $CHBR_3$is a brominated organic solvent, pale yellow liquid at room temperature, with a high refractive index, and very high density. The high density makes it useful for separation of minerals by density. Acetone $(CH_3)_2CO$, on the other hand,is the organic compound. It is a colourless, volatile, flammable liquid, and is the simplest ketone.

Other methods that can be used to analyze glass include; Microscopic analysis for minute characteristics and visual analysis for class characteristics. Just by utilizing the methods just stated, an analysis may be able to provide general information relating to glass colour, thickness, density and molecular composition which entails the dissociation of the glass fragment(s) in solution followed by analysis.

The first and most common analysis of glass would be optical analysis. It is understood that glass breaks in different ways when relative force and different types of smashing techniques are applied to them.

External force applied to a glass causes a deformation that may leave a visible mark or fracture in that glass. The markings can be used to determine ddirection of the force, amount of force applied and the sequence of impacts. Glass acts as an elastic surface and bends away when an initial force is applied. When the force increases beyond its tensile strength, it CRACKS; and depends on the type of glass for example tempered glass, it will shatter.

There are three types of glass surface fracture patterns:

- **Radial:** originates at point of impact and moves away from that point
- **Concentric:** broken series of concentric circles around the impact point
- Along with the types of impact fracture pattern shown on the surface of the glass, there are also cross sectional fracture pattern which aid in determining the possible type of object which impacted the glass as well as the direction from which that object made its impact; these are called the **Conchoidal fracture**s. Concordial fractures are shaped like arches that are perpendicular to one side of the glass surface and curved nearly parallel to the opposite glass surface

NB – concordial fractures follows the 3R rule which states that **Radial** fractures forms a **Right angle** at the **Reverse side** to which force was applied.

Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

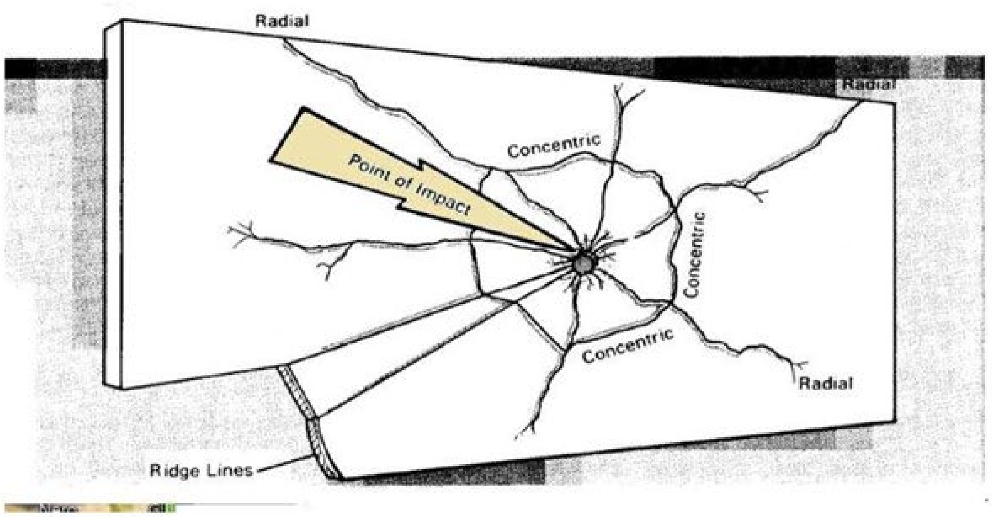
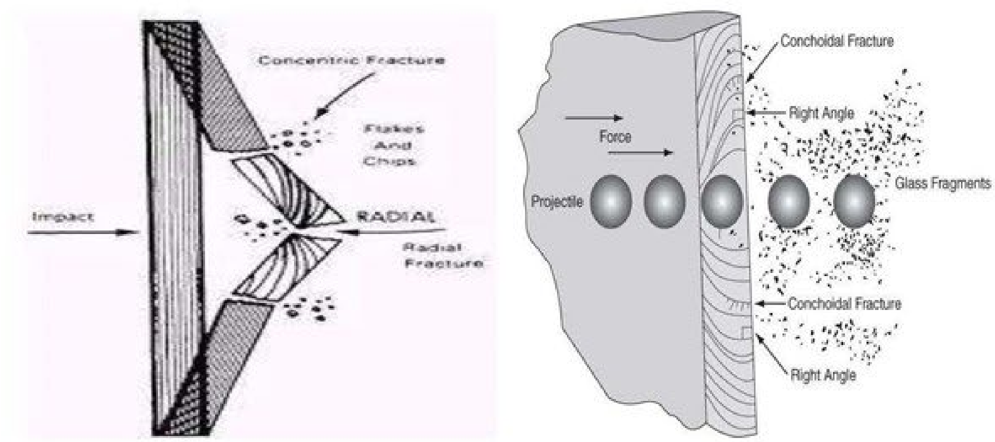


FIGURE SHOWING RADIAL AND CONCENTRIC CRACKS UPON IMPACT



FIGURES SHOWING CROSSECTIONAL FRACTURE PATTERNS OF A BROKEN GLASS UPON IMPACT

Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

Glass plays an important role in the dynamic world of crime scene investigations. Because of its tiny supra and sub characteristics when broken, glass have been labelled by forensic specialists to be among the category of trace evidence (Claridge, 2014). In addition, glass tends to follow the concept of Edmond Locard's principle of transfer evidence, as they are commonly transferred to other surfaces such as clothing, carpets, etc.

Rankin(2014), made indications to Edmond Locard, founder of the institute of criminalistics at the University of Lyon, France, whom developed what has become known as the Locard's Exchange Principle. This Principle states that 'every contact leaves a trace', implying that a criminal will leave trace and take away trace evidence when at a scene. Trace evidence often refers to minute samples of a substance, particularly glass fragments, fibres, hairs, and paint chips. A crime scene will commonly contain trace evidence, often caused by the perpetrator(s) unconsciously coming into contact with surfaces and leaving behind or picking up particles. Glass therefore, has the ability to create association between a suspect and a scene as well as the association between two (2) or more scenes.

In order for glass from a crime scene to be used as evidence in court, the proper collection and packaging of such evidence must be done. Glass evidence is viewed as class evidence, not individualistic. Depending on the crime scene, the CSI may need to attempt to collect all of the glass present or only a comparison sample of the glass. This type of evidence (glass) should be packaged in solid containers. if the glass pieces are being collected from the clothing of a suspect or victim's clothes which is suspected to have made contact with shards of glass, then the clothes should be wrapped individually in paper and clothing surfaces from different sources should not be allowed to touch. The proper chain of custody should be established as the evidence transition from the crime scene to the testing laboratory then subsequently to court.

Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

By: Vincenzo D. Crawford
Bs. Forensic Science

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Vincenzo D. Crawford
Bs. Forensic Science
University of Technology (U-Tech), Jamaica

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 8: Firearms/Weapons

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Plan the safe and proper collection processes for firearms and weapons.

Unit Enabling Learning Objectives (ELOs)

8.1 Identify firearms and weapons as forensic evidence.
8.2 Document firearms and weapons as forensic evidence.
8.3 Collect firearms and weapons as forensic evidence.
8.4 Preserve firearms and weapons as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Plan the safe and proper collection processes for firearms and weapons.	Practicum Part I: Crime Scene Investigation Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify firearms and weapons as forensic evidence.	Class dialogue/ facilitated discussion	Final Exam
Document firearms and weapons as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect firearms and weapons as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve firearms and weapons as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

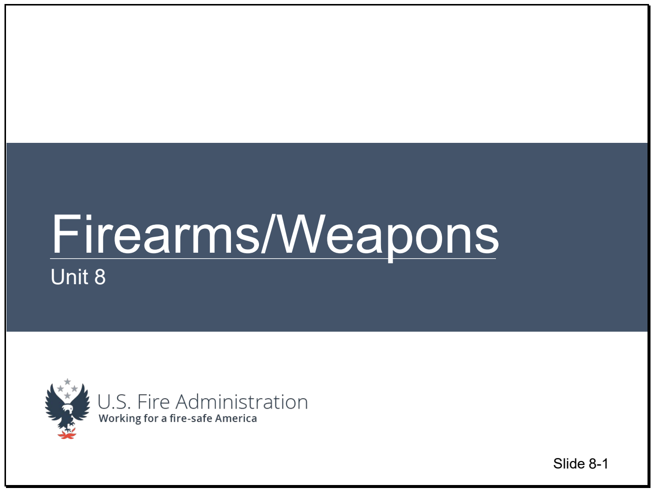
Unit Schedule

Topic	Duration
Lesson	60 min.
Summary	5 min.

Audiovisual

Slides 8-1 to 8-33

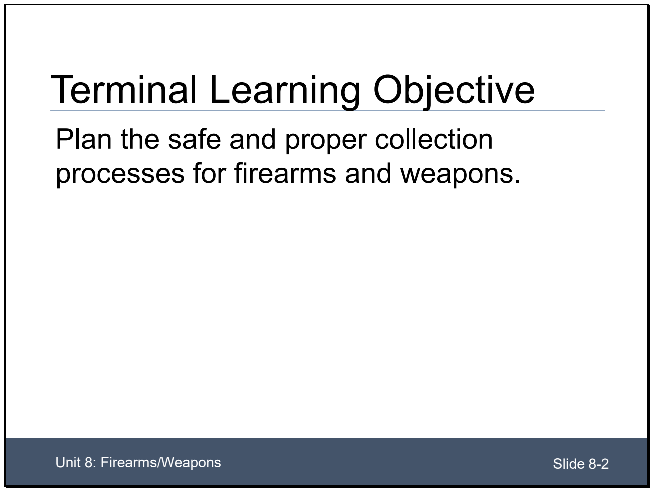
Slide 8-1: Firearms/Weapons



Key Information

Welcome to Unit 8: Firearms/Weapons!

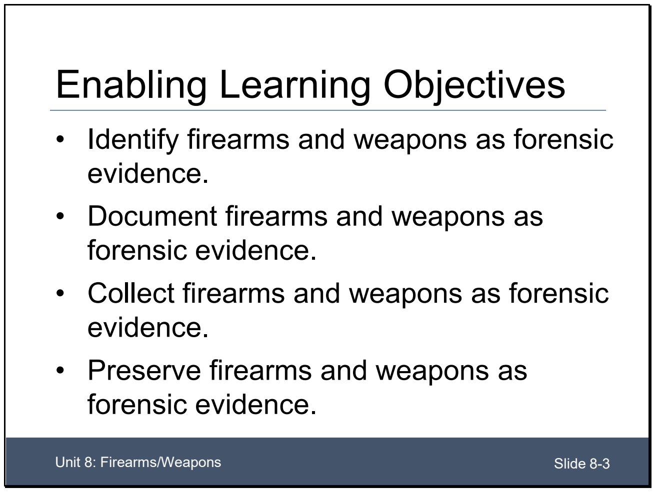
Slide 8-2: Terminal Learning Objective



Key Information

Plan the safe and proper collection processes for firearms and weapons.

Slide 8-3: Enabling Learning Objectives

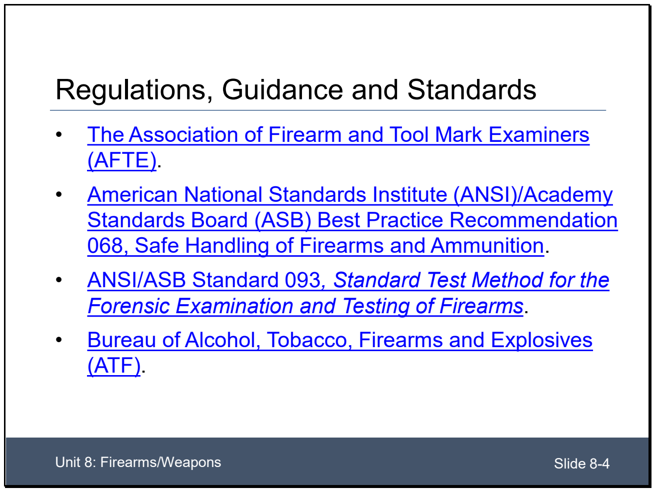


Key Information

After completing this unit, students will be able to:

- Identify firearms and weapons as forensic evidence.
- Document firearms and weapons as forensic evidence.
- Collect firearms and weapons as forensic evidence.
- Preserve firearms and weapons as forensic evidence.

Slide 8-4: Regulations, Guidance and Standards



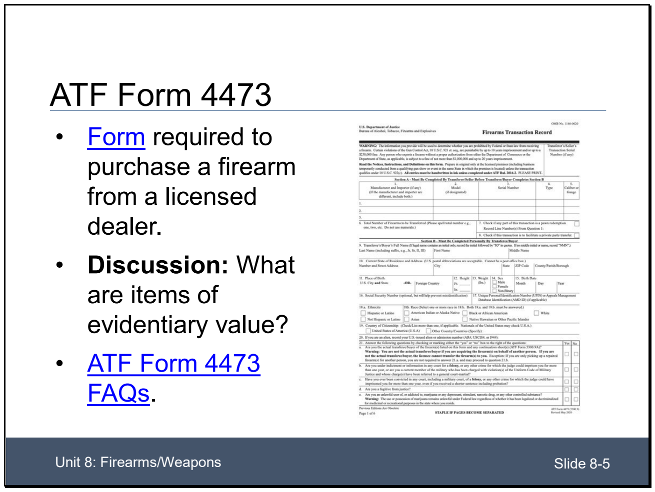
Key Information

There are multiple items of evidence that can be retrieved from the proper collection of firearms. However, your priority when dealing with firearms should always be safety.

Regulations, Guidance and Standards

- The Association of Firearm and Tool Mark Examiners (AFTE).
- American National Standards Institute (ANSI)/Academy Standards Board (ASB) Best Practice Recommendation 068, *Safe Handling of Firearms and Ammunition*.
- ANSI/ASB Standard 093, *Standard Test Method for the Forensic Examination and Testing of Firearms*.
- Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).

Slide 8-5: ATF Form 4473



Key Information

ATF Form 4473 “Firearms Transaction Record” is required for any firearm purchase from a licensed dealer.

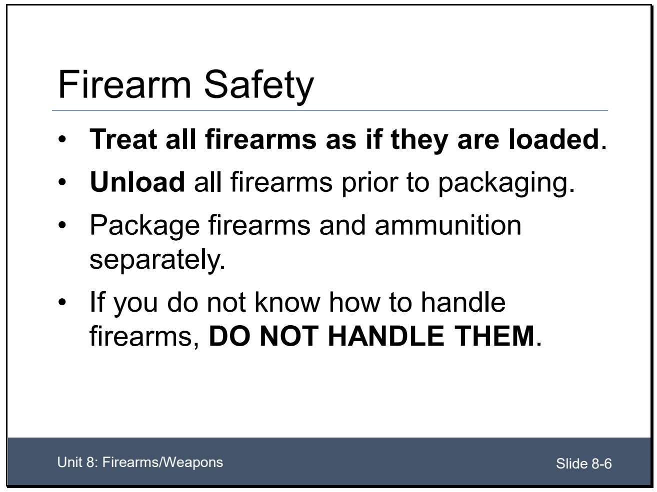
- ATF Form 4473 (PDF) (v. May 2020).
- ATF Form 4473 FAQs.

Discussion

Complete a sample ATF 4473 and consider the following:

- What information found on the 4473 is of evidentiary value?
- Explain why you believe so.

Slide 8-6: Firearm Safety

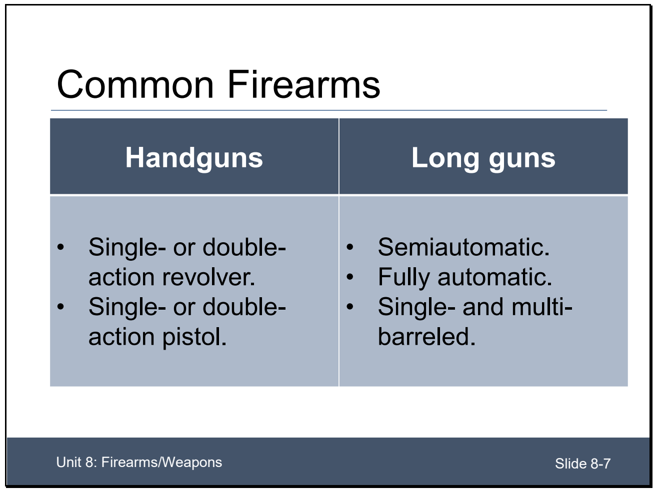


Key Information

Considerations for firearms safety include:

- **Treat all firearms as if they are loaded.**
- **Unload** all firearms prior to packaging.
- Package firearms and ammunition separately.
- If you do not know how to handle firearms, **DO NOT HANDLE THEM.**

Slide 8-7: Common Firearms



Key Information

Common firearms can be broken down into two basic categories: handguns and long guns.

Handguns

- Single- or double-action revolver.
- Single- or double-action pistol.

A single-action trigger performs just a single action: dropping the hammer, which fires the round. A double-action trigger performs two actions in one trigger pull: cocking the hammer and then releasing it.

Long guns

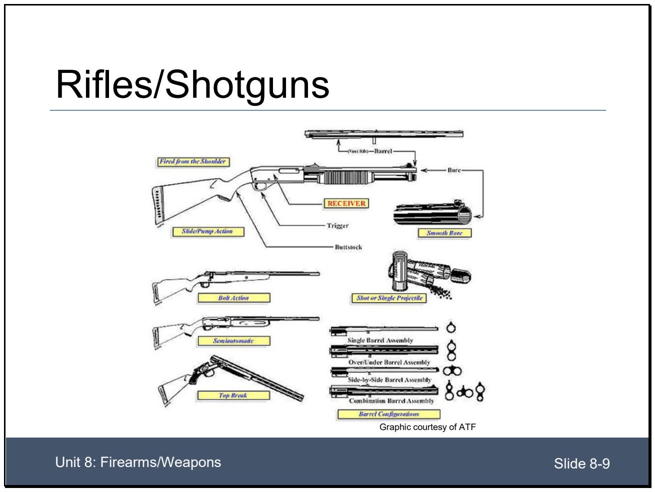
- Semiautomatic (gas and recoil).
- Fully automatic.
- Single- and multi-barreled.
  - Shotgun.
  - Break-open.
  - Pump (or slide).
  - Bolt.

Slide 8-8: Handguns

Key Information

Handguns are divided into revolvers and pistols, each featuring single- or double-action.

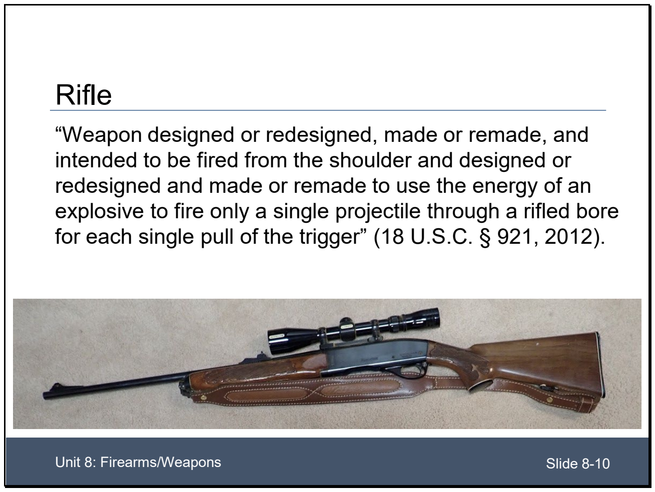
Slide 8-9: Rifles/Shotguns



Key Information

This slide displays examples of rifles and shotguns.

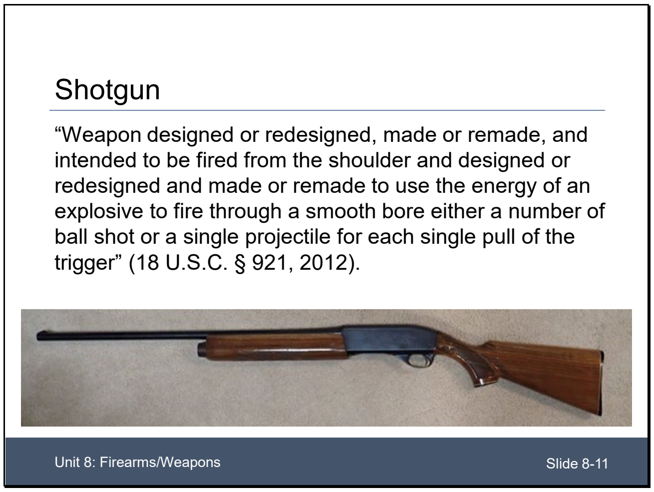
Slide 8-10: Rifle



Key Information

A rifle is a “weapon designed or redesigned, made or remade, and intended to be fired from the shoulder and designed or redesigned and made or remade to use the energy of an explosive to fire only a single projectile through a rifled bore for each single pull of the trigger” (18 U.S.C. § 921, 2012).

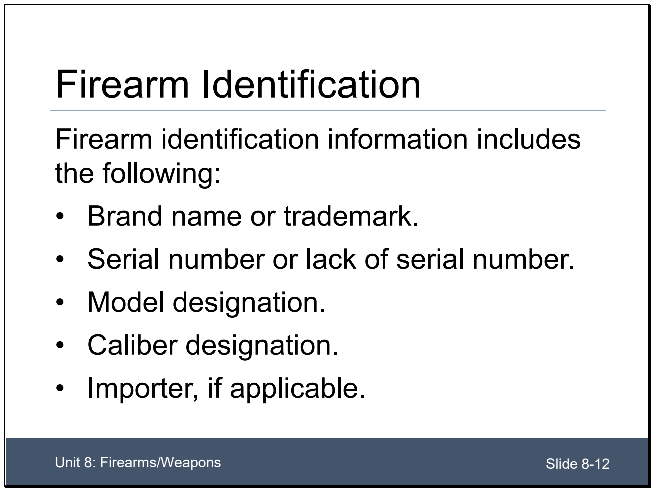
Slide 8-11: Shotgun



Key Information

A shotgun is defined as a “weapon designed or redesigned, made or remade, and intended to be fired from the shoulder and designed or redesigned and made or remade to use the energy of an explosive to fire through a smooth bore either a number of ball shot or a single projectile for each single pull of the trigger” (18 U.S.C. § 921, 2012).

Slide 8-12: Firearm Identification



Key Information

Firearm identification information includes the following:

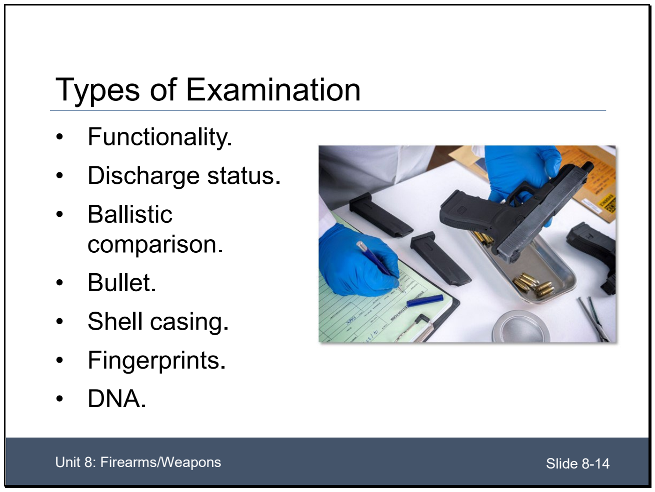
- Brand name or trademark.
- Serial number (note if the serial number has been damaged or removed).
- Model designation.
- Caliber designation.
- Importer, if applicable.

Slide 8-13: Firearm Identification (cont’d)

Key Information

This slide displays examples of firearm identification information.

Slide 8-14: Types of Examination

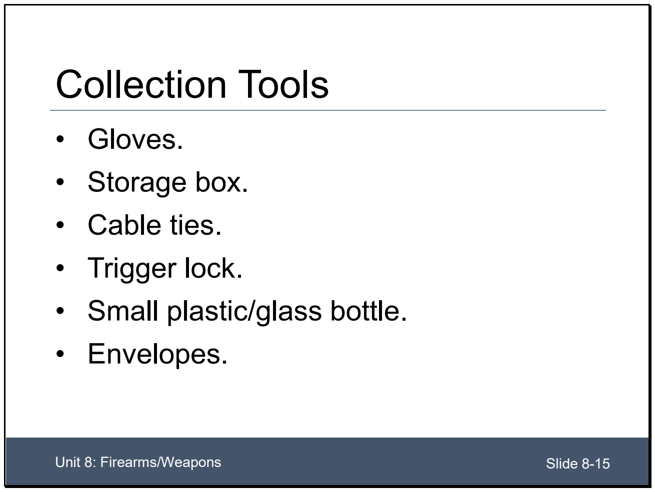


Key Information

Laboratory examination of a firearm can be used to determine:

- Functionality.
- Discharge status.
- Ballistic comparison using the National Integrated Ballistic Information Network (NIBIN).
- Bullet type/composition.
- Shell casing type/composition.
- Fingerprints.
- DNA.

Slide 8-15: Collection Tools

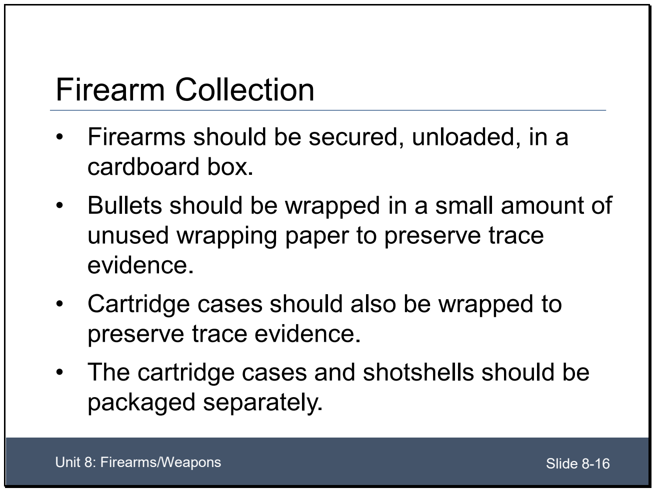


Key Information

The following items should be available at the crime scene to properly collect firearms/weapons:

- Gloves.
- Storage box.
- Cable ties.
- Trigger lock.
- Plastic/glass bottle (small).
- Envelopes for loose bullets/shells.

Slide 8-16: Firearm Collection



Key Information

Considerations for the collection of firearms include:

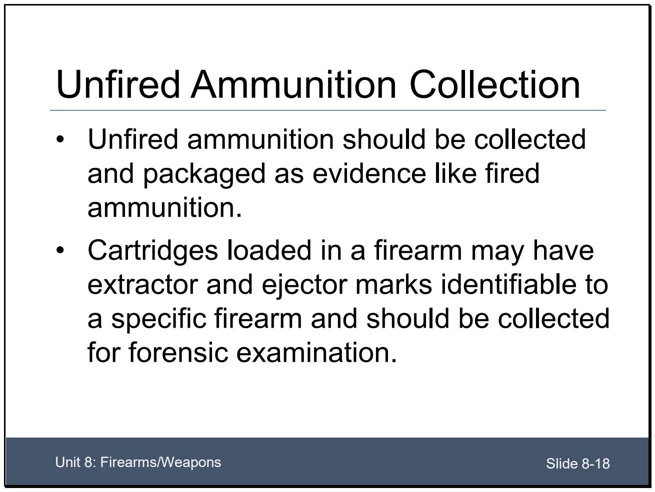
- Firearms should be secured, **unloaded,** in a cardboard box (preferably a box designed to store firearms).
- Bullets should be wrapped in a small amount of unused wrapping paper to preserve any trace evidence that may be present.
- Cartridge cases, like bullets, should be wrapped in unused wrapping paper to preserve any trace evidence.
- The cartridge cases and shotshells should be packaged separately to prevent them from striking each other.

Slide 8-17: Firearm Packaging

Key Information

This slide displays firearms secured in packaging boxes.

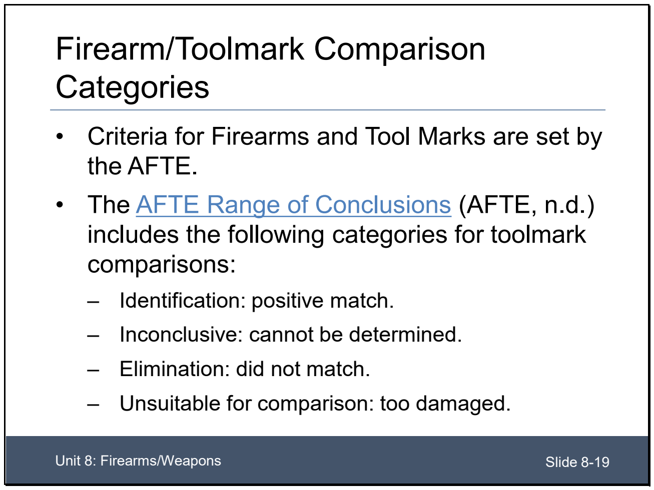
Slide 8-18: Unfired Ammunition Collection



Key Information

Unfired ammunition should be collected and packaged as evidence similarly to fired ammunition. Cartridges loaded in a firearm may have extractor and ejector marks identifiable to a specific firearm and should be collected for forensic examination.

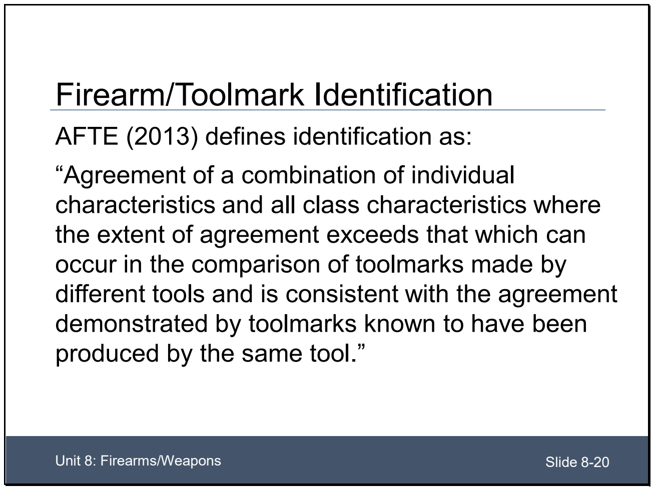
Slide 8-19: Firearm/Toolmark Comparison Categories



Key Information

- Criteria for firearms and toolmarks are set by the AFTE.
- The AFTE Range of Conclusions (AFTE, n.d.) includes the following categories for toolmark comparisons:
  - Identification: positive match.
  - Inconclusive: cannot be determined.
  - Elimination: did not match.
  - Unsuitable for comparison: too damaged.

Slide 8-20: Firearm/Toolmark Identification



Key Information

The AFTE defines identification as, “Agreement of a combination of individual characteristics and all class characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool” (AFTE, n.d.).

Slide 8-21: Firearm/Toolmark Identification (cont’d)

Key Information

According to the National Forensic Science Technology Center (NFSTC), fired and unfired cartridge case and shotshell case examination and identification are based on the following principles:

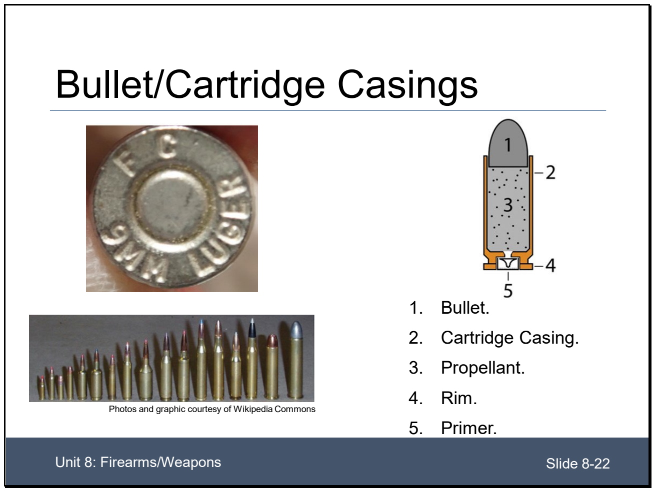
- “The various parts of the operating mechanism of firearms (firing pin, breech face, chamber, extractor, ejector, and other areas) can bear unique microscopic characteristics as a result of manufacturing processes, use, and abuse” (NFSTC, 2008).

- “These characteristics may mark the surfaces of fired and unfired cartridge cases/shotshell cases with striated marks or impressions as they are fired in or cycled through the firearm” (NFSTC, 2008).

- “These individual characteristics may be reproducible and may be uniquely identifiable with a particular firearm” (NFSTC, 2008).

The unique characteristics of firearm operations can be studied using comparison microscopy to aid in firearm identification.

Slide 8-22: Bullet/Cartridge Casings



Key Information

There is specific nomenclature associated with the different parts of a bullet. Understanding and properly using these terms will avoid confusion and effectively communicate the intended meaning.

1. Bullet.

2. Cartridge casing.

3. Propellant.

4. Rim.

5. Primer.

Slide 8-23: Firearm Bullet/Casing Markings

Key Information

This slide displays how markings are made on bullets and cartridges.

Slide 8-24: Identification and Examination

Identification and Examination

These principles and comparison microscopy combine to form the conceptual and physical foundation for firearm identification.

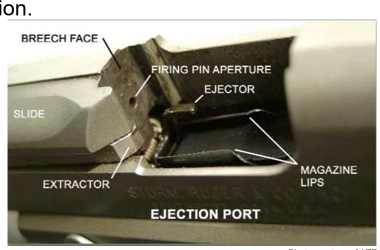


Photo courtesy of ATF

Unit 8: Firearms/Weapons Slide 8-24

Key Information

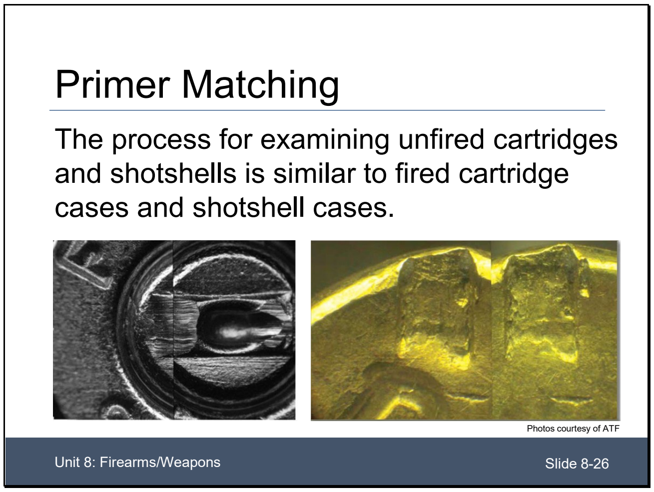
These principles and comparison microscopy combine to form the conceptual and physical foundation for firearm identification.

Slide 8-25: Extraction Markings

Key Information

This slide displays extraction markings on a firearm.

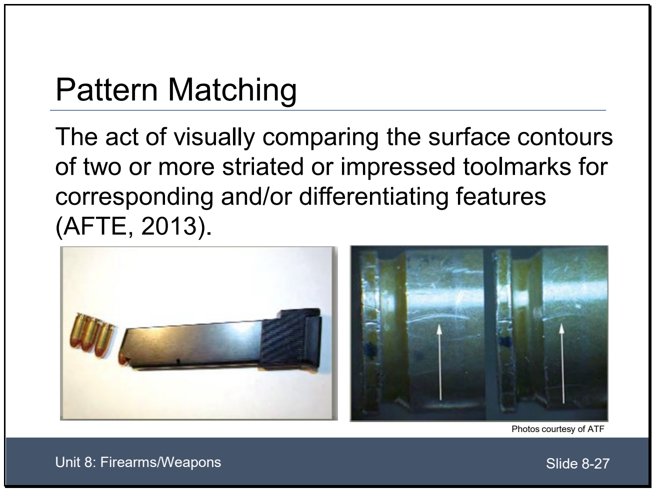
Slide 8-26: Primer Matching



Key Information

This slide displays examples of primer matching.

Slide 8-27: Pattern Matching



Key Information

Pattern matching is the act of visually comparing the surface contours of two or more striated or impressed toolmarks for corresponding and/or differentiating features (AFTE, 2013).

Slide 8-28: Rifling Marks

Key Information

Rifling refers to unique microscopic characteristics on a machined steel surface created during the manufacturing process.

Slide 8-29: National Integrated Ballistic Information Network

National Integrated Ballistic Information Network

https://www.atf.gov/firearms/national-integrated-ballistic-information-network-nibin

Unit 8: Firearms/Weapons Slide 8-29

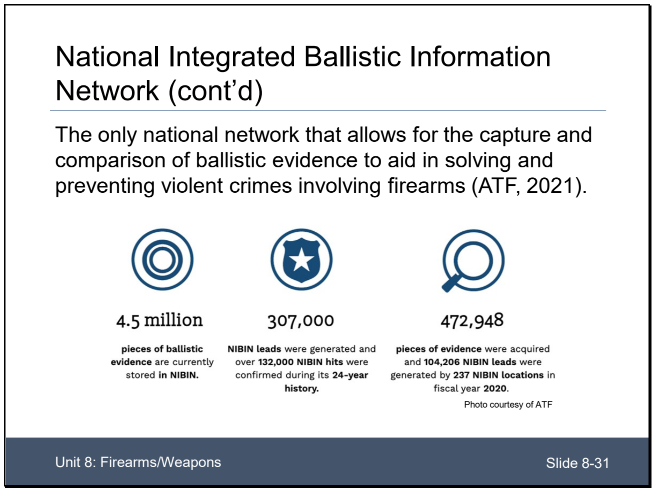
Slide 8-30: National Integrated Ballistic Information Network (cont'd)

National Integrated Ballistic Information Network (cont'd)

- Compares images of submitted ballistic evidence from shooting scenes and recovered firearms and produces a list of possible similar results.
- Trained National Integrated Ballistic Information Network (NIBIN) technicians then conduct a correlation review of these results, identifying NIBIN leads or potential links or associations from the same firearm.
- Firearms examiner will conduct a microscopic examination of the actual physical evidence to confirm a NIBIN lead as a hit.

Unit 8: Firearms/Weapons Slide 8-30

Slide 8-31: National Integrated Ballistic Information Network (cont'd)

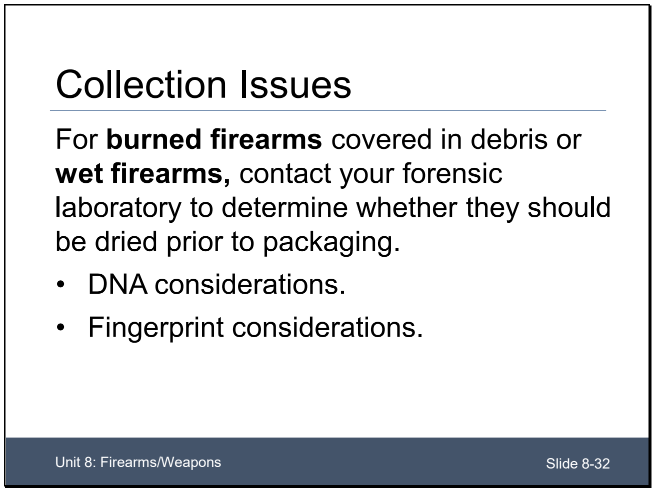


Key Information

NIBIN

- Compares images of submitted ballistic evidence from shooting scenes and recovered firearms and produces a list of possible similar results.
- Trained NIBIN technicians then conduct a correlation review of these results, identifying NIBIN leads or potential links or associations from the same firearm.
- Firearms examiner will conduct a microscopic examination of the actual physical evidence to confirm a NIBIN lead as a hit.
- Automated ballistic imaging network established in 1997.
- Enables investigators to match ballistic evidence with other cases across the nation.
- Only used for criminal investigations (ATF, 2021).

Slide 8-32: Collection Issues

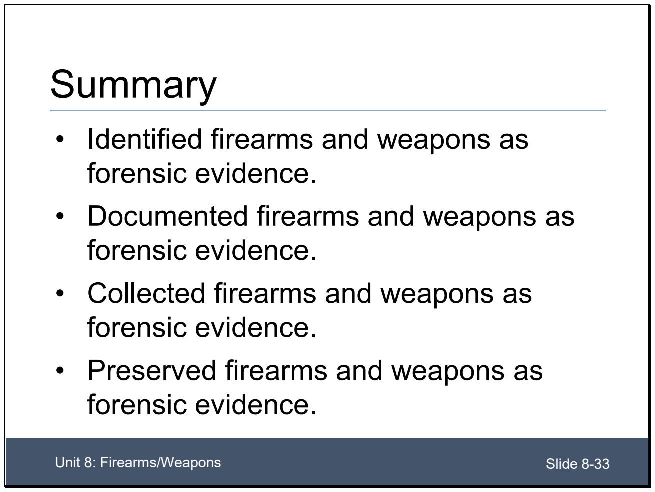


Key Information

For **burned firearms** covered in debris or **wet firearms,** contact your forensic laboratory to determine whether they should be dried prior to packaging.

- DNA considerations.
- Fingerprint considerations.

Slide 8-33: Summary



Key Information

Students should now be able to:

- Identify firearms and weapons as forensic evidence.
- Document firearms and weapons as forensic evidence.
- Collect firearms and weapons as forensic evidence.
- Preserve firearms and weapons as forensic evidence.

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 9: Foot/Tire Impressions (Known and Unknown)

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Create foot and tire impressions suitable for submission to a crime laboratory.

Unit Enabling Learning Objectives (ELOs)

9.1 Identify foot and tire impressions as forensic evidence.
9.2 Document foot and tire impressions as forensic evidence.
9.3 Collect foot and tire impressions as forensic evidence.
9.4 Preserve foot and tire impressions as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Create foot and tire impressions suitable for submission to a crime laboratory.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify foot and tire impressions as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 9.1	Final Exam
Document foot and tire impressions as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 9.1	Practicum Part I: Crime Scene Investigation
Collect foot and tire impressions as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 9.1	Practicum Part I: Crime Scene Investigation
Preserve foot and tire impressions as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 9.1	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	75 min.
Demonstration	30 min.
Activity 9.1: Footwear Impression	30 min.
Summary	5 min.

Audiovisual

Slides 9-1 to 9-32

Videos: “How to Properly Photograph Footwear Impression Evidence”
“3-D Impressions”
“How to Cast Footwear Impression Evidence at a Crime Scene”
“How to Use a Gelatin Lifter for Evidence Collection”

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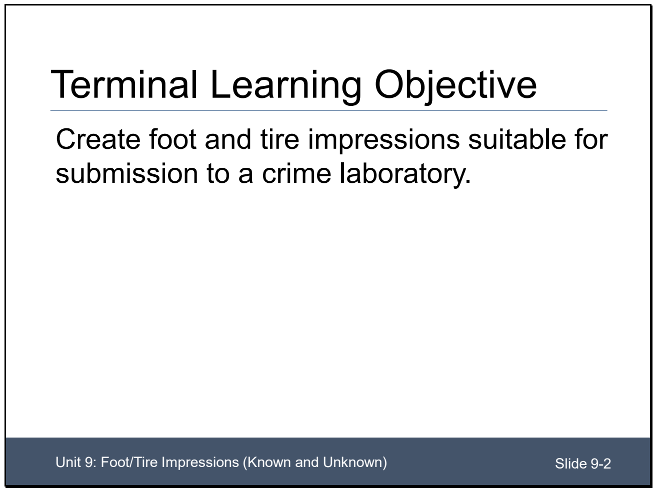
Slide 9-1: Foot/Tire Impressions (Known and Unknown)

Key Information

Welcome to Unit 9: Foot/Tire Impressions (Known and Unknown)!

One assurance on any crime scene examination is the knowledge of Locard’s Exchange Principle occurring. To commit a crime, people must enter an area either by foot, vehicle, bicycle or other method of travel. There is an exchange by the method of transportation to the environment entered. Dirt, grass and/or other objects allow Locard’s Exchange Principle to occur. Impressions, like a latent print, assist to facilitate identification of a person or persons on a scene.

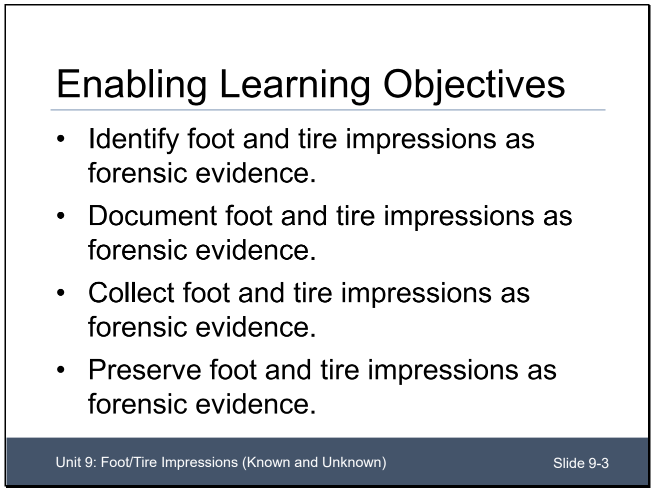
Slide 9-2: Terminal Learning Objective



Key Information

Create foot and tire impressions suitable for submission to a crime laboratory.

Slide 9-3: Enabling Learning Objectives

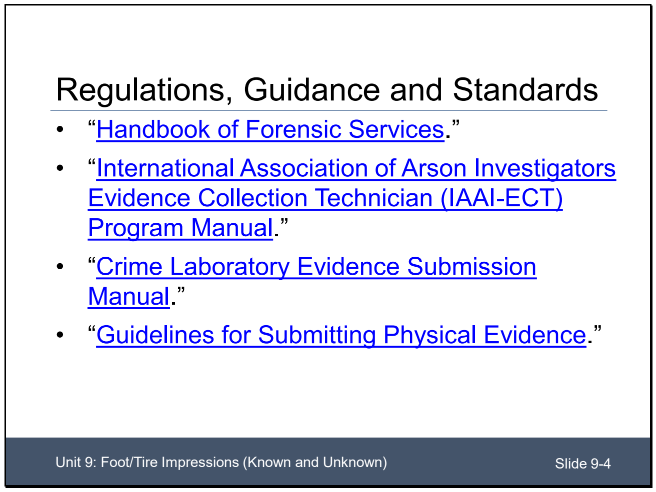


Key Information

After completing this unit, students will be able to:

- Identify foot and tire impressions as forensic evidence.
- Document foot and tire impressions as forensic evidence.
- Collect foot and tire impressions as forensic evidence.
- Preserve foot and tire impressions as forensic evidence.

Slide 9-4: Regulations, Guidance and Standards



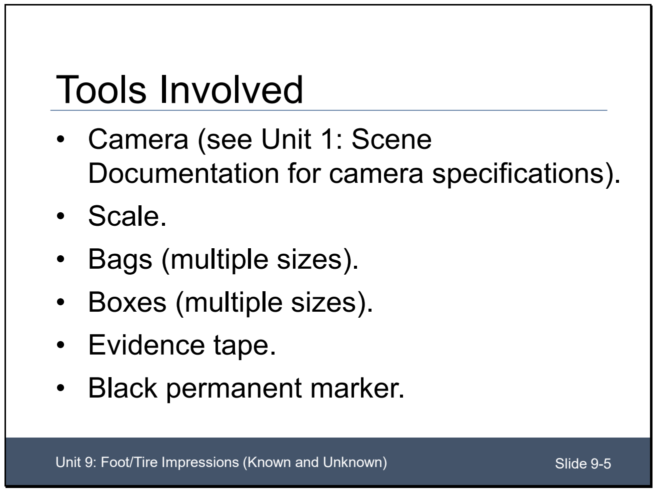
Key Information

Locating evidence that will directly tie a suspect to a crime scene can be difficult. Without an eyewitness, the investigation requires proof of the suspect being physically present. There are numerous direct ways to accomplish this; however, there are also indirect ways, as well. Foot, shoe or tire impressions can be very helpful in providing confirmation of a suspect's appearance at the scene. The collector's knowledge of locating and collecting an impression can assist with this identification. As a reminder, while examining a crime scene for trace evidence, the student should remember to follow the scientific method.

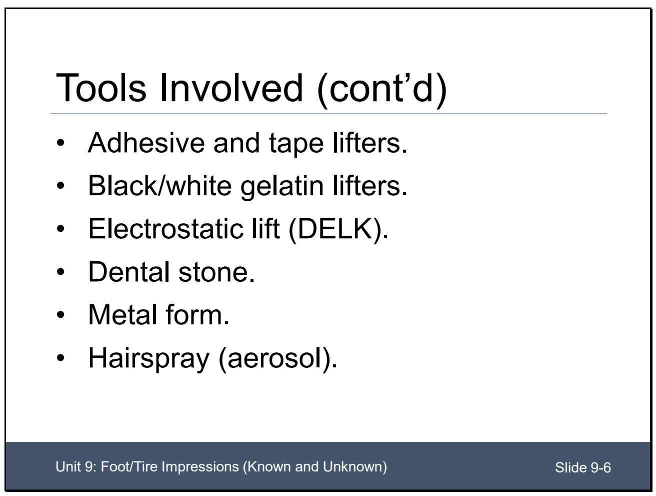
Regulations, Guidance and Standards

- "Handbook of Forensic Services."
- "International Association of Arson Investigators Evidence Collection Technician (IAAI-ECT) Program Manual."
- "Crime Laboratory Evidence Submission Manual."
- "Guidelines for Submitting Physical Evidence."

Slide 9-5: Tools Involved



Slide 9-6: Tools Involved (cont'd)



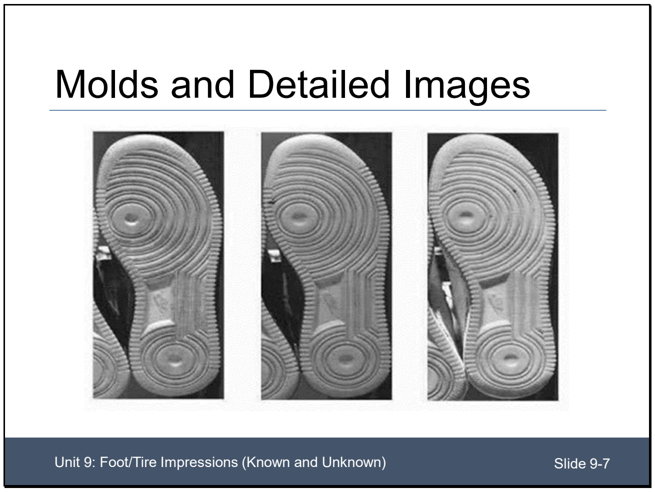
Key Information

The following items should be available at the crime scene to properly document and collect foot/tire impressions:

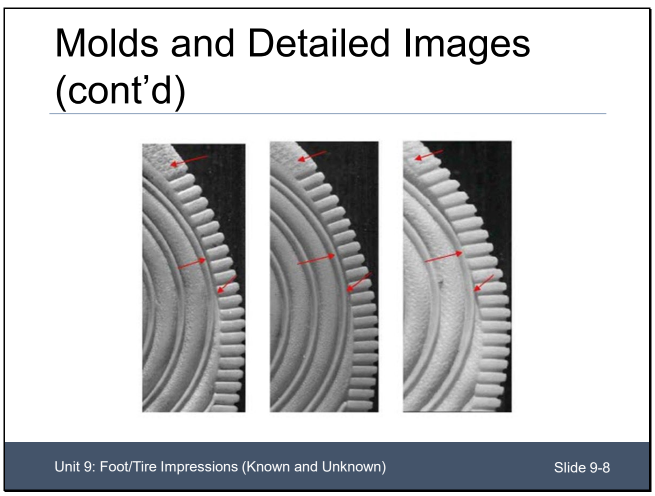
- Camera (refer to Unit 1: Scene Documentation for camera specifications and equipment).
- Scale.
  - Thin, flat and ridged.
  - Six to 12 inches long.
  - Nonreflective, black with white numerals or white with black numerals.

- Bags (multiple sizes).
- Boxes (multiple sizes).
- Evidence tape.
- Black permanent marker.
- Adhesive and tape lifters.
- Black/white gelatin lifters.
- Electrostatic lift (DELK).
- Dental stone.
  - Stone material.
  - Zip-close bags.
  - Water.
- Metal form.
- Hairspray (aerosol) or a fixing agent for winter weather (e.g., Snow Wax (aerosol)).

Slide 9-7: Molds and Detailed Images

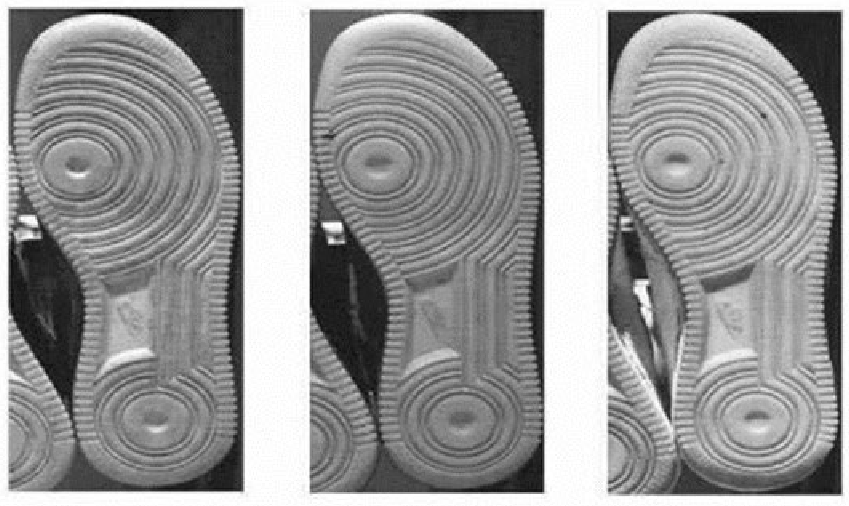


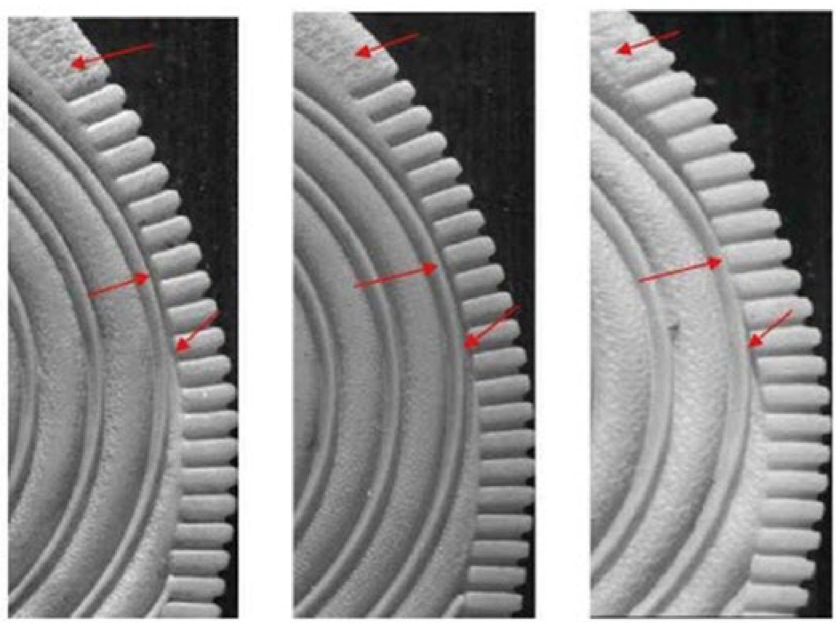
Slide 9-8: Molds and Detailed Images (cont'd)



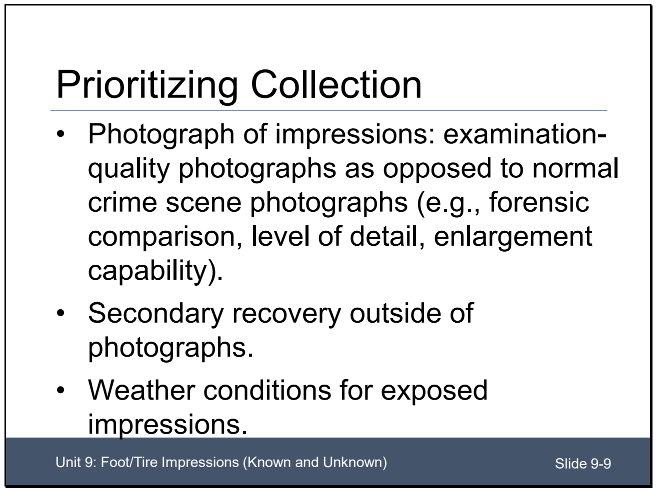
Key Information

These images represent the important role that molds and detailed images play in identification. The images are from a Federal Bureau of Investigation (FBI) Forensic Science Communications article titled, "The Forensic Analysis of Footwear Impression Evidence" dated September 2009. The first image depicts the left shoe of a Nike athletic sneaker. Each of the three images comes from a different mold. The second set of pictures shows the level of detail up close.





Slide 9-9: Prioritizing Collection



Key Information

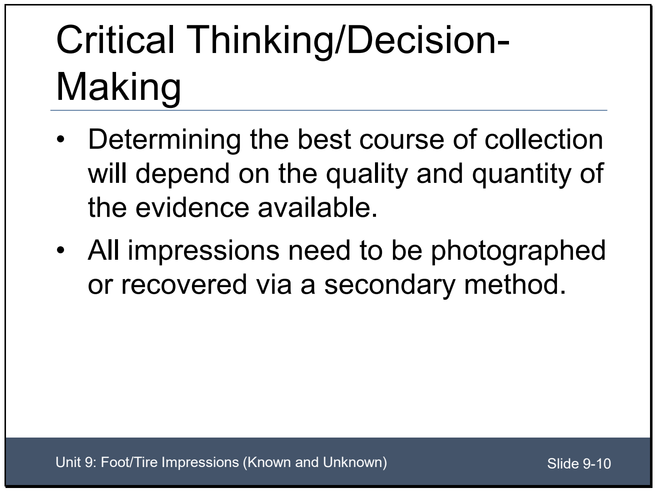
Prioritizing the collection of foot/tire impressions is a necessary step:

- Photographs of impressions: Examination-quality photographs must be utilized as opposed to normal crime scene photographs (e.g., forensic comparison, level of detail, enlargement capability).

- Secondary recovery outside of photographs.

- Weather conditions for exposed impressions.

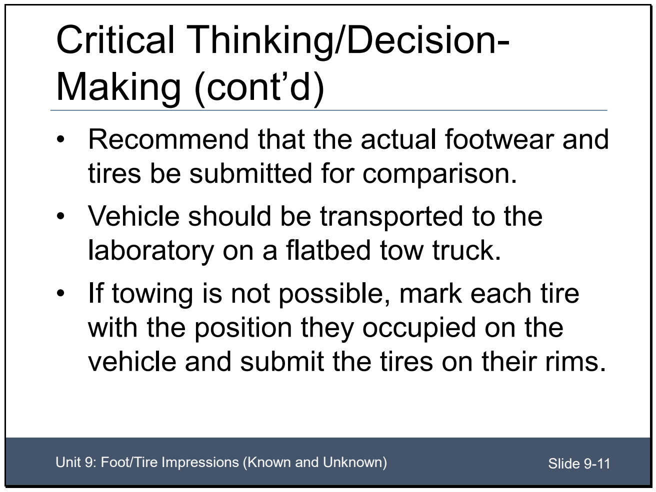
Slide 9-10: Critical Thinking/Decision-Making



Key Information

Determining the best course of collection will depend on the quality and quantity of the evidence available at the scene. All impressions need to be photographed or recovered via secondary methods (e.g., shoe, foot or tire prints). For example, a clear print, such as a footprint in dirt, could be collected solely with a photo, whereas a partial print, such as a footprint in grass, would need to be casted for laboratory examination.

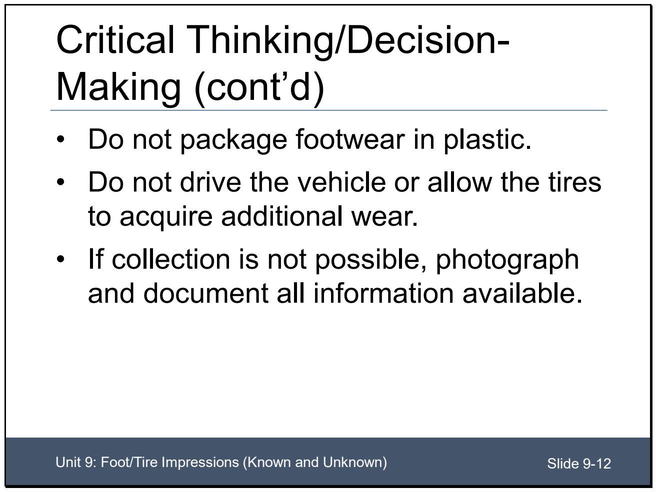
Slide 9-11: Critical Thinking/Decision-Making (cont’d)



Key Information

For a thorough examination, it is recommended that the actual footwear and tires be submitted for comparison. When possible, the vehicle should be transported to the laboratory on a flatbed tow truck. If towing the vehicle is not possible, mark each tire with the position they occupied on the vehicle (e.g., LF, LR, RF, RR) and submit the tires on their rims.

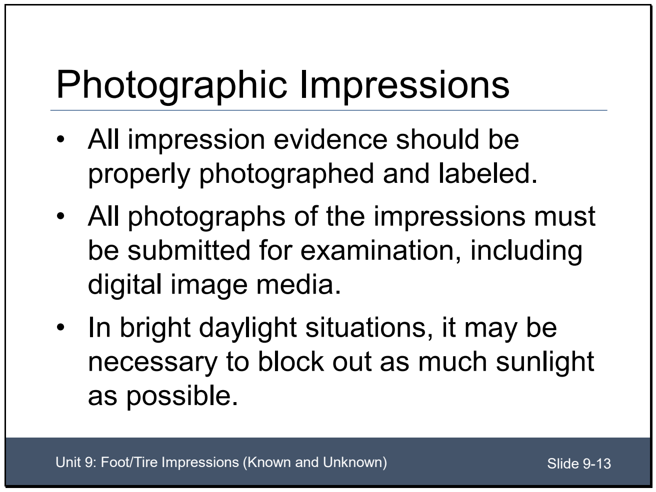
Slide 9-12: Critical Thinking/Decision-Making (cont'd)



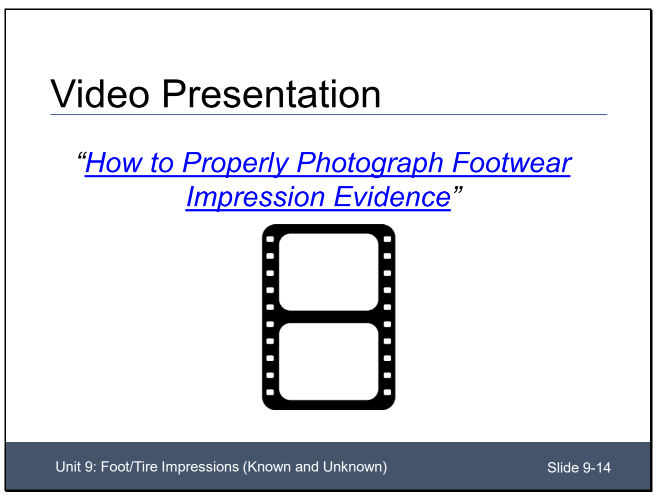
Key Information

Do not package footwear in plastic. Do not drive the vehicle or allow the tires to acquire additional wear. In the event the collection of the footwear or tires is not possible, photograph and document all information available (e.g., brand, color, make, model, size, Department of Transportation (DOT) numbers, etc.). This information can be located on the inside of the footwear or sidewall of the tire.

Slide 9-13: Photographic Impressions



Slide 9-14: Video Presentation



Key Information

Best practices for photographic impressions include:

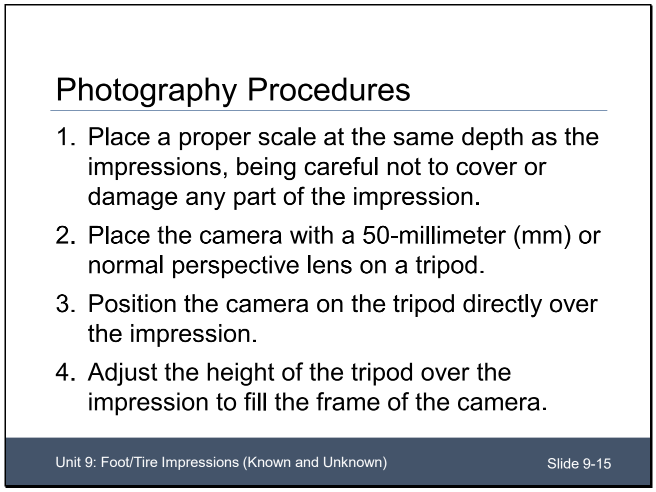
- All impression evidence should be properly photographed and labeled.
- All photographs of the impressions must be submitted for examination including digital image media.

- In bright daylight situations, it may be necessary to block out as much sunlight as possible. Sunlight or direct overhead light can often wash out detail created by using side lighting*.

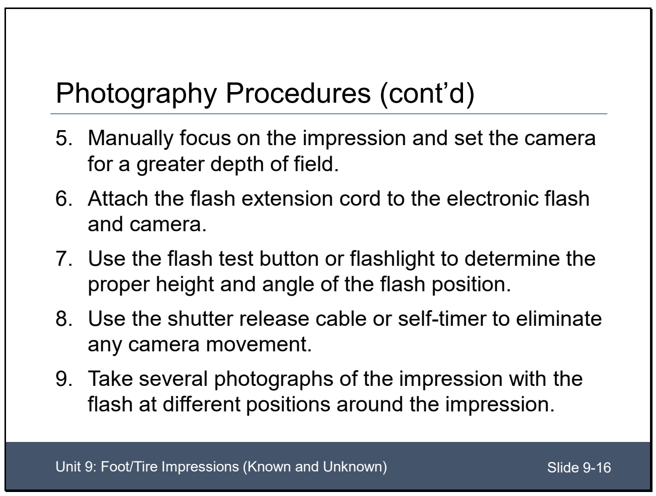
*Lighting a subject from the side creates shadows that highlight the three-dimensional features of an object. Side lighting may also be referred to as “rim light” or “hair light” (Jacobs, n.d.).

For more information, watch “How to Properly Photograph Footwear Impression Evidence.” (7:24)

Slide 9-15: Photography Procedures



Slide 9-16: Photography Procedures (cont'd)



Key Information

To avoid washout, use a dark cloth to create shadow over the impression and then follow this photography procedure:

1. Use a proper scale. (Do not use cloth measuring tapes, metal retractable tapes, coins, pens, etc., for scale.) Place scale next to, and at the same depth as, the impressions, being careful not to cover or damage any part of the impression.

2. Place the camera with a 50-millimeter (mm) or normal perspective lens on a tripod.

3. Position the camera on the tripod directly over the impression and make sure the back of the camera is parallel to the impression.

4. Adjust the height of the tripod directly over the impression to fill the frame of the camera.

5. Manually focus on the impression (not the scale) and set the camera for a greater depth of field (i.e., f-stop of F/16 or F/22).

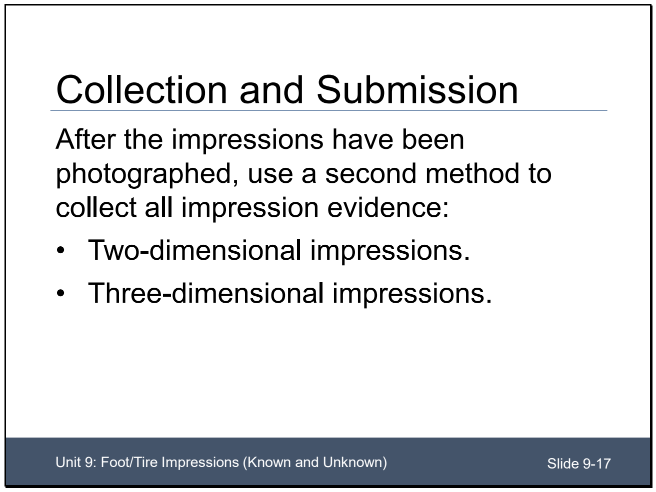
6. Attach the flash extension cord to the electronic flash and camera.

7. Use the flash test button or flashlight to determine the proper height and angle of the flash position (generally 4 to 5 feet to the side of the impression).

8. Use the shutter release cable or self-timer to eliminate any camera movement.

9. Take several photographs of the impression (with the flash) at different positions around the impression.

Slide 9-17: Collection and Submission

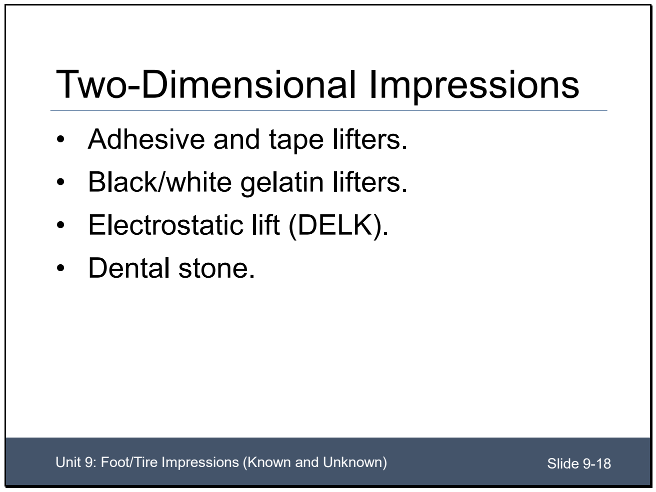


Key Information

After the impressions have been photographed, it is highly recommended that a second method is used to collect all impression evidence (even partial impressions). The types of secondary methods for impressions are:

- Two-dimensional impressions.
- Three-dimensional impressions.

Slide 9-18: Two-Dimensional Impressions



Key Information

Two-Dimensional Impressions:

- Adhesive and tape lifters can be used for lifting impressions on nonporous surfaces that have been enhanced with fingerprint powder. This process can be difficult; however, when you do not have the necessary equipment, this can be a good alternative.

- Black/white gelatin lifters can be used for lifting impressions on both porous and nonporous surfaces that may or may not be wet.

- Electrostatic lift (DELK) can be used for lifting dry dust or dry residue footwear impressions from clean, porous or nonporous surfaces.

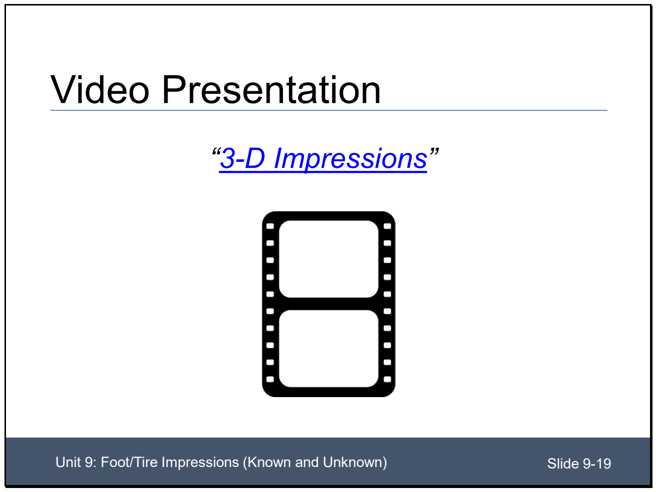
  - The proper storage of electrostatic lift film is crucial to the preservation of any impressions present.

  - A small lift should be placed in a clean manila folder or a clean shallow box with edges taped down to prevent movement.

  - A long/large lift may be gently rolled to protect the impression. Do not fold the film or use pizza boxes or other previously used boxes.

- Dental stone can be used for lifting dry dust or dry residue footwear impressions from clean, porous or nonporous surfaces. Place tape around the impression before pouring to help the dental stone release from the concrete.

Slide 9-19: Video Presentation



Key Information

Three-Dimensional Impressions:

Use of a dental stone allows casting impressions in soil, sand, mud, snow, or impressions tracked across a driveway or sidewalk. Place tape around the impression before pouring to help the dental stone release from the concrete.

For more information, visit "3-D Impressions" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 9-20: Video Presentation

Key Information

For more information, watch "How to Cast Footwear Impression Evidence at a Crime Scene." (3:10)

Slide 9-21: Dental Stone Directions

Dental Stone Directions

1. Open one 8-inch by 12-inch plastic zip-close bag.
2. Add 2 pounds of dental stone and 9 to 12 ounces of water.
3. Close bag and massage vigorously for three to five minutes. Mixture should resemble pancake batter when ready.

Unit 9: Foot/Tire Impressions (Known and Unknown) Slide 9-21

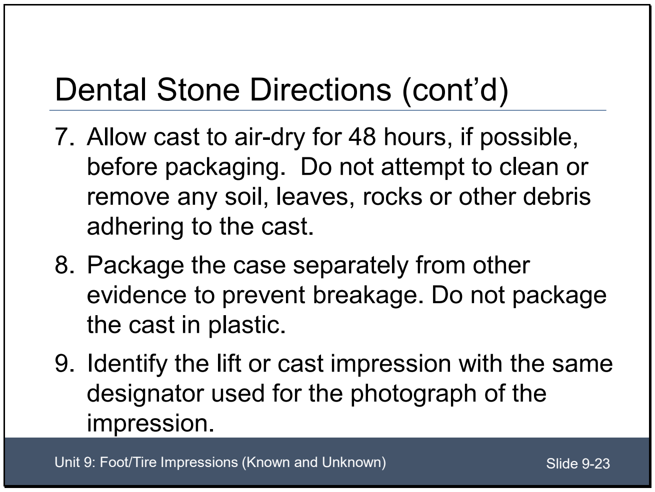
Slide 9-22: Dental Stone Directions (cont'd)

Dental Stone Directions (cont'd)

4. Open bag or snip one corner and pour mixture beside the impression, allowing the flow into the impression.
5. You may skim the surface of the mixture with your finger to gently smooth or direct the flow into all areas for complete coverage of the impression.
6. Leave undisturbed for at least 20 to 30 minutes, or longer if the outside air is cold. When set, the cast loses gloss and feels cold to the touch.

Unit 9: Foot/Tire Impressions (Known and Unknown) Slide 9-22

Slide 9-23: Dental Stone Directions (cont'd)



Key Information

Dental stone directions follow. This mixture yields one footwear cast; you must double the amount for 18-inch tire impressions:

1. Open an 8-inch by 12-inch plastic resealable bag.

2. Add 2 pounds of dental stone and 9 to12 ounces of water.

3. Close bag and massage vigorously for three to five minutes, including any mixture caught in the corner of the bag. Mixture should resemble pancake batter when ready.

4. Open bag or snip one corner and pour mixture beside the impression, allowing the flow into the impression. Do not pour directly on the impression.

5. You may skim the surface of the mixture with your finger to gently smooth or direct the flow into all areas for complete coverage of the impression, being careful not to let your fingers sink below the surface.

6. Leave undisturbed for at least 20 to 30 minutes or longer if the outside air is cold. When set, the cast loses gloss and feels cold to the touch.

7. Allow cast to air-dry for 48 hours, if possible, before packaging. Do not attempt to clean or remove any soil, leaves, rocks or other debris adhering to the cast.

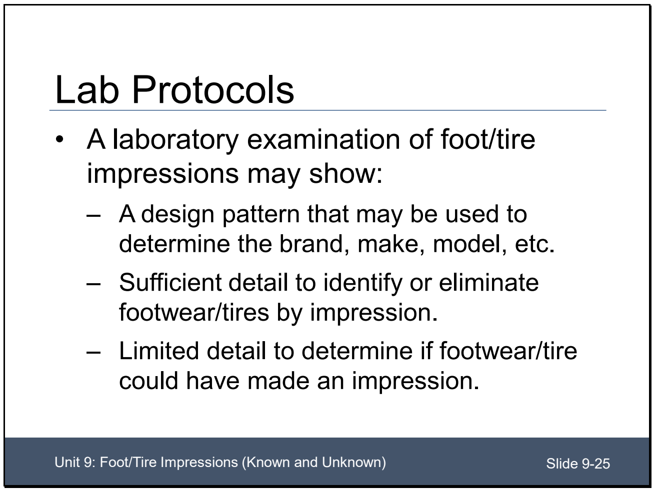
8. Package the case separately from other evidence and to prevent breakage (with plastic foam peanuts, bubble wrap, crumpled newspaper, etc.). Do not package case in plastic.

9. Identify the lift or cast impression with the same designator used for the photograph of the impression. Example: Marker #, Impression #1, #2 (or A, B), etc.

Slide 9-24: Dental Stone Images

Key Information

Slide 9-25: Lab Protocols

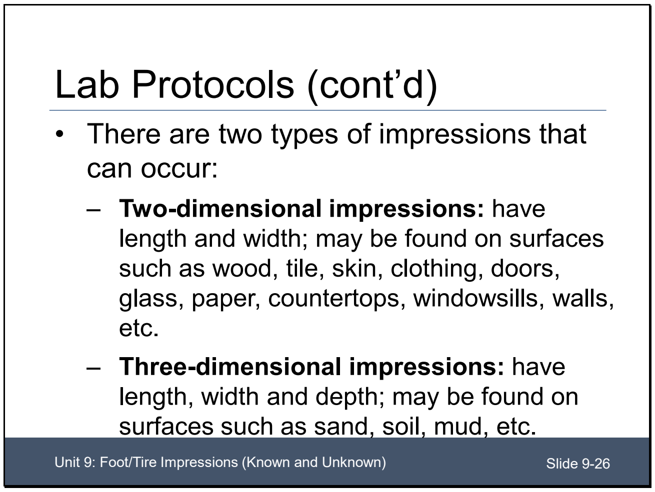


Key Information

When impression evidence is analyzed, it may show:

- A design that may be researched to determine brand names and manufacturers of footwear or tires that could have made the impression.
- Sufficient detail to identify or eliminate the footwear or tire that did or did not make the impression.
- Limited detail, but enough to determine that the footwear or tire could have made an impression.

Slide 9-26: Lab Protocols (cont'd)



Key Information

There are two types of impressions that can occur:

- **Two-dimensional impressions:** impressions that have length and width and may be found on surfaces such as wood, tile, skin, clothing, doors, glass, paper, countertops, windowsills, walls, etc. They may be left by a variety of contaminants such as water, blood, dust, paint, grease, etc.

- **Three-dimensional impressions:** impressions that have length, width and depth and may be found on surfaces such as sand, soil, mud, etc. They are left when the footwear or tire has been impressed into a surface.

Slide 9-27: Demonstration

Demonstration

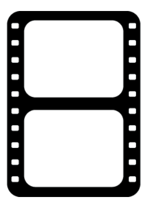
The instructor will demonstrate the proper collection and preservation methods (i.e., adhesive and tape lifters, black/white gelatin lifters, electrostatic lift (DELK), and dental stone).

Unit 9: Foot/Tire Impressions (Known and Unknown) Slide 9-27

Slide 9-28: Video Presentation

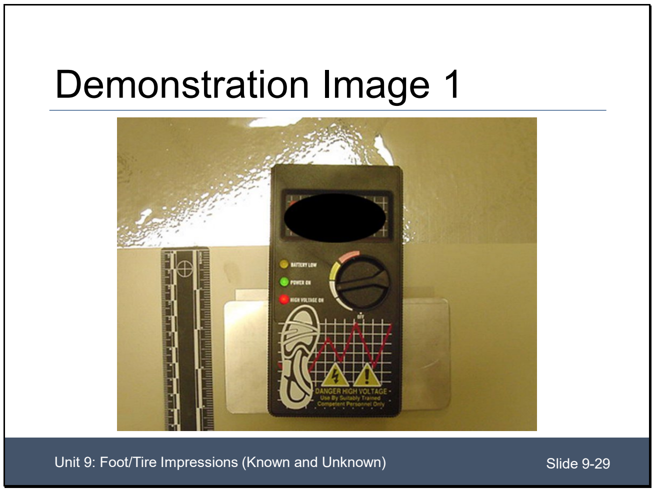
Video Presentation

"How to Use a Gelatin Lifter for Evidence Collection"

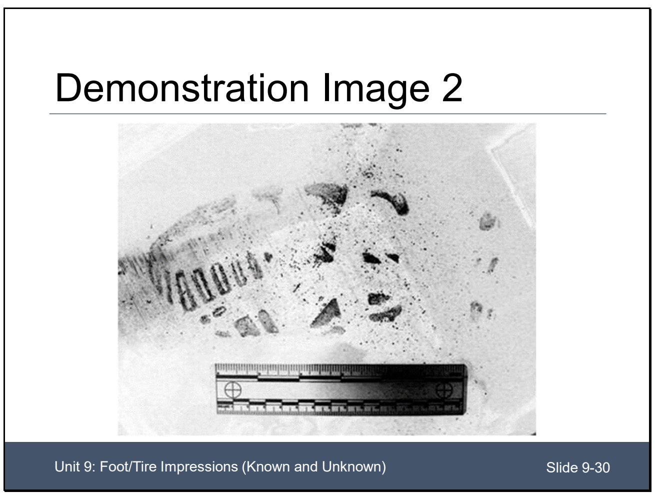


Unit 9: Foot/Tire Impressions (Known and Unknown) Slide 9-28

Slide 9-29: Demonstration Image 1



Slide 9-30: Demonstration Image 2



Key Information

Adhesive and Tape Lifters: This process is similar to that of lifting a latent print in which the powder is applied to the image/print and an adhesive tape. Due to the size of the impression to be collected, the adhesive may have to use makeshift adhesive lifters. Putting sections of tape together to make a lifter can create seams, folds and overlaps; because of these shortcomings, other materials are better suited for collection.

Black/White Gelatin Lifters:

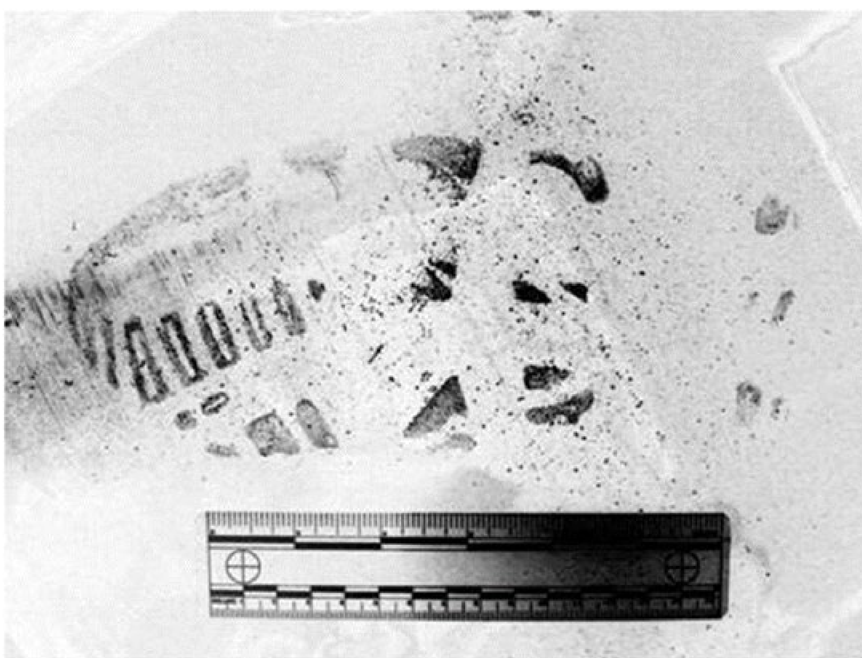
- Video: "How to Use a Gelatin Lifter for Evidence Collection." (3:10)
- This process uses gelatin, which will allow for the pickup of a footprint on a wood or tile floor.
  - The student should locate the marking using an oblique light and make a pen mark showing the area to secure the print.
  - Using gloves, measure the lifter and cut/trim to size.
  - Remove the protective sheeting and place it on top of the print.
  - Using a latent print roller, roll over the top to apply pressure onto the print.
  - Once complete, pick up the lift, photograph and replace the covering. This will help protect items from dirt, dust and debris while waiting to be examined.

Electrostatic Lift (DELK): "Electrostatic Dust Print Lifter"

- This process involves using an electrical charge box, ground and electrostatic material.
- Place the electrostatic material on top of the footprint.
- Remove the charge box and ground plate.
- Place the ground plate an inch or so away from the material.
- Take the box and put the top prongs (located on the top of the box) on the material.
- Place the bottom prong on the ground. If correct, the box should sit on top of the ground plate and electrostatic material.
- Using a soft material, remove any air bubbles on the material.
- Removing any physical contact, turn the charge box on. This will attach the print to the material electrically.
- Once removed from the charge box, the charge on the material should remain.

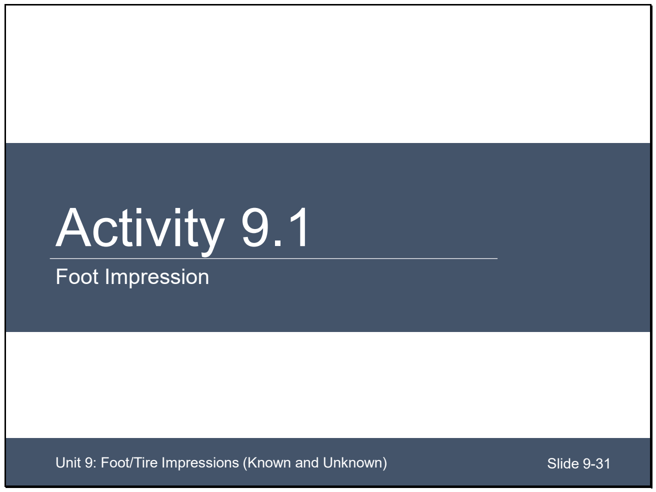
- Place the charged sheet into a shallow box and seal.

Dental Stone: Dental stone is mostly used to make a cast of an impression but can be used to take an impression of a dried mud print on wood or concrete.



(Minnesota BCA, n.d.)

Slide 9-31: Activity 9.1



Activity Estimated Time: 30 minutes

Activity Purpose

This activity provides students with an opportunity to practice collecting shoe impressions. Students will create, document, collect and package the impression.

Activity Directions

1. Create a footprint in dirt.

2. Document the impression evidence.

3. Collect the impression evidence using casting material.

4. Package the impression evidence using appropriate packing methods.

Tools

Camera (refer to Unit 1 for camera specifications and equipment), scale (thin, flat and ridged; 6 to 12 inches long; nonreflective; black with white numerals or white with black numerals), bags (multiple sizes), boxes (multiple sizes), evidence tape, black permanent marker, adhesive and tape lifters, black/white gelatin lifters, electrostatic lift (DELK), dental stone, stone material, zip-close bags, water, metal form, hairspray (aerosol) or a fixing agent for winter weather (e.g., Snow Wax (aerosol)).

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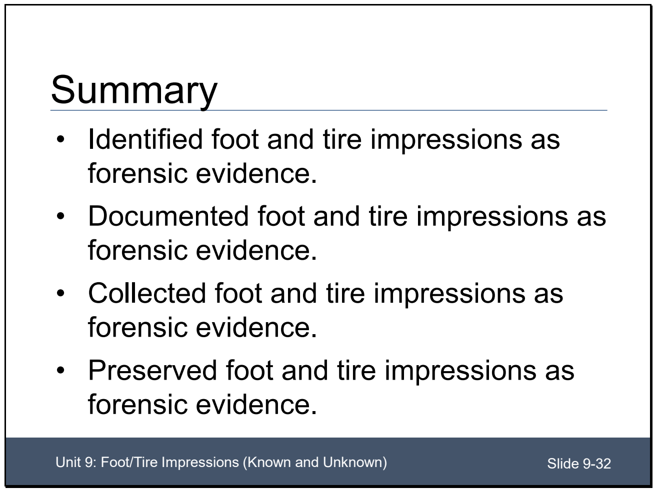
Slide 9-32: Summary



Key Information

Students should now be able to:

- Identify foot and tire impressions as forensic evidence.
- Document foot and tire impressions as forensic evidence.
- Collect foot and tire impressions as forensic evidence.
- Preserve foot and tire impressions as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 10: Toolmarks

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Collect toolmarks and impression evidence from samples provided.

Unit Enabling Learning Objectives (ELOs)

10.1 Identify toolmarks as forensic evidence.
10.2 Document toolmarks as forensic evidence.
10.3 Collect toolmarks as forensic evidence.
10.4 Preserve toolmarks as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Collect toolmarks and impression evidence from samples provided.	Practicum Part I: Crime Scene Investigation/ Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify toolmarks as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 10.1	Final Exam
Document toolmarks as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 10.1	Practicum Part I: Crime Scene Investigation
Collect toolmarks as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 10.1	Practicum Part I: Crime Scene Investigation
Preserve toolmarks as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 10.1	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	60 min.
Demonstration	30 min.
Activity 10.1: Toolmarks: Collection	30 min.
Summary	5 min.

Audiovisual

Slides 10-1 to 10-24

Videos: “Toolmark on Substrate”
“Collecting Impression Evidence, pry marks and tool marks”

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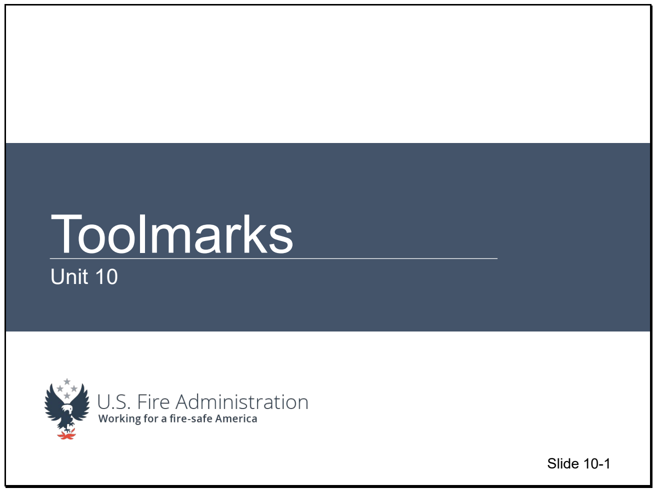
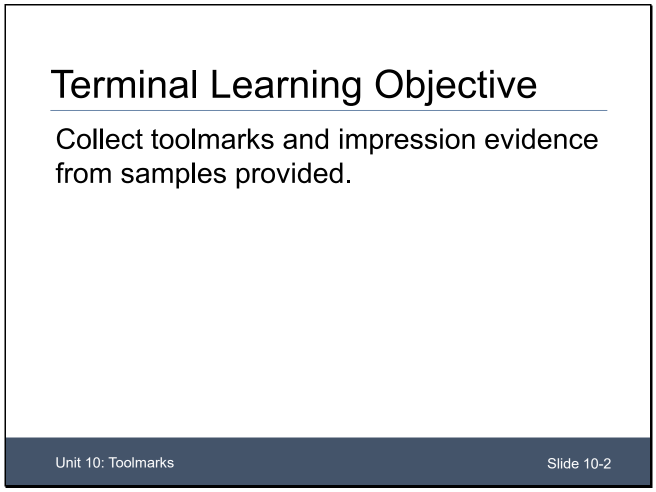
Slide 10-1: Toolmarks



Key Information

Welcome to Unit 10: Toolmarks!

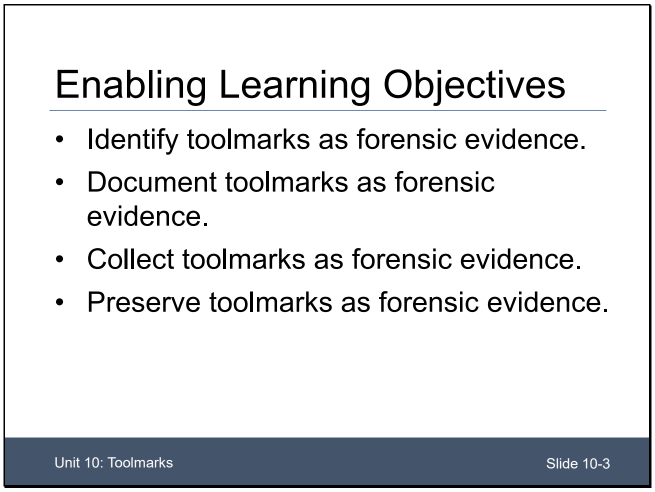
Slide 10-2: Terminal Learning Objective



Key Information

Collect toolmarks and impression evidence from samples provided.

Slide 10-3: Enabling Learning Objectives

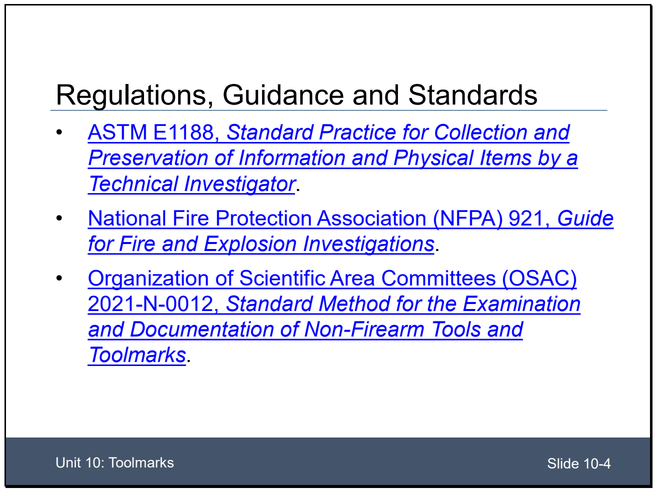


Key Information

After completing this unit, students will be able to:

- Identify toolmarks as forensic evidence.
- Document toolmarks as forensic evidence.
- Collect toolmarks as forensic evidence.
- Preserve toolmarks as forensic evidence.

Slide 10-4: Regulations, Guidance and Standards

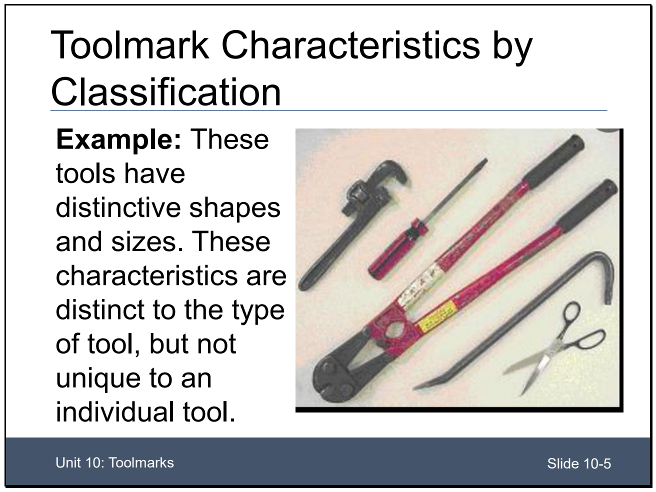


Key Information

Many tools can be uniquely identified based on the style and manufacturing process. This individuality can be used to identify the type of tool used during a crime and/or matching a tool to the mark it created.

- ASTM E1188, *Standard Practice for Collection and Preservation of Information and Physical Items by a Technical Investigator*.
- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
- Organization of Scientific Area Committees (OSAC) 2021-N-0012, *Standard Method for the Examination and Documentation of Non-Firearm Tools and Toolmarks*.

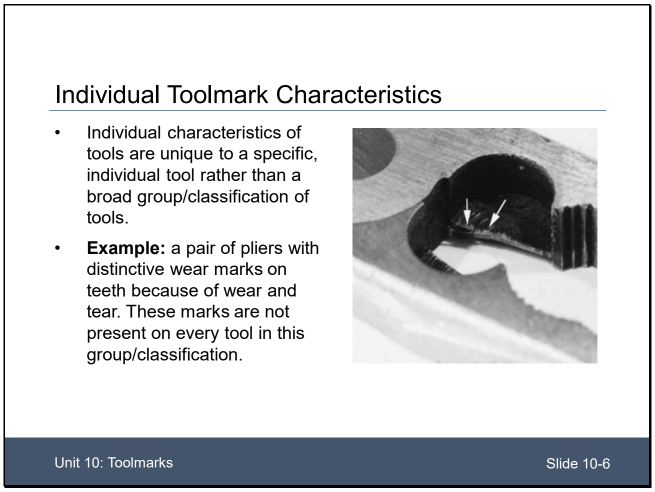
Slide 10-5: Toolmark Characteristics by Classification



Key Information

Characteristics of tools by classification are those that are common to a group of tools, with distinctive shape and size according to function and purpose (e.g., Phillips head versus flat-head screwdrivers). These characteristics are distinct to the type of tool, but not unique to an individual tool.

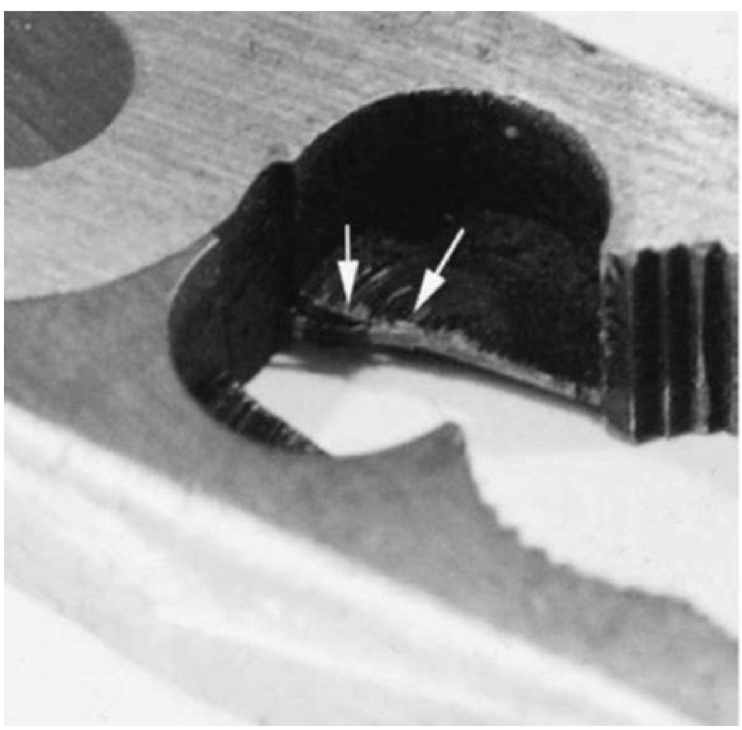
Slide 10-6: Individual Toolmark Characteristics



Key Information

Individual characteristics of tools are those that are unique to a specific, individual tool rather than a broad group/classification of tools.

Example: a pair of pliers with distinctive wear marks on the teeth caused by wear and tear. Like fingerprints, these wear marks are unique and are not present on every tool in this group/classification.



Slide 10-7: Types of Toolmark Impressions

Types of Toolmark Impressions

Static (impressed)	**Caused by harder object being pressed into another softer object.**
Dynamic (striated)	**Caused when a tool slides or scratches across another surface.**
Cutting (crushed)	**Caused by pressure being applied to both sides of object.**
Multi-stroke	**Caused by repetitive actions.**

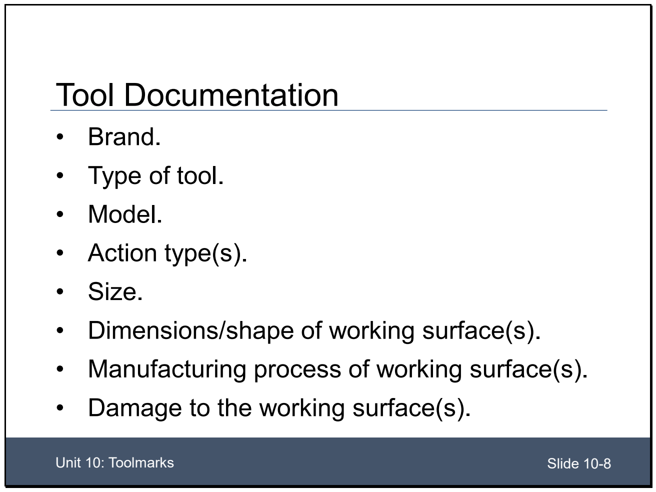
Unit 10: Toolmarks Slide 10-7

Key Information

Types of toolmark impressions include:

- **Static (impressed):** caused by harder object being pressed into another softer object.
- **Dynamic (striated):** caused when a tool slides or scratches across another surface.
- **Cutting (crushed):** caused by pressure being applied to both sides of object.
- **Multi-stroke:** caused by repetitive actions.

Slide 10-8: Tool Documentation

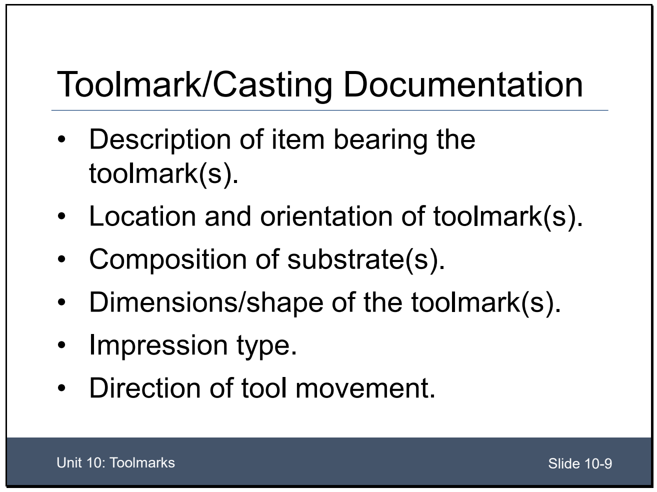


Key Information

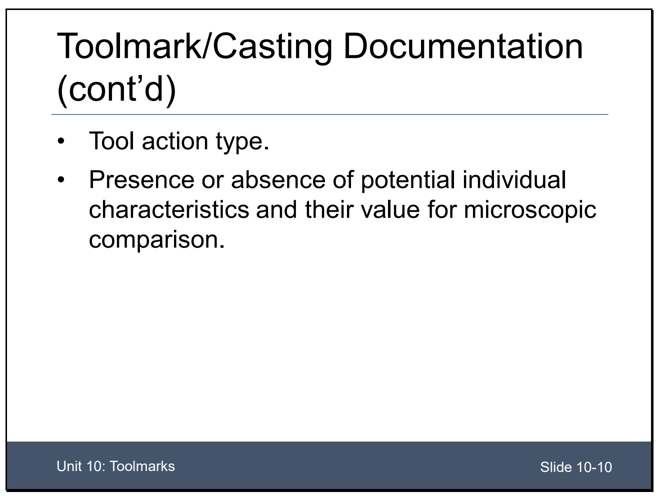
To comprehensively document tools, identify as much of this information as possible:

- Brand.
- Type of tool (e.g., hammer, bolt cutters).
- Model (if known).
- Action type(s) (e.g., cutting, prying, pinching, shearing).
- Size.
- Dimensions/shape of working surface(s).
- Manufacturing process of working surface(s).
- Damage to the working surface(s).

Slide 10-9: Toolmark/Casting Documentation



Slide 10-10: Toolmark/Casting Documentation (cont'd)



Key Information

Document the following information for toolmarks/castings as potential evidence:

- Description of item bearing the toolmark(s).
- Location and orientation of toolmark(s).
- Composition of substrate(s) (e.g., steel, plastic, wood).
- Dimensions/shape of the toolmark(s).
- Impression type (impressed and/or striated).
- Direction of tool movement.

- Tool action type (e.g., cutting, prying, pinching, shearing).
- Presence or absence of potential individual characteristics and their value for microscopic comparison.

Slide 10-11: Drill Markings/Evidence

Key Information

Example: drill bit and possible evidence.

Image 1: drill bit with residual polyvinyl chloride (PVC) fragments.

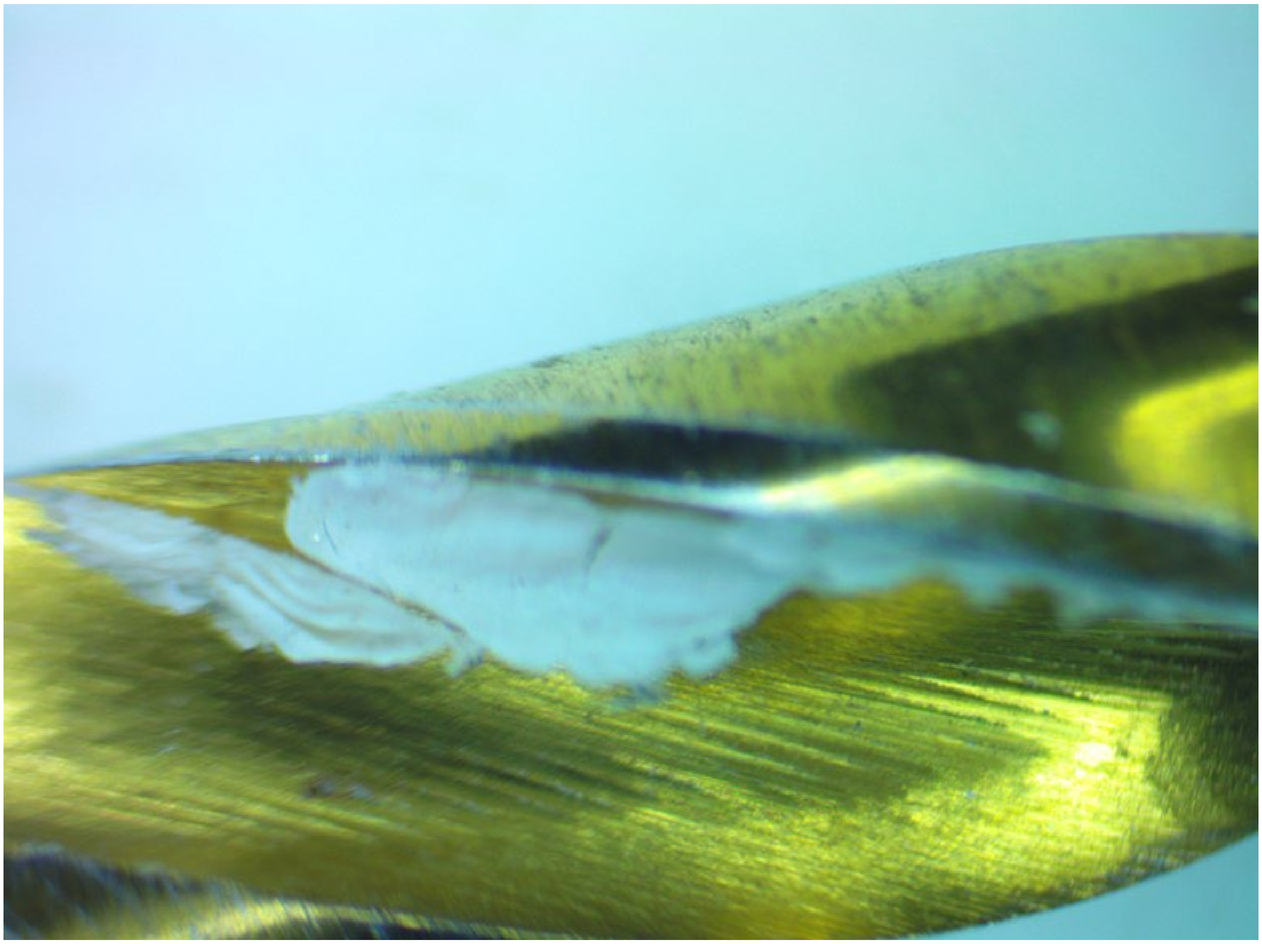


Image 2: PVC remnants from drilling.

Image 3: drill hole in PVC.

Slide 10-12: Wrench Mark

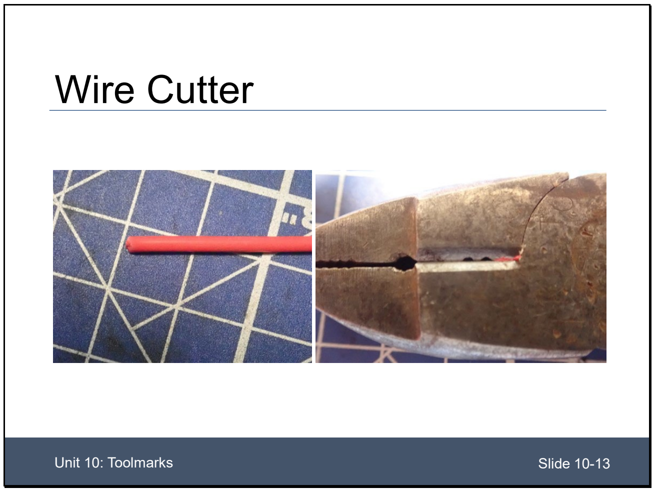
Key Information

Example: wrench marks as potential evidence.

Image 1: striation marks from a gas fitting.

Image 2: wrench used to remove gas fitting.

Slide 10-13: Wire Cutter



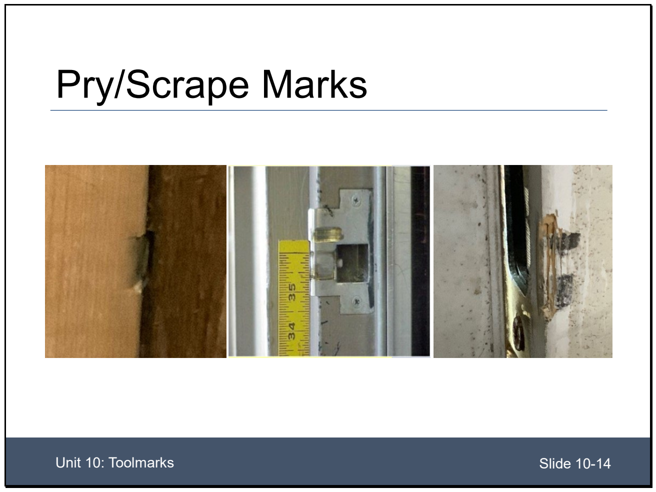
Key Information

Example: wire cutters as potential evidence.

Image 1: section of cut wire found at crime scene.

Image 2: remnants of red wire and specific wear marks on cutters.

Slide 10-14: Pry/Scrape Marks



Key Information

Example: pry/scrape marks as potential evidence.

Image 1: mark made from a screwdriver.

Image 2: marks made from an attempted burglary.

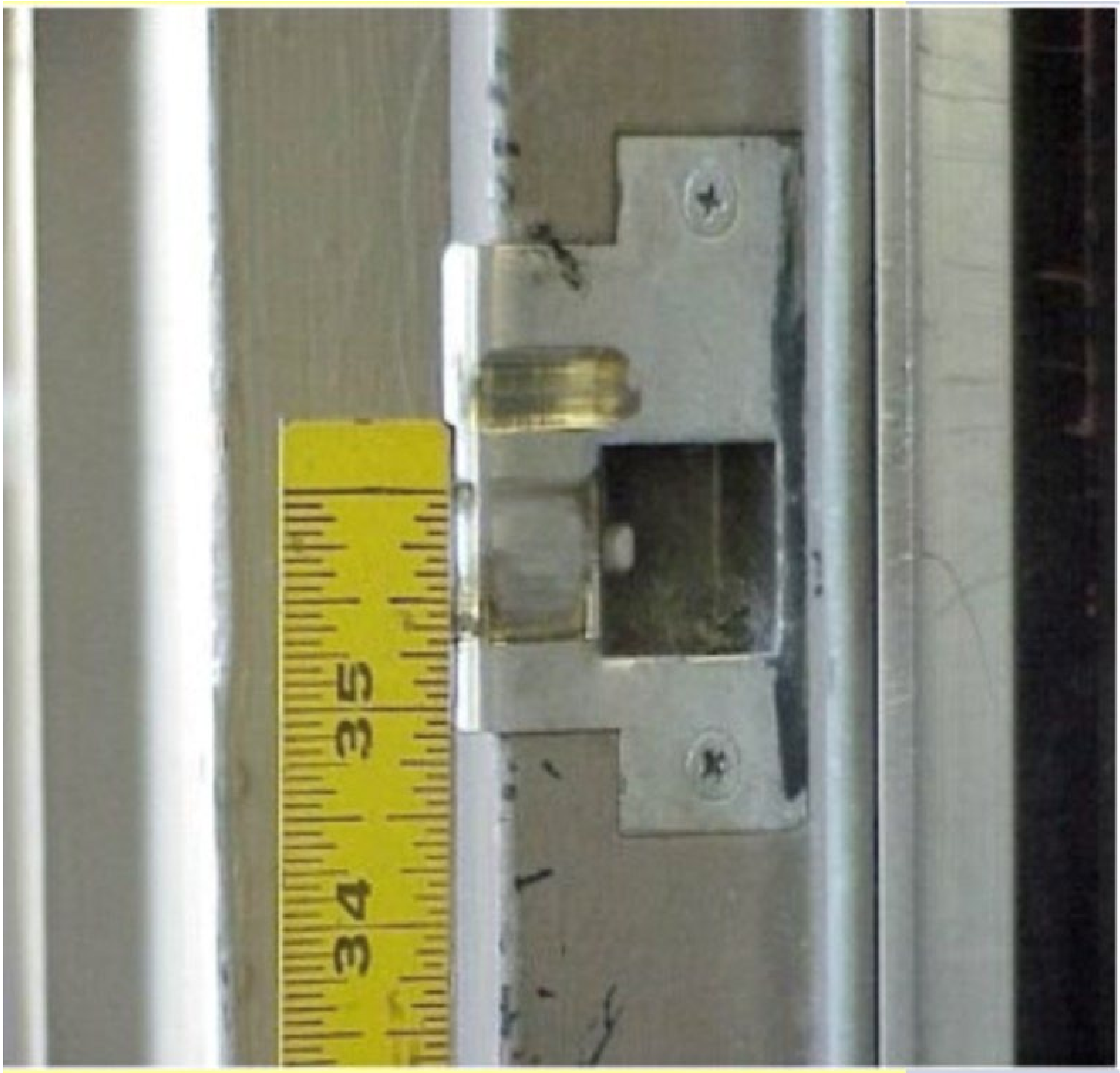
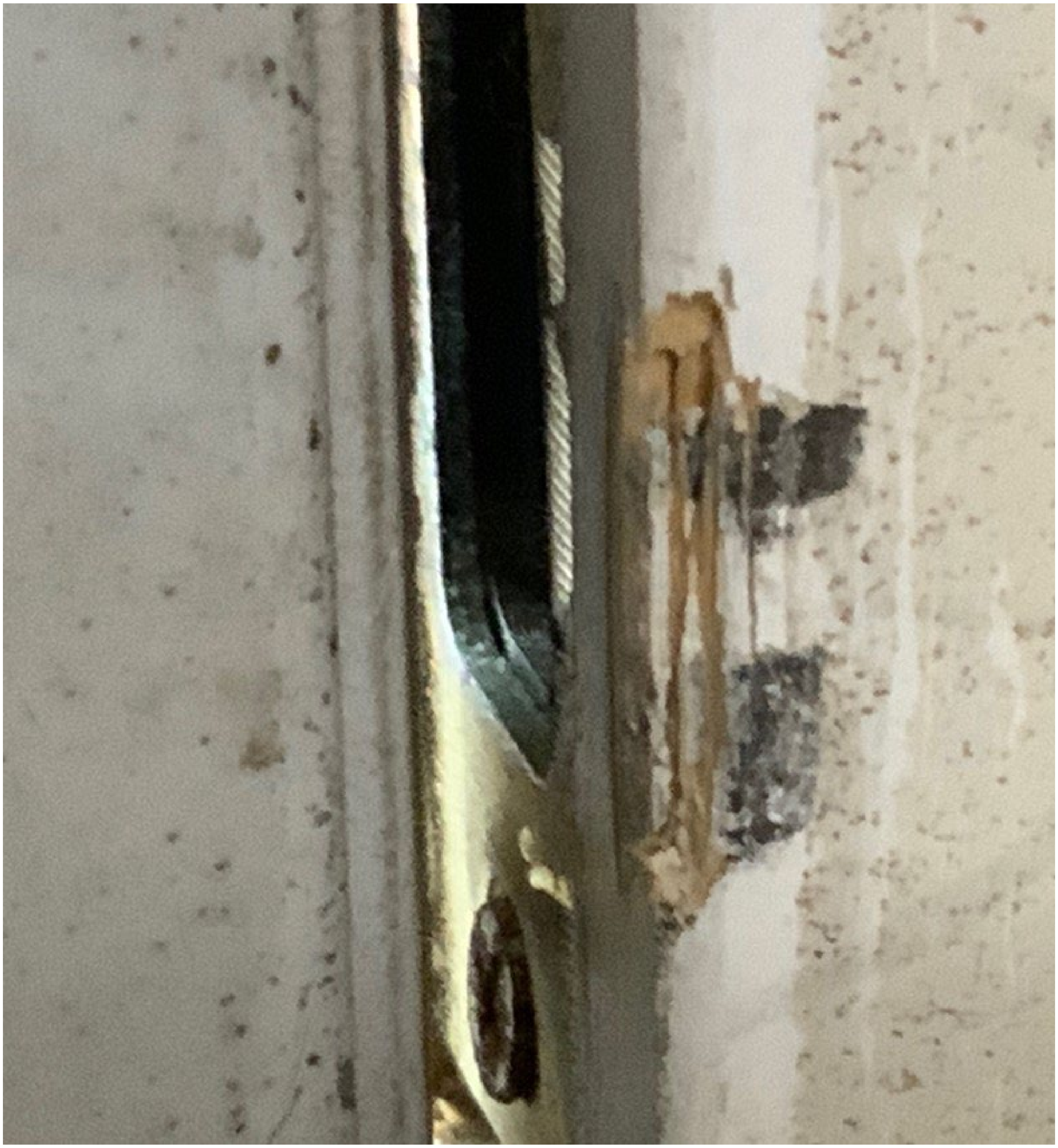
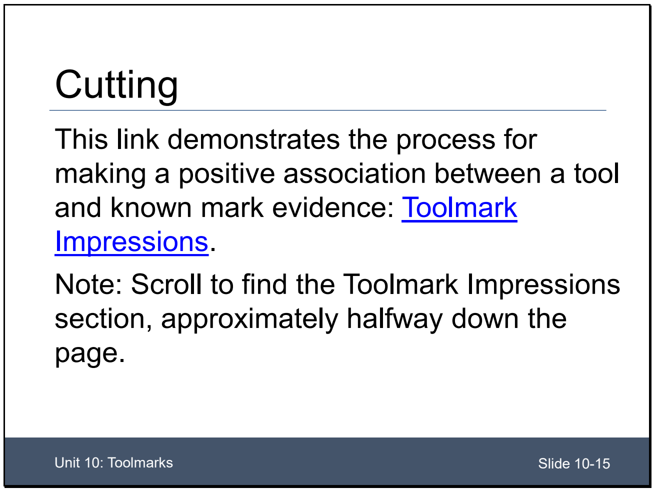


Image 3: marks made from an attempted burglary.



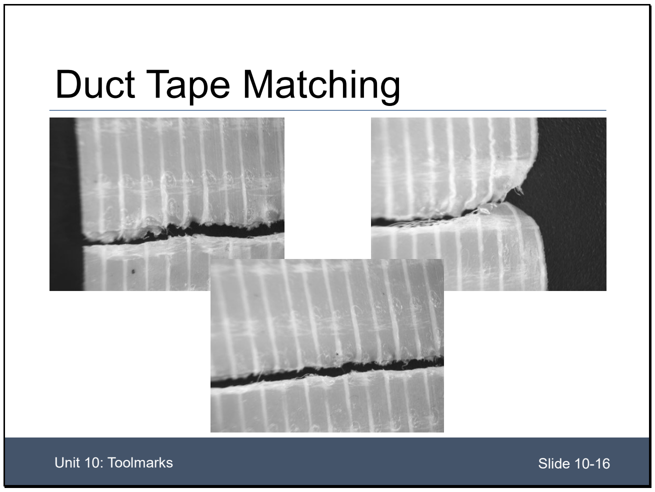
Slide 10-15: Cutting



Key Information

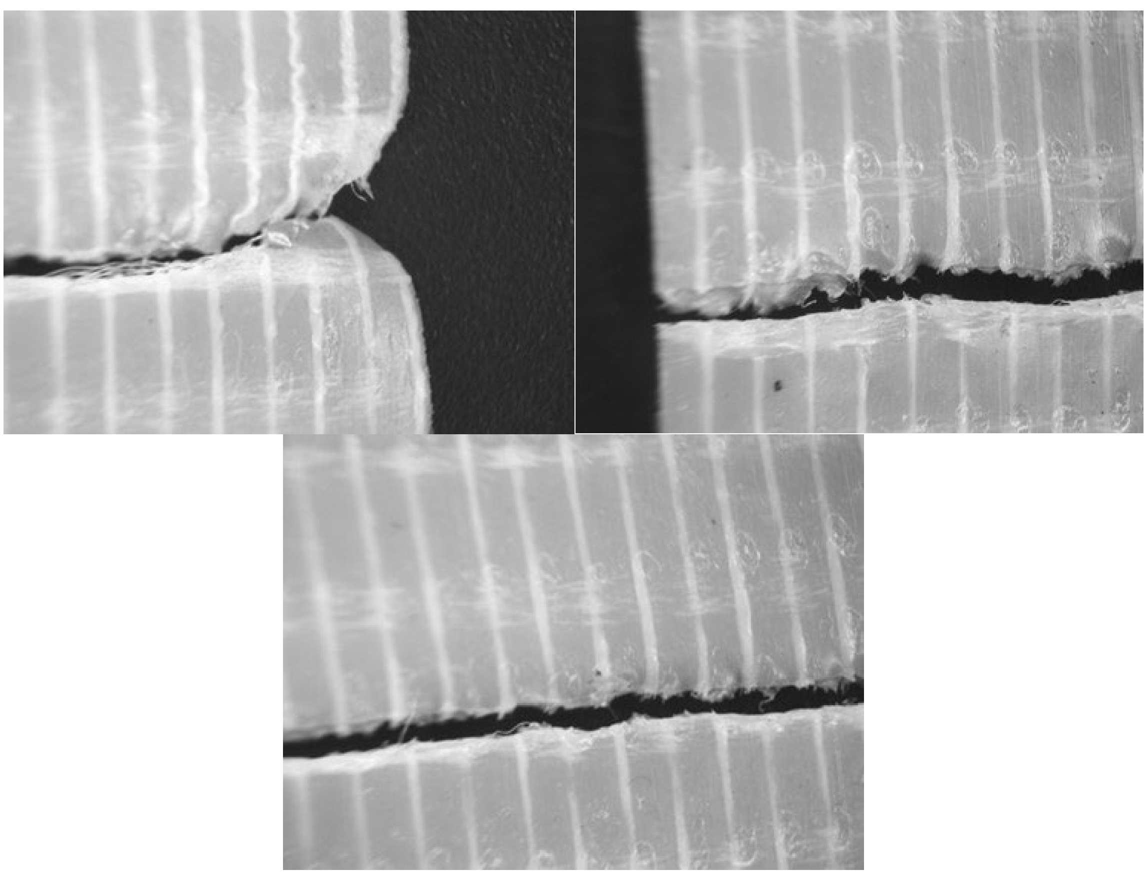
Example: cutting marks as potential evidence. This example demonstrates the process for making a positive association between a tool and known mark evidence: Toolmark Impressions.

Slide 10-16: Duct Tape Matching



Key Information

Duct tape is sometimes used to bind victims or wrap tools and devices. The tape found on victims or items can potentially be matched with the originating tape roll by comparing the brand, tape marks and tear marks.



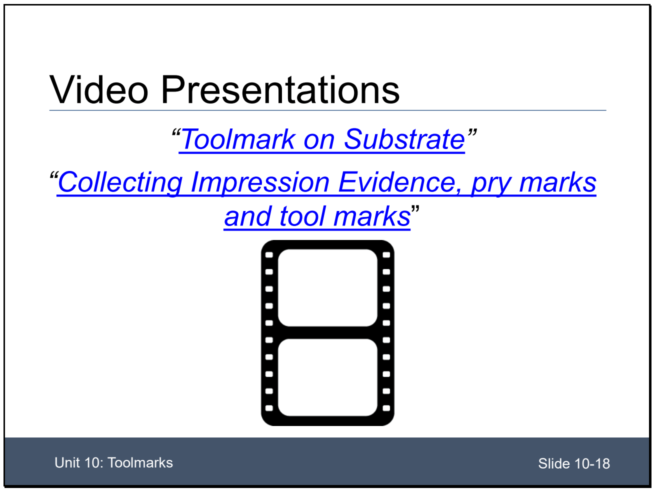
Slide 10-17: Tools Involved

Key Information

The following items should be available at a crime scene to collect toolmarks as evidence:

- Gloves.
- Safety glasses.
- Battery-operated saws.
- Hand saws.
- Ruler and/or tape measure.
- Calipers.
- Mikrosil/Forensic-Sil.

Slide 10-18: Video Presentations

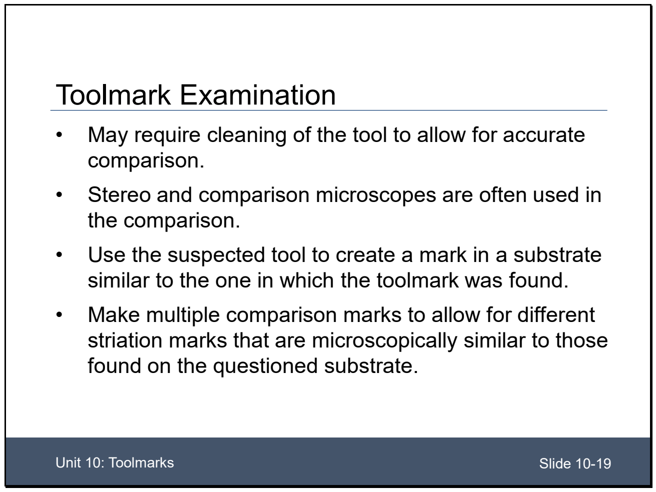


Key Information

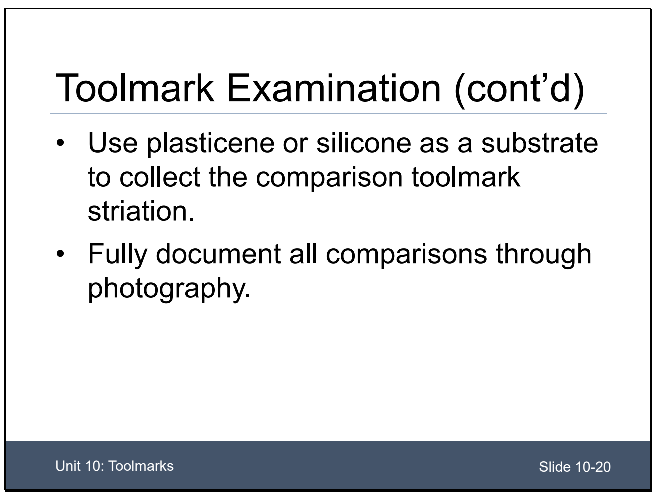
The process of collecting toolmark impressions as evidence is detailed in these videos:

- "Toolmark on Substrate." (2:04)
- "Collecting Impression Evidence, pry marks and tool marks." (9:27)

Slide 10-19: Toolmark Examination



Slide 10-20: Toolmark Examination (cont’d)



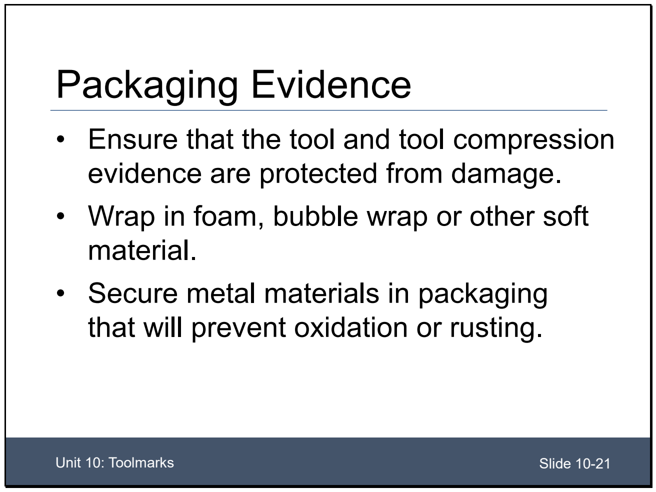
Key Information

The examination of toolmarks involves comparing the striation marks between a known tool and a questioned mark. This process may require cleaning of the tool to allow for accurate comparison; stereo and comparison microscopes are often used.

Based on the substrate, use the suspected tool to create a mark in a similar substrate. **Example:** If a pry mark is found on a wood door, it is best to find similar wood to make comparison marks.

Make multiple comparison marks to allow for different striation marks that are microscopically like those found on the questioned substrate; these include striation and impression marks. Plasticene or clay may also be used as a substrate to collect the comparison toolmark striation. Comparisons must be fully documented through photography.

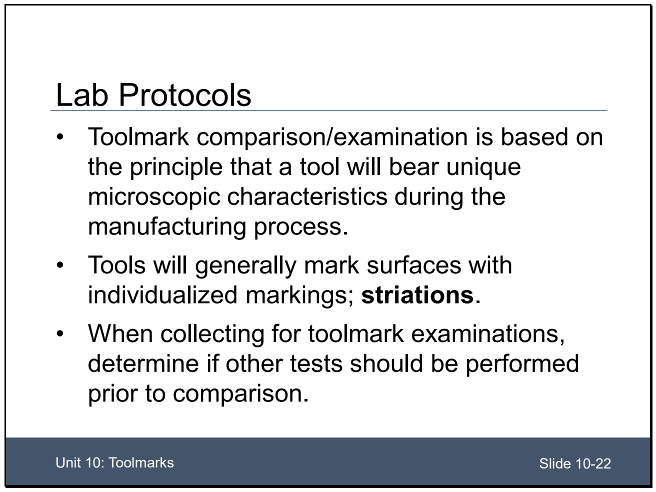
Slide 10-21: Packaging Evidence



Key Information

When packing tools and toolmark samples as evidence, ensure that the tool and any tool compression evidence are protected from damage. Wrap the item(s) in foam, bubble wrap or other soft material. Secure any metal materials in packaging that will prevent oxidation or rusting.

Slide 10-22: Lab Protocols



Key Information

Toolmark comparison/examination is based on the principle that a tool will bear unique microscopic characteristics during the manufacturing process. Tools will generally mark surfaces with individualized markings upon contact; these marks can be reproduced on similar substrates.

The first thing the investigator must do is to recognize toolmark striations, which can be anywhere. **Striations** are minute grooves, scratches or channels, especially when one of a parallel series (Merriam-Webster, n.d.). When collecting for toolmark examinations, determine if other tests should be performed prior to comparison (e.g., touch DNA, fingerprints, trace evidence).

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Slide 10-23: Activity 10.1

Activity Estimated Time: 30 minutes

Activity Purpose

Groups will be given a box with tools and substrates. The students will make marks and then determine how best to collect the evidence.

Activity Directions

1. Identify the items that can make a toolmark impression.
2. Document the type of marks that each tool makes.
3. Collect the samples created.
4. Preserve and package the evidence correctly.

Tools

Gloves, safety glasses, battery-operated saws, hand saws, ruler and/or measure, caliper, screwdriver, linesman pliers, small bolt cutters, pry bar, channel lock pliers, pipe wrench, two pieces of wood screwed together, 12-gauge wire, small item to simulate a lock hasp (1/4-inch metal rod), door hasp connected to block of wood, door handle, and a gas line connection.

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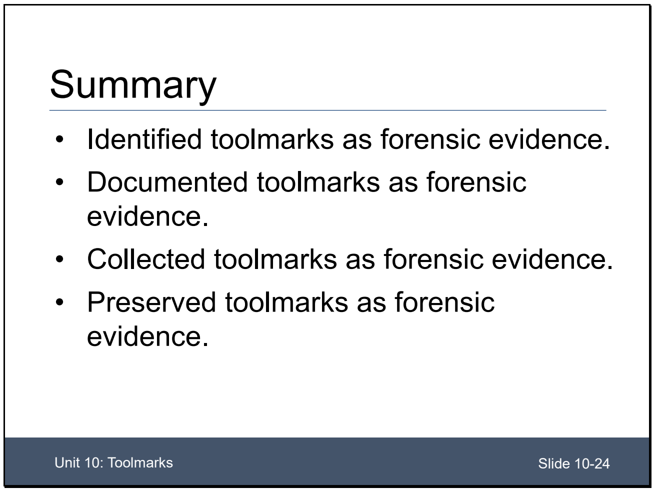
Slide 10-24: Summary



Key Information

Students should now be able to:

- Identify toolmarks as forensic evidence.
- Document toolmarks as forensic evidence.
- Collect toolmarks as forensic evidence.
- Preserve toolmarks as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 11: Paint

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Formulate proper collection processes for paint in order to relate the significance of sample to laboratory analysis.

Unit Enabling Learning Objectives (ELOs)

11.1 Identify paint as forensic evidence.
11.2 Document toolmarks as forensic evidence.
11.3 Collect paint as forensic evidence.
11.4 Preserve paint as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Formulate proper collection processes for paint in order to relate the significance of sample to laboratory analysis.	Practicum Part I: Crime Scene Investigation Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify paint as forensic evidence.	Class dialogue/facilitated discussion	Final Exam
Document toolmarks as forensic evidence.	Class dialogue/facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect paint as forensic evidence.	Class dialogue/facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve paint as forensic evidence.	Class dialogue/facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	60 min.
Summary	5 min.

Audiovisual

Slides 11-1 to 11-23

Videos: “Chips & Particles”
“Films & Smears”
“Painted Surfaces”

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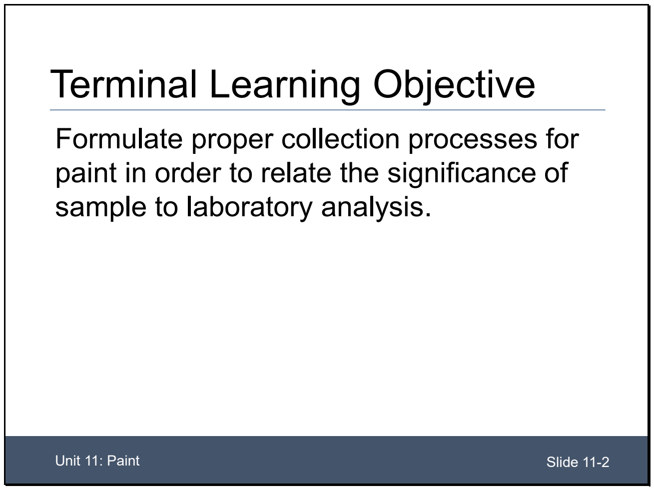
Slide 11-1: Paint

Key Information

Welcome to Unit 11: Paint!

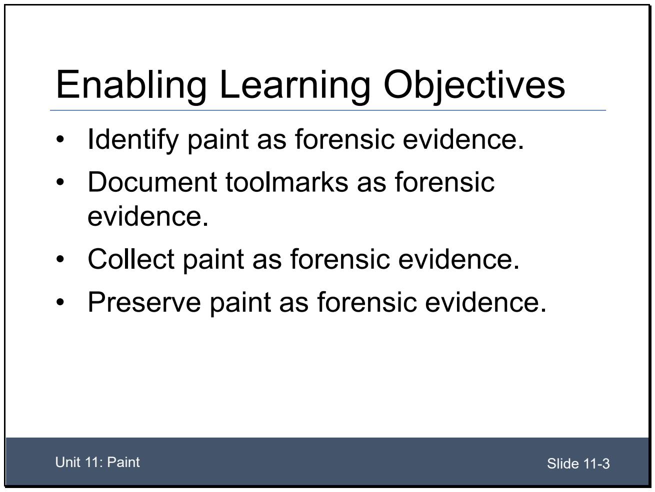
Slide 11-2: Terminal Learning Objective



Key Information

Formulate proper collection processes for paint in order to relate the significance of sample to laboratory analysis.

Slide 11-3: Enabling Learning Objectives

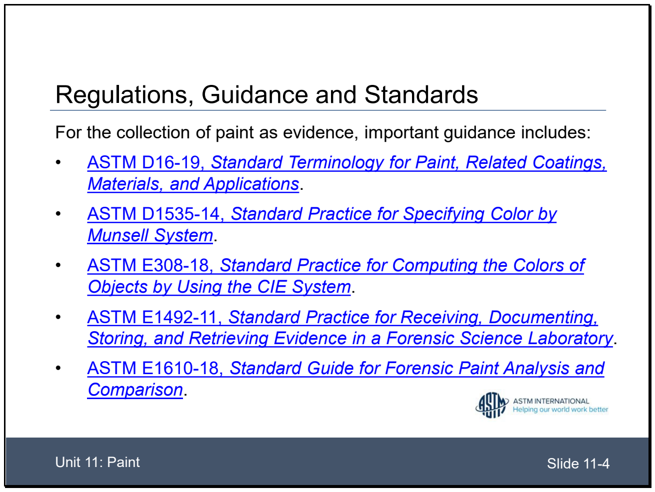


Key Information

After completing this unit, students will be able to:

- Identify paint as forensic evidence.
- Document toolmarks as forensic evidence.
- Collect paint as forensic evidence.
- Preserve paint as forensic evidence.

Slide 11-4: Regulations, Guidance and Standards



Key Information

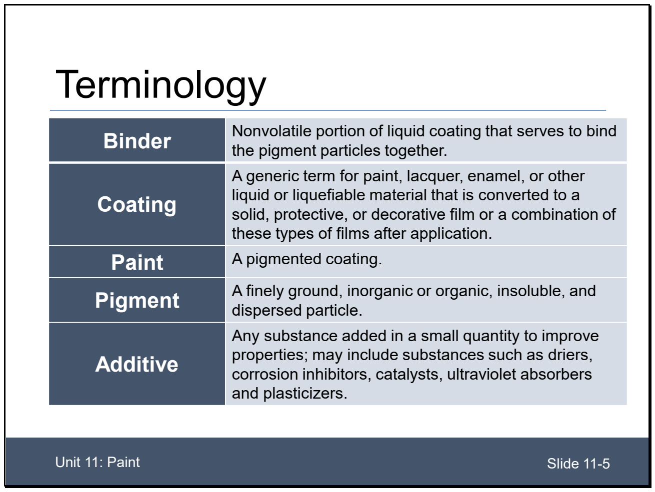
Forensic paint analysis usually involves comparing the differences between known and questioned samples.

Regulations, Guidance and Standards

For the collection of paint as evidence, important guidance includes:

- ASTM D16-19, *Standard Terminology for Paint, Related Coatings, Materials, and Applications*.
- ASTM D1535-14, *Standard Practice for Specifying Color by Munsell System*.
- ASTM E308-18, *Standard Practice for Computing the Colors of Objects by Using the CIE System*.
- ASTM E1492-11, *Standard Practice for Receiving, Documenting, Storing, and Retrieving Evidence in a Forensic Science Laboratory*.
- ASTM E1610-18, *Standard Guide for Forensic Paint Analysis and Comparison*.

Slide 11-5: Terminology



Key Information

Binder: nonvolatile portion of liquid coating that serves to bind the pigment particles together.

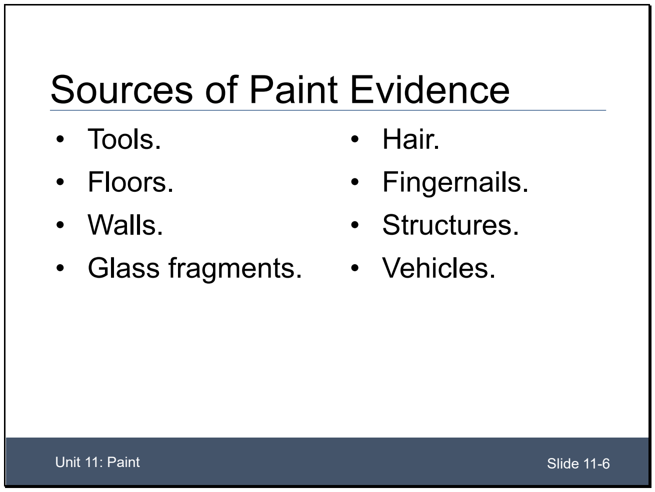
Coating: a generic term for paint, lacquer, enamel, or other liquid or liquefiable material that is converted to a solid, protective, or decorative film or a combination of these types of films after application.

Paint: commonly known as a pigmented coating.

Pigment: a finely ground, inorganic or organic, insoluble, and dispersed particle. Besides color, a pigment may provide many of the essential properties of paint such as opacity, hardness, durability and corrosion resistance. The term pigment includes extenders.

Additive (modifier): any substance added in a small quantity to improve properties. Additives may include substances such as driers, corrosion inhibitors, catalysts, ultraviolet absorbers and plasticizers.

Slide 11-6: Sources of Paint Evidence

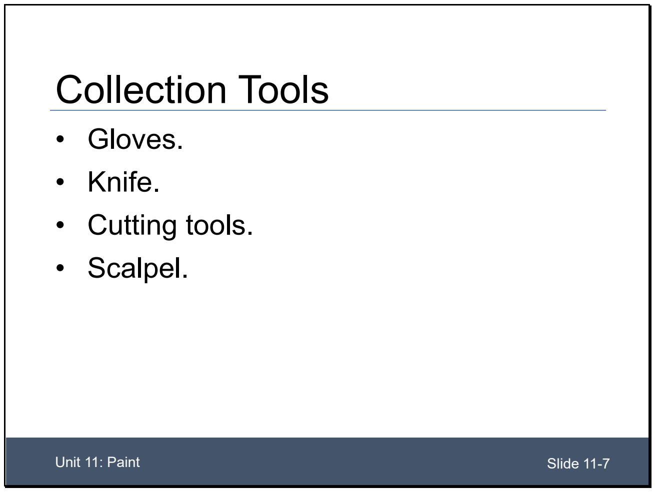


Key Information

When investigating a scene, common sources of paint evidence may include:

- Tools.
- Floors.
- Walls.
- Glass fragments.
- Hair.
- Fingernails.
- Structures.
- Vehicles.

Slide 11-7: Collection Tools

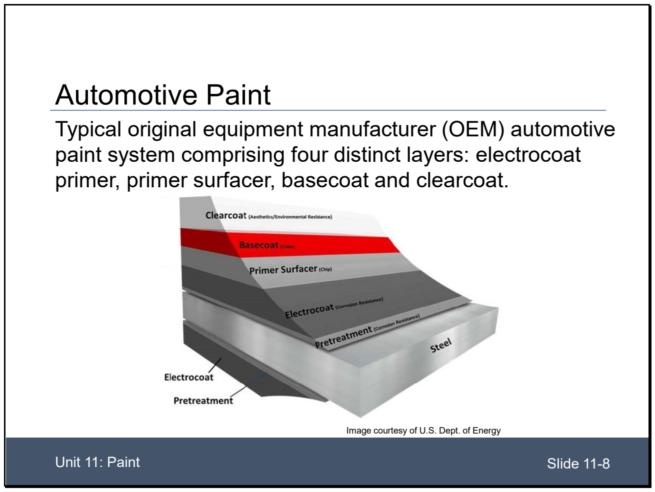


Key Information

The following items should be available at the crime scene to properly collect latent prints on paint:

- Gloves.
- Knife.
- Cutting tools.
- Scalpel.

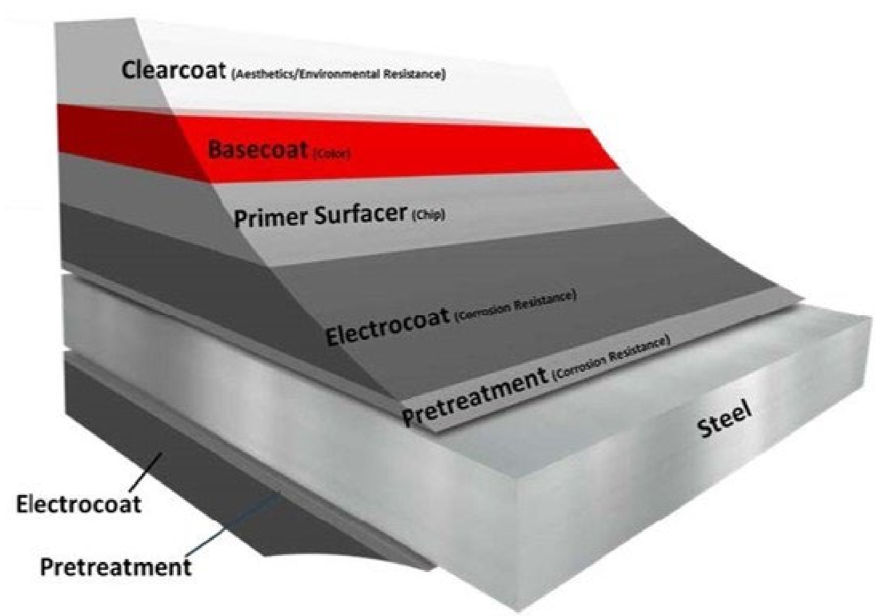
Slide 11-8: Automotive Paint



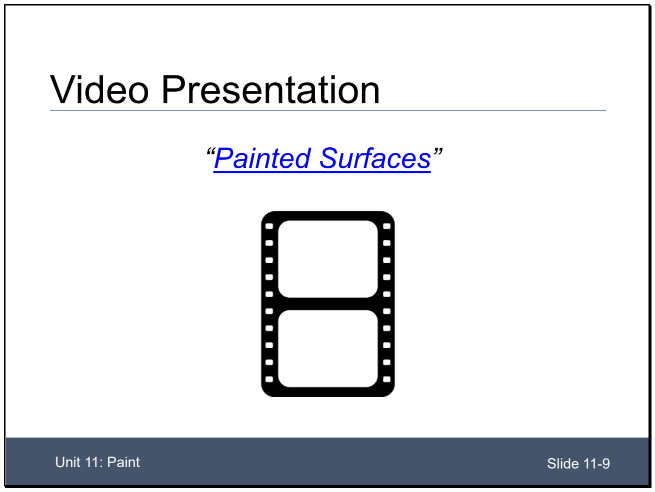
Key Information

The typical original equipment manufacturer (OEM) automotive paint system comprises four distinct layers:

- Electrocoat primer.
- Primer surfacer.
- Basecoat.
- Clearcoat.



Slide 11-9: Video Presentation



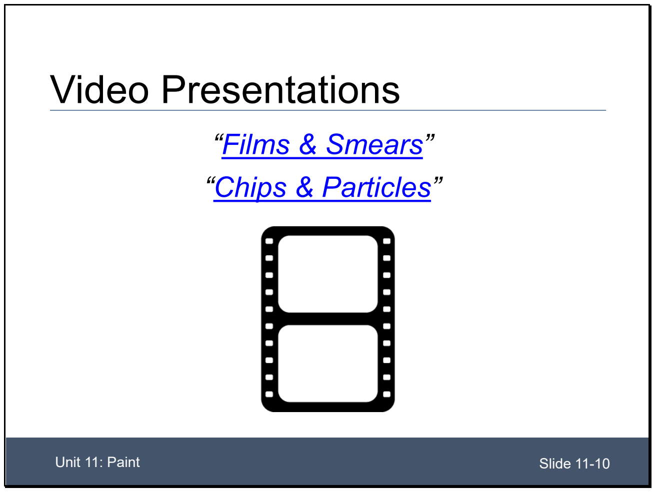
Key Information

Attempts should be made to remove samples manually. Do not use tape lift methods, as the adhesive may contaminate the paint sample. Tape can also make the sample more difficult for the analyst to manipulate.

The surface under the suspected sample should be collected and submitted to the laboratory; included in the collection should be a known sample adjacent or near the questioned sample.

For more information, visit "Painted Surfaces" section in the "International Association of Arson Investigators (IAAI) Fire Scene Evidence Collection Guide."

Slide 11-10: Video Presentations



Key Information

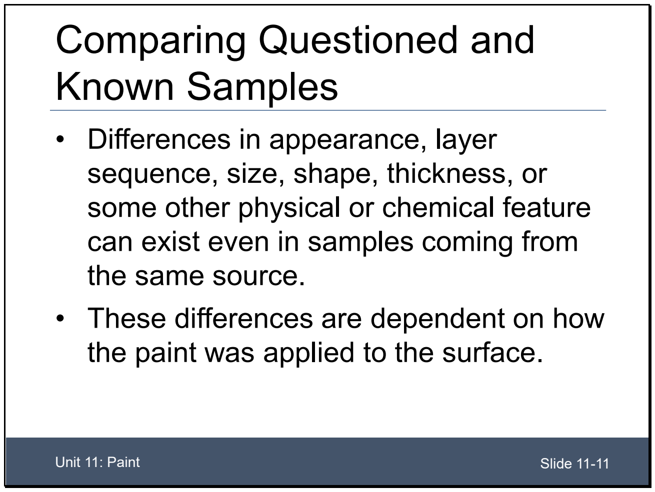
Smeared and abraded samples present challenges to the investigator because several layers are converged or mingled together. Collection of these samples should involve removing the entire substrate for analysis.

For loose flakes:

- Scrape with a clean blade.
- Lift or pry loosely attached samples into envelope.
- Scrape the blade at an angle to collect around and through the attached substrate.

For more information, visit “Films & Smears” and “Chips & Particles” sections in the “IAAI Fire Scene Evidence Collection Guide.”

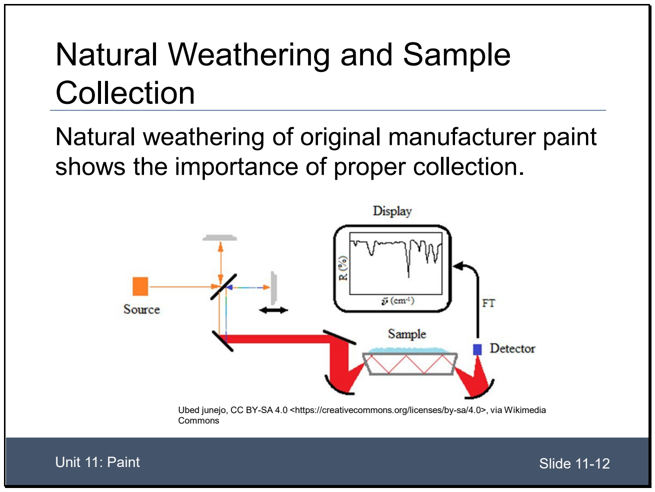
Slide 11-11: Comparing Questioned and Known Samples



Key Information

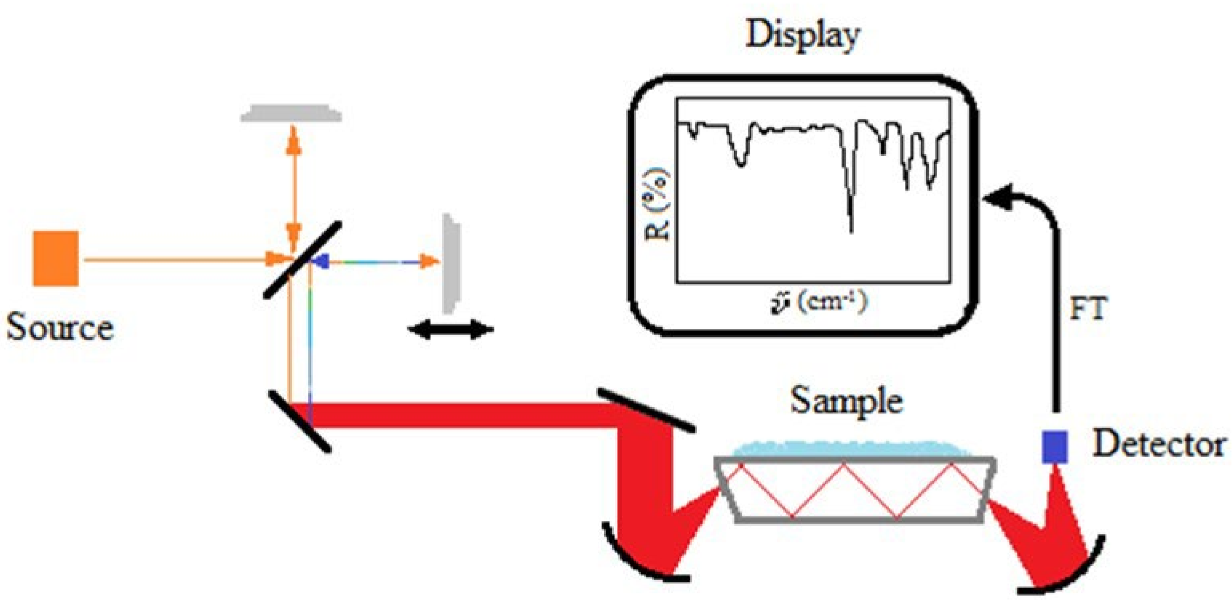
Differences in the appearance, layer sequence, size, shape, thickness, or some other physical or chemical features can exist even in samples coming from the same source. These differences are dependent on how the paint is applied to the surface. Curves, corners and edges are often impact points and may be subjected to previous damage, sanding or overpainting.

Slide 11-12: Natural Weathering and Sample Collection

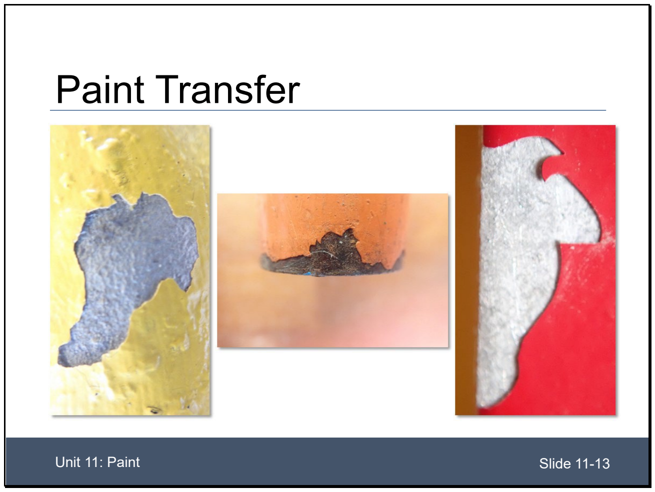


Key Information

Natural weathering of original manufacturer paint shows the importance of proper sample collection.



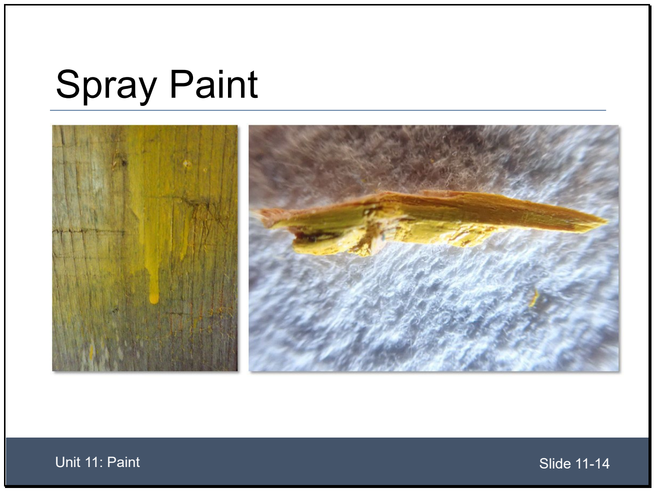
Slide 11-13: Paint Transfer



Key Information

These images are examples of paint being scraped away during crime.

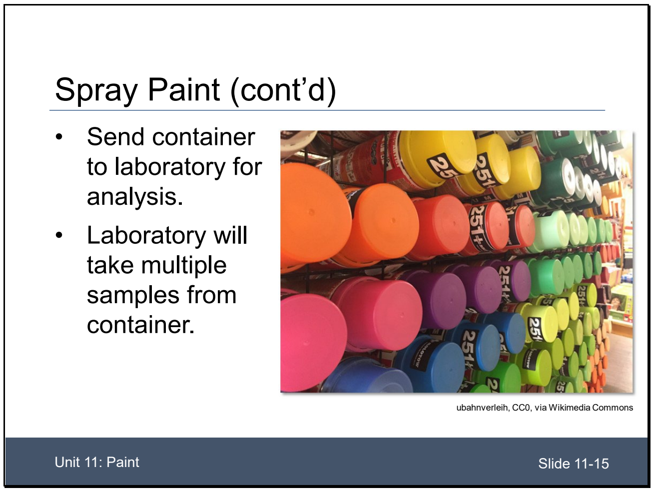
Slide 11-14: Spray Paint



Key Information

Spray paint is often used in cases of vandalism. A comparison of samples to paint found in a suspect’s residence can be conducted to determine a match.

Slide 11-15: Spray Paint (cont'd)



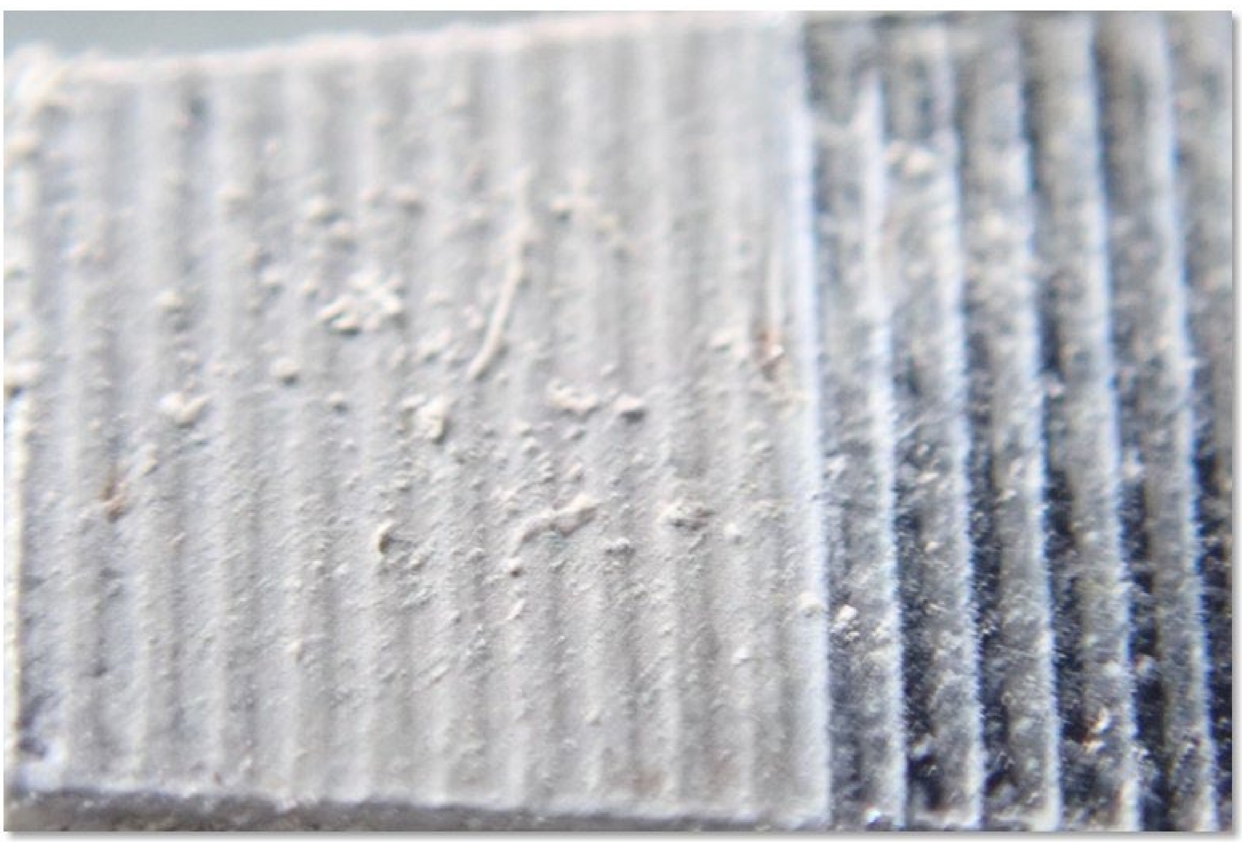
Key Information

Send the entire container to laboratory for analysis, not just the sample. The lab will take multiple samples from the container, shaking at different intervals to ensure different consistencies. The lab will take samples in a variety of ways to ensure the entire range of paint pigment possibilities are taken.

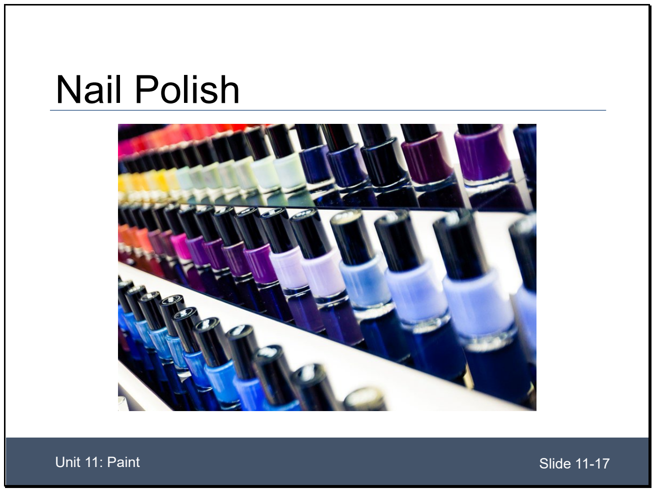
Slide 11-16: Paint Toolmarks

Key Information

When a tool is used during a crime, the paint found on the tool may be able to be matched to the surface/toolmark impression.

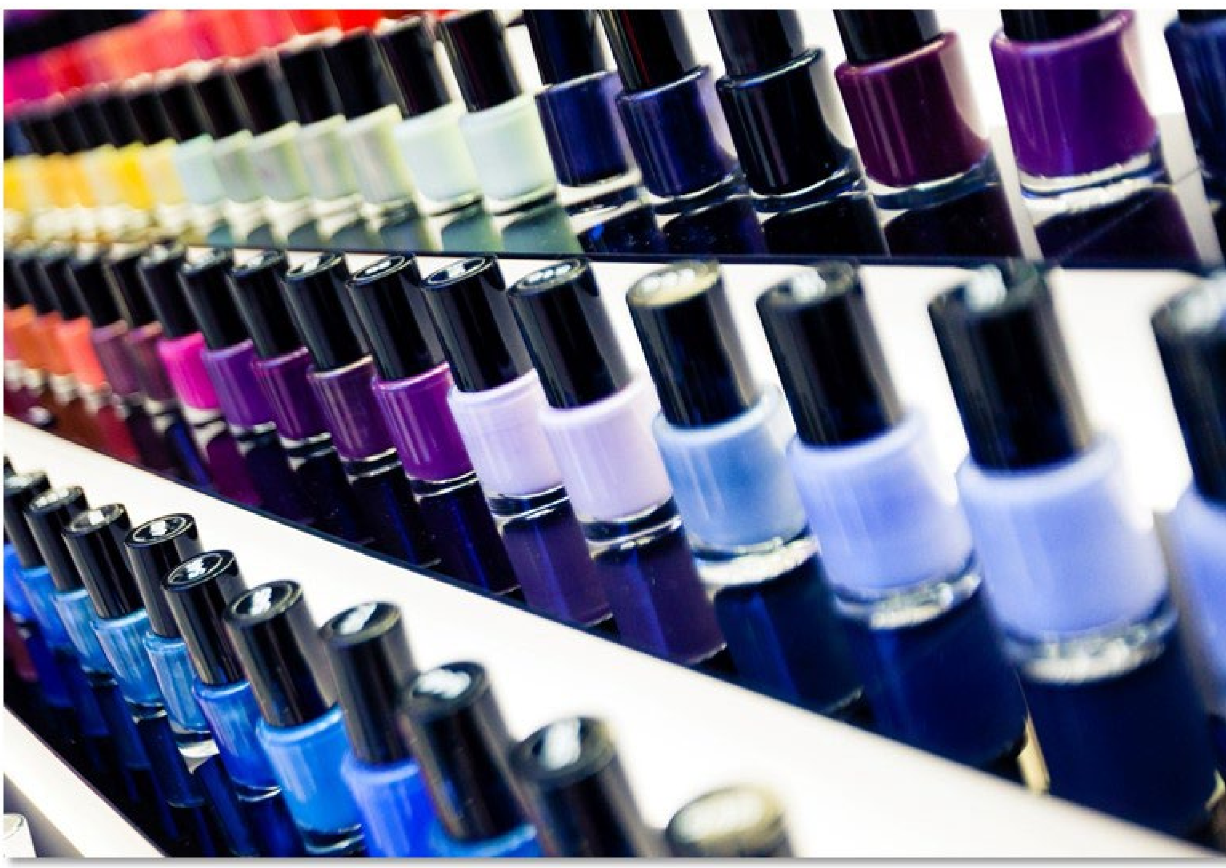


Slide 11-17: Nail Polish

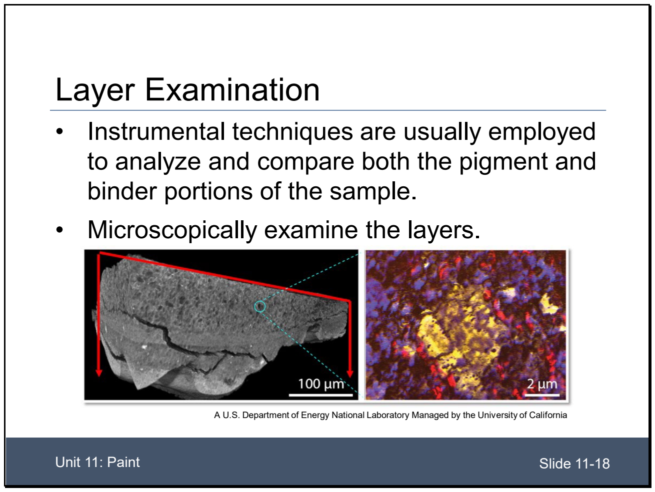


Key Information

In instances where an assailant or victim was wearing nail polish, the analysis of nail polish can be compared from the suspect to victim.

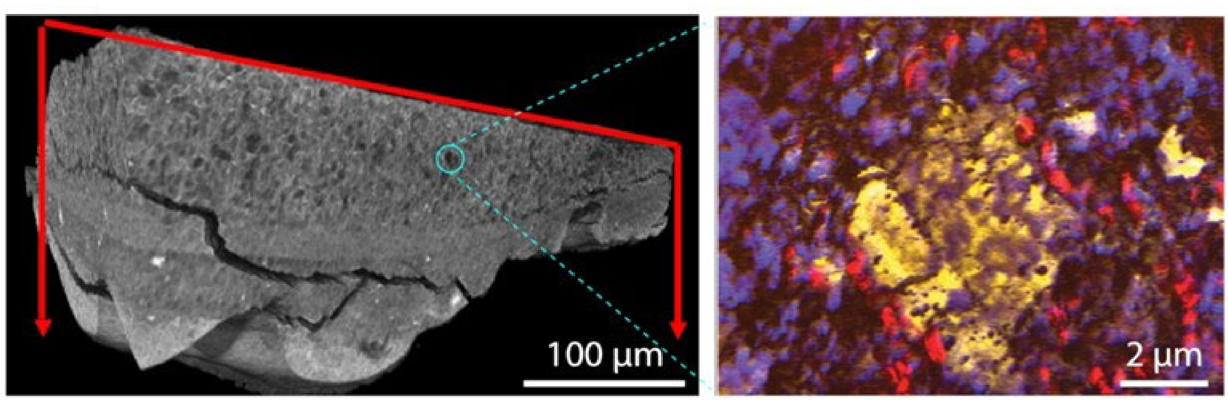


Slide 11-18: Layer Examination

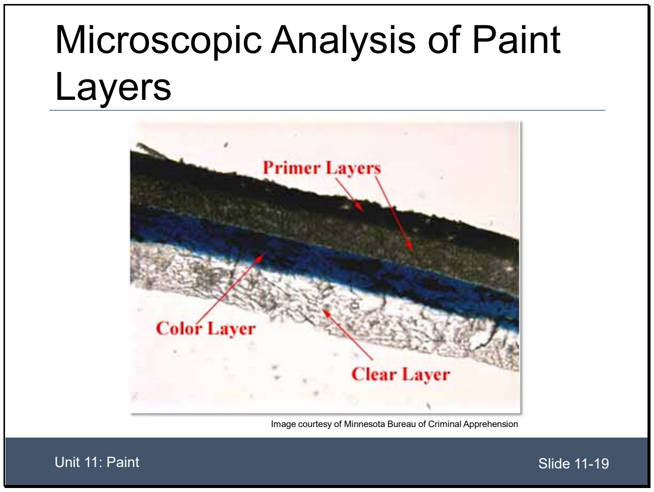


Key Information

Instrumental techniques should be employed to analyze and compare both the pigment and binder portions of a paint sample; microscopically examine the layers.



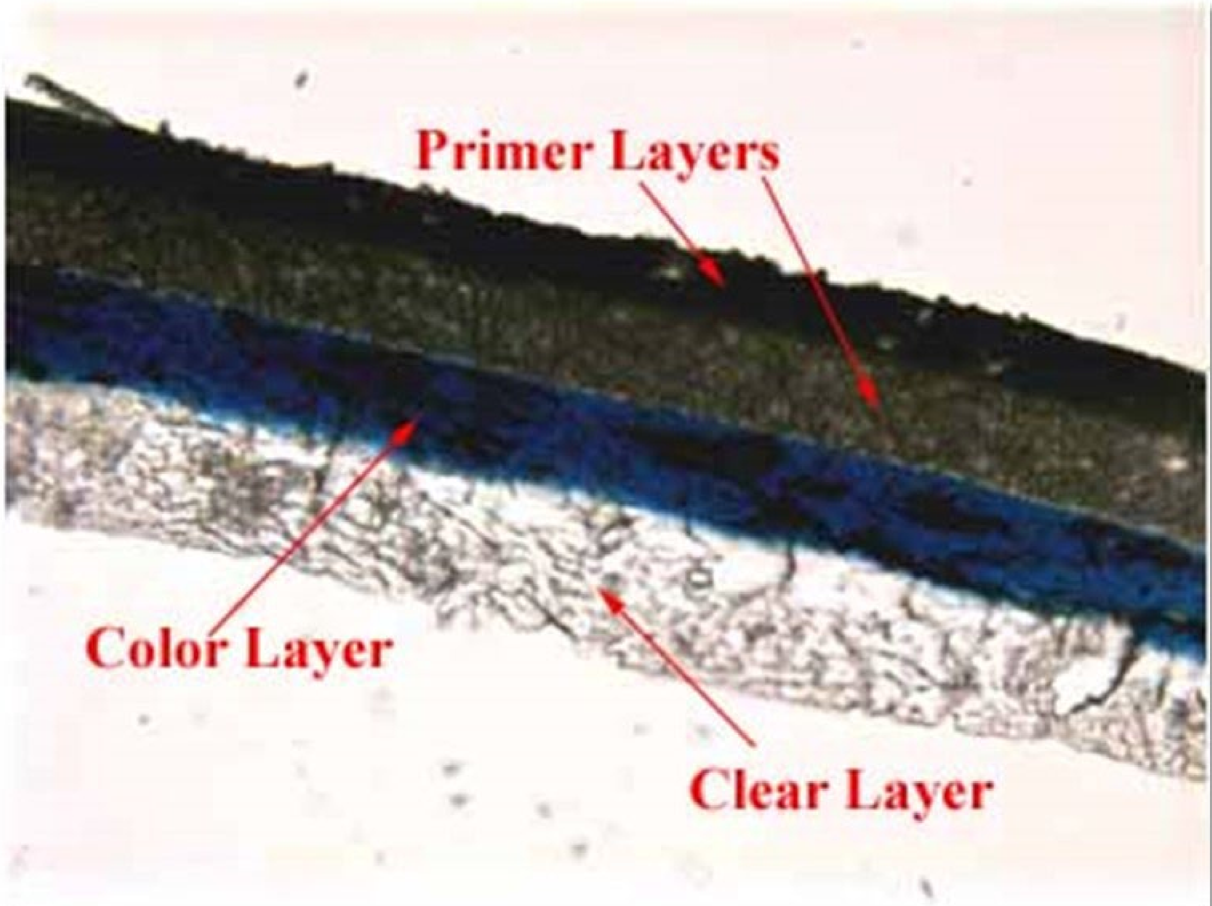
Slide 11-19: Microscopic Analysis of Paint Layers



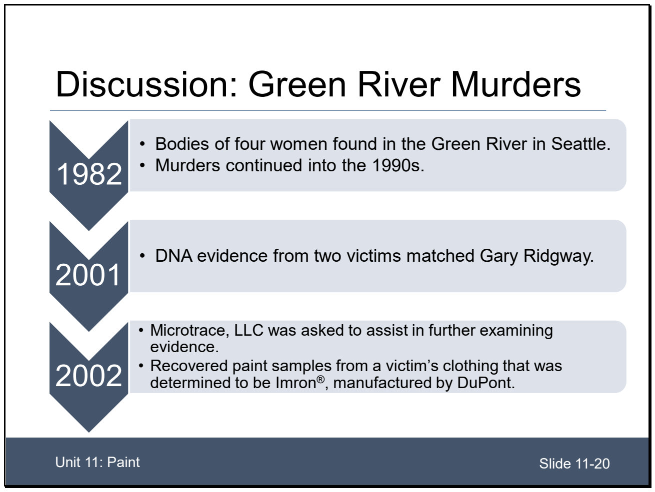
Key Information

Additional considerations for the examination and collection of paint evidence include:

- Comparison of layers of paint.
- **Infrared (IR) spectroscopy** may be used to obtain information about binders, pigments and additives used in various types of coating materials. An IR microscope accessory permits the analysis of a small sample or a small area of a sample.
- **Microspectrophotometry** color analysis has a long history in the pigment, paint, dyestuff and fabric industries and has led to numerous approaches to color measurement and description.


Primer Layers
Color Layer
Clear Layer

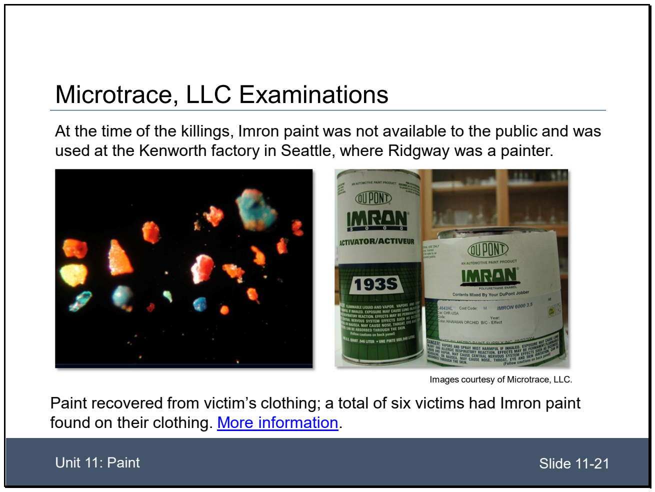
Slide 11-20: Discussion: Green River Murders



Key Information

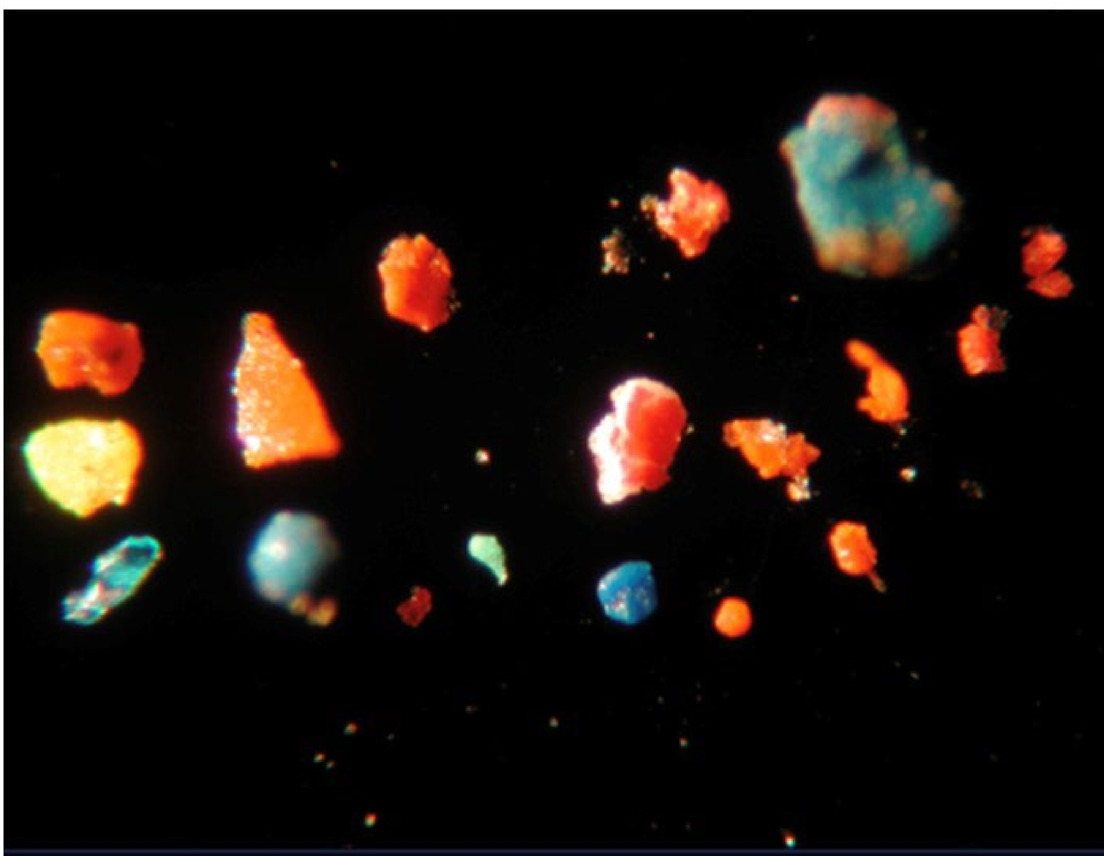
In September 1982, the bodies of four women were found in the Green River in Seattle. The murders continued into the 1990s. In 2001, DNA evidence from two victims was matched to Gary Ridgway. In 2002, Microtrace, LLC was asked to assist in further examining evidence from the case. Microtrace analyzed recovered paint samples from a victim's clothing that were determined to be Imron®, a product manufactured by DuPont.

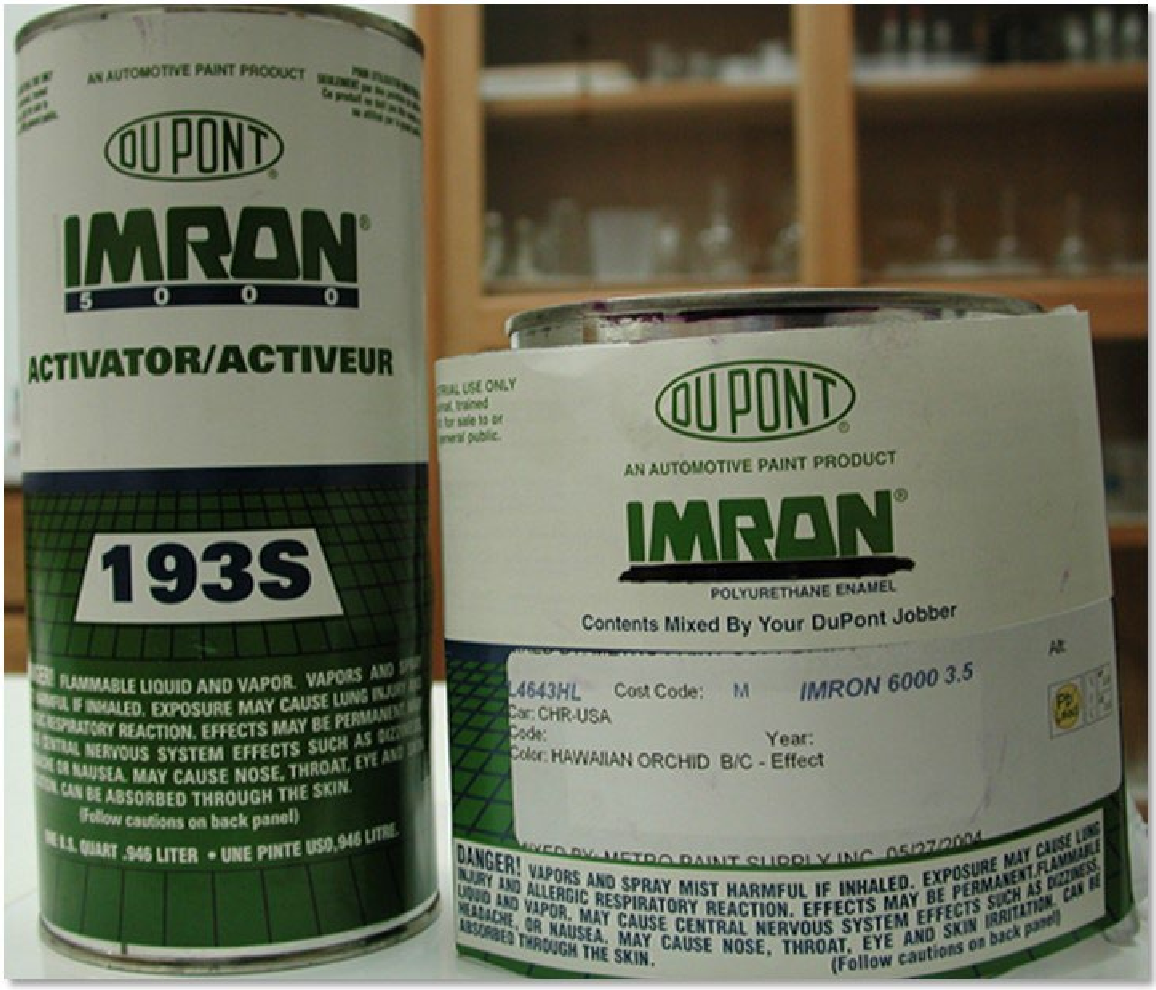
Slide 11-21: Microtrace, LLC Examinations



Key Information

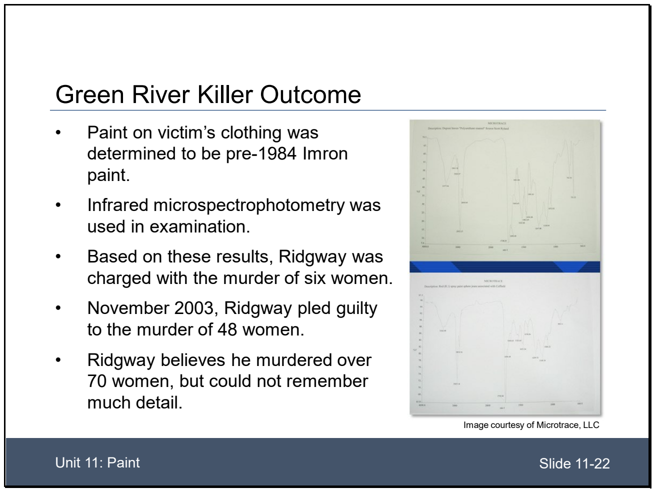
At the time of the killings, Imron paint was not available to the public and was used at the Kenworth factory in Seattle, where Ridgway was a painter. A total of six victims had Imron paint found on their clothing.





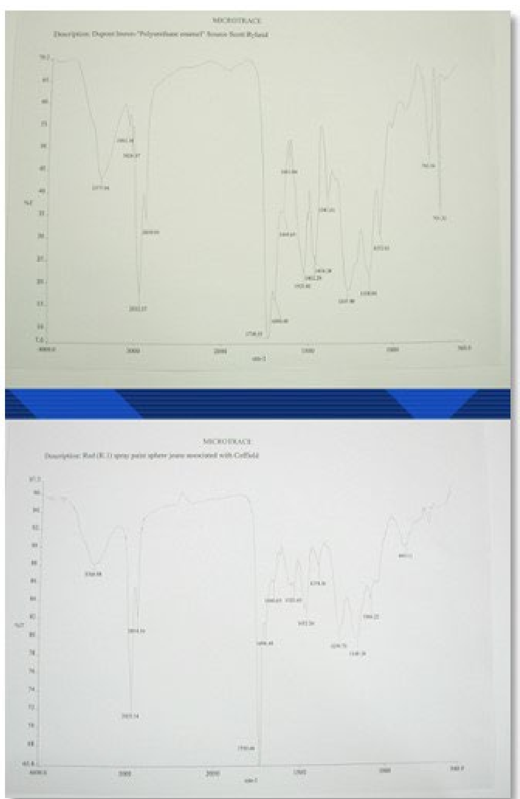
For detailed information about the case, review "[The Contributions of Chemical Microscopy to the Solution of the Green River Murders]."

Slide 11-22: Green River Killer Outcome

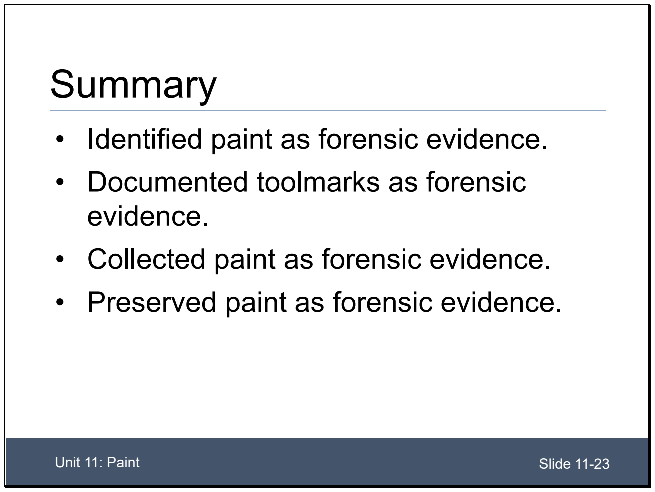


Key Information

Through IR microspectrophotometry analysis, the paint on the victims’ clothing was determined to be pre-1984 Imron paint. Based on these results, Ridgway was charged with the murder of those six women. In November 2003, Ridgway pled guilty to the murder of 48 women. Ridgway stated that he believed he murdered over 70 women but could not remember specific details to aid investigators.



Slide 11-23: Summary



Key Information

Students should now be able to:

- Identify paint as forensic evidence.
- Document toolmarks as forensic evidence.
- Collect paint as forensic evidence.
- Preserve paint as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 12: Questioned Documents

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Evaluate the proper collection processes for questioned documents in order to relate the significance of sample analysis by a laboratory.

Unit Enabling Learning Objectives (ELOs)

12.1 Identify questioned documents as forensic evidence.
12.2 Document questioned documents as forensic evidence.
12.3 Collect questioned documents as forensic evidence.
12.4 Preserve questioned documents as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Evaluate the proper collection processes for questioned documents in order to relate the significance of sample analysis by a laboratory.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify questioned documents as forensic evidence.	Class dialogue/ facilitated discussion	Final Exam
Document questioned documents as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Collect questioned documents as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Preserve questioned documents as forensic evidence.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	60 min.
Summary	5 min.

Audiovisual

Slides 12-1 to 12-29

Videos: “Charred and/or Wet Documents”
“Undamaged Documents”
“Indent or Impression on Paper”

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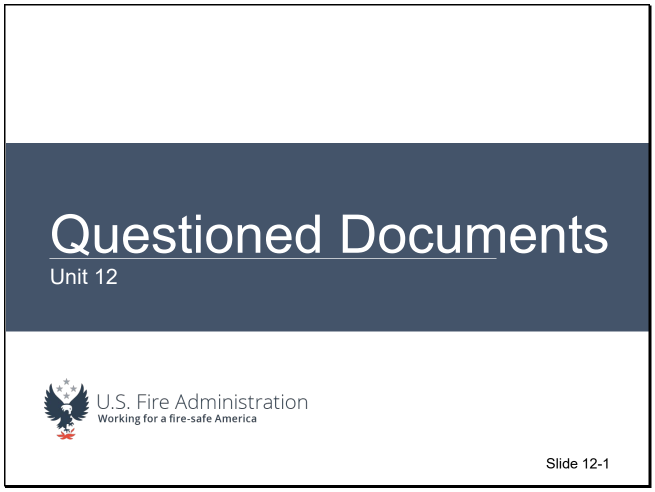
Slide 12-1: Questioned Documents

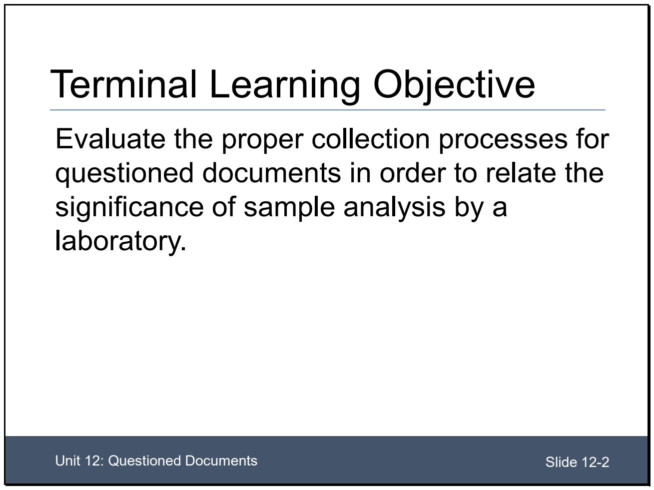


Key Information

Welcome to Unit 12: Questioned Documents!

A questioned document is defined as any signature, handwriting, typewriting or other mark whose source or authenticity is in dispute or doubtful. Examples include letters, checks, driver's licenses, contracts, wills, voter registrations, passports, petitions, threatening letters, suicide notes, lottery tickets, and marks on doors, walls, windows or boards (USLegal, n.d.). These documents can be tremendous assets to fire investigations and should be carefully documented, collected and packaged as evidence.

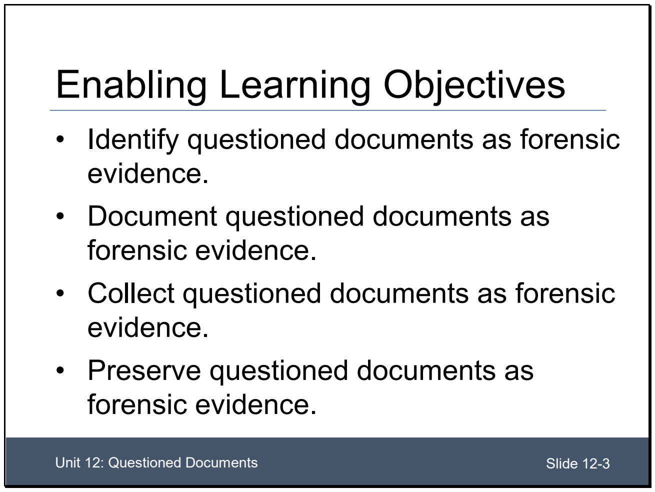
Slide 12-2: Terminal Learning Objective



Key Information

Evaluate the proper collection processes for questioned documents in order to relate the significance of sample analysis by a laboratory.

Slide 12-3: Enabling Learning Objectives



Key Information

After completing this unit, students will be able to:

- Identify questioned documents as forensic evidence.
- Document questioned documents as forensic evidence.
- Collect questioned documents as forensic evidence.
- Preserve questioned documents as forensic evidence.

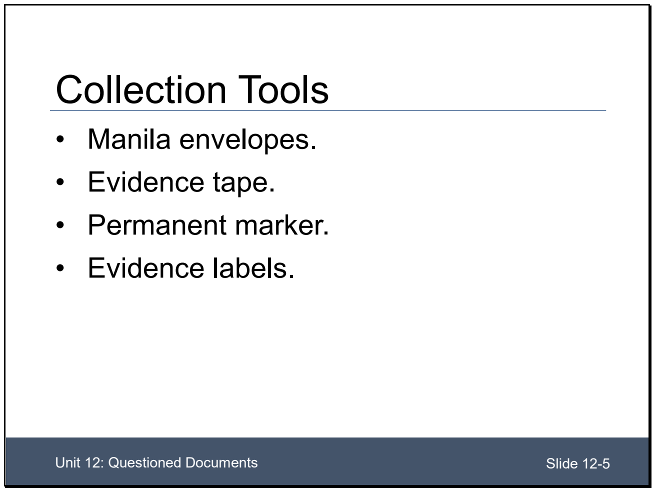
Slide 12-4: Regulations, Guidance and Standards

Key Information

Locating evidence that will directly tie a suspect to a crime scene can be difficult. Without an eyewitness, the investigation requires proof of the suspect being physically present. There are numerous direct ways to accomplish this; however, there are also indirect ways. The investigator's knowledge of documents of a criminal enterprise can assist the investigation.

- Florida Department of Law Enforcement (FDLE) "Crime Laboratory Evidence Submission Manual."
- Federal Bureau of Investigations (FBI) "Handbook of Forensic Services."
- Maryland State Police (MSP) Forensic Sciences Division "Guidelines for Submitting Physical Evidence."

Slide 12-5: Collection Tools

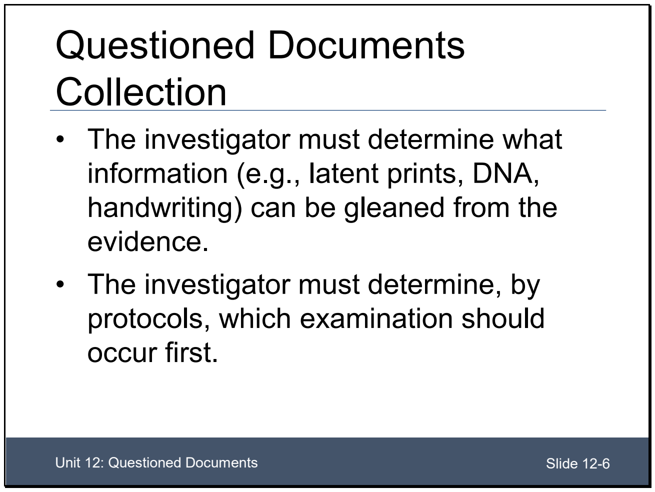


Key Information

The following items should be available at the crime scene to properly collect questioned documents:

- Manila envelopes (all sizes).
- Evidence tape.
- Permanent marker (black).
- Evidence labels.

Slide 12-6: Questioned Documents Collection

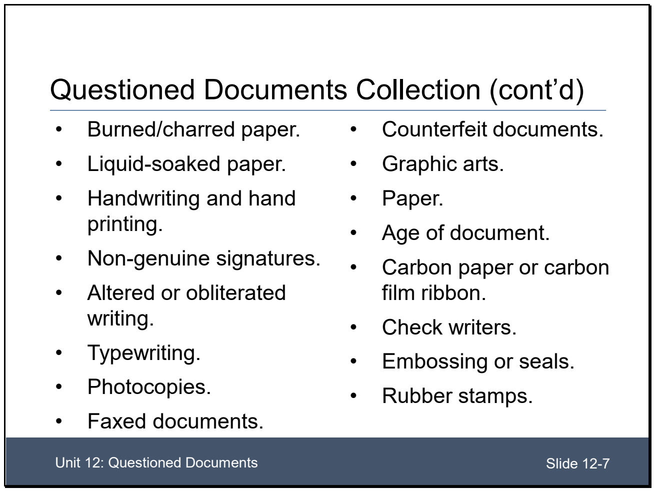


Key Information

Investigators should determine what information (e.g., latent prints, DNA, handwriting) can be gleaned from the evidence. Some examination processes can alter the collection of other evidence; therefore, the investigator should determine, by protocols, which examination should occur first. This will need to be completed on a case-by-case basis as it relates to the specific crime committed and the evidence involved.

An example of this would be a forged document in which the crime hinges on authenticating the document (as a forgery) and to whom the signature belongs. Areas such as DNA and latent prints are probably not useful in this situation. However, the specifics (i.e., time and place) of the crime committed will dictate whether the evidence is valuable.

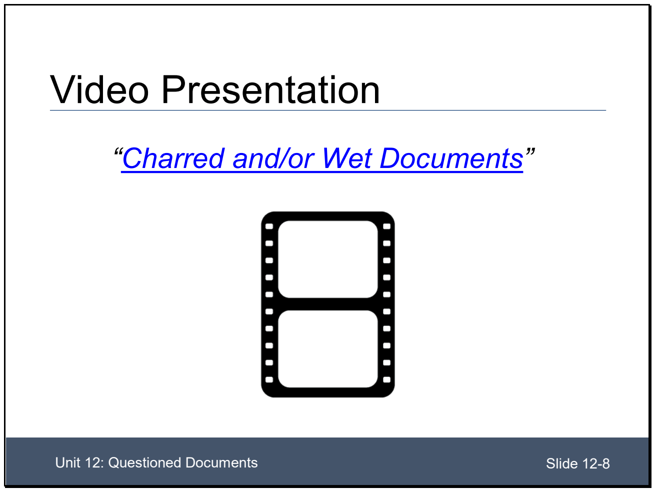
Slide 12-7: Questioned Documents Collection (cont’d)



Key Information

The following slides will discuss collection practices for various types of documents.

Slide 12-8: Video Presentation



Key Information

Charred Paper

Information on burned or charred documents can sometimes be deciphered. The document must be minimally handled and shipped in one of three methods:

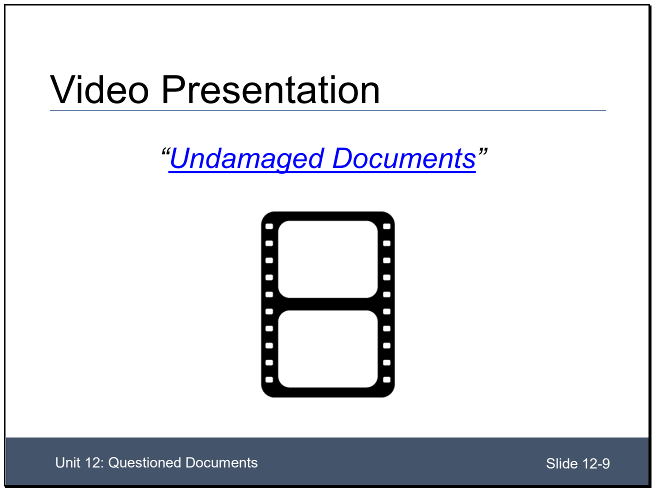
- In the container in which it was burned; this minimizes handling of the item and allows laboratory extraction for processing.
- In polyester film encapsulation.
- In a rigid container between layers of cotton.

Wet Paper

Similar to burned or charred paper, information on liquid-soaked documents may also be deciphered. This type of evidence should be minimally handled and air-dried before packaging. Depending on the size and shape of the document, either place it in a ridged container between layers of cotton or keep it flat in a paper envelope.

For more information, visit "Charred and/or Wet Documents" section in the "International Association of Arson Investigators (IAAI) Fire Scene Evidence Collection Guide."

Slide 12-9: Video Presentation



Key Information

What cannot be determined:

- Age.
- Gender.
- Personality.
- Intent.

What can sometimes be determined:

- Origination of the document (e.g., bank, insurance company, credit card company, etc.).
- Authenticity of the document (e.g., notary, witnessed signature, official institution).

Reasons for inconclusive results may include:

- Limited questioned and/or known writing.
- Lack of contemporaneous writing or lapse of time between execution of questioned and known writing.
- Distortion or disguise in the questioned and/or known writing.
- Lack of sufficient identifying characteristics.
- Submission of photocopied evidence instead of original evidence.
- Submission of chemically processed evidence.

If there is a document in question, comparison samples are critical. The document questioned can only provide a certain amount of information. Having other known samples (e.g., subject's writing, signature, notes, etc.) will be important for comparison.

For more information, visit "Undamaged Documents" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 12-10: Obtaining Known Writing Samples

Obtaining Known Writing Samples

- The text, size of paper, space available for writing, writing instrument and writing style must be as close to the original writing as possible.
- Give verbal or typewritten instructions concerning the text to be written; do not give instructions on spelling, punctuation or arrangement of writing.
- All exemplars must be on separate pieces of paper, and the writer and witness must initial and date each page of writing.

Unit 12: Questioned Documents Slide 12-10

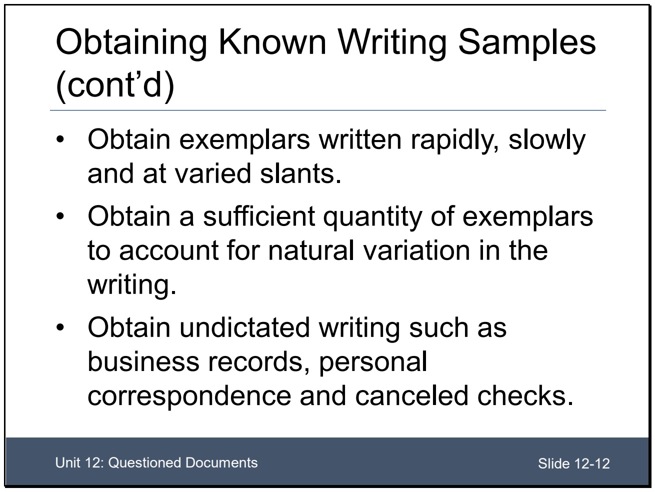
Slide 12-11: Obtaining Known Writing Samples (cont'd)

Obtaining Known Writing Samples (cont'd)

- Do not allow the writer to see the previous exemplars or the questioned writing; remove exemplars from the writer's sight as soon as complete.
- Obtain exemplars from dictation until normal writing has been produced; normal handwriting is assessed by determining whether the writing is too quickly or slowly executed and whether the handwriting is consistent.
- Obtain exemplars from the right and left hand, as well as in uppercase and lowercase letters.

Unit 12: Questioned Documents Slide 12-11

Slide 12-12: Obtaining Known Writing Samples (cont’d)



Key Information

According to the FBI “Handbook of Forensic Services” (2019), best practices for obtaining known writing samples include:

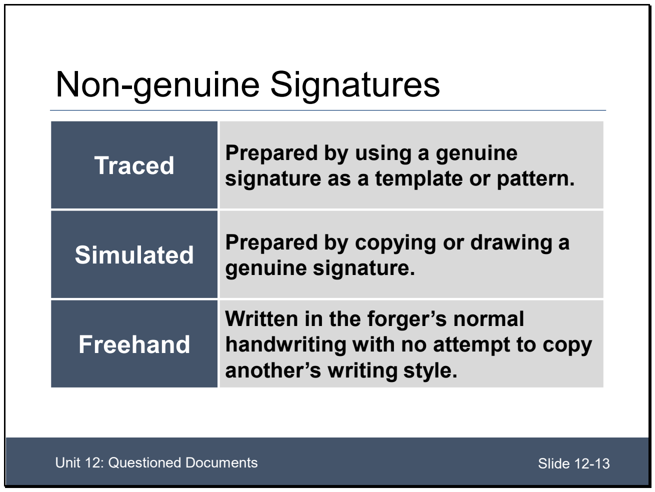
- The text, size of paper, space available for writing, writing instrument and writing style must be as close to the original writing as possible.
- Provide verbal or typewritten instructions concerning the text to be written. Do not give instructions on spelling, punctuation or arrangement of writing.
- All exemplars must be on separate pieces of paper, and the writer and witness must initial and date each page of writing.
- Do not allow the writer to see the previous exemplars or the questioned writing. Remove exemplars from the writer’s sight as soon as complete.
- Obtain exemplars from dictation until normal writing has been produced. Normal handwriting is assessed by determining whether the writing is too quickly or slowly executed and whether the handwriting is consistent.
- Obtain exemplars from the right and left hand, as well as in uppercase and lowercase letters.
- Obtain exemplars written rapidly, slowly and at varied slants.
- Obtain a sufficient quantity of exemplars to account for natural variation in the writing.

- Obtain undictated writing such as business records, personal correspondence and canceled checks.

There are legal concerns with getting handwriting samples from a suspect or person of interest. In such instances, consult with legal counsel before starting the process. Some examples of how to obtain samples legally include:

- Government documents (e.g., driver's license, marriage license).
- Statement forms.
- Trash collection.

Slide 12-13: Non-genuine Signatures

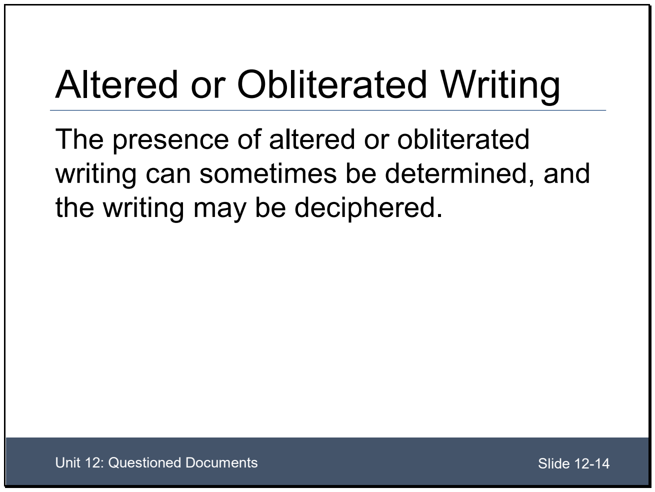


Key Information

Types of non-genuine signatures include:

- **Traced signatures:** prepared by using a genuine signature as a template or pattern.
- **Simulated signatures:** prepared by copying or drawing a genuine signature.
- **Freehand signatures:** written in the forger's normal handwriting with no attempt to copy another's writing style.

Slide 12-14: Altered or Obliterated Writing



Key Information

The presence of altered or obliterated writing can sometimes be determined, and the writing may be deciphered.

Slide 12-15: Typewriting

Typewriting

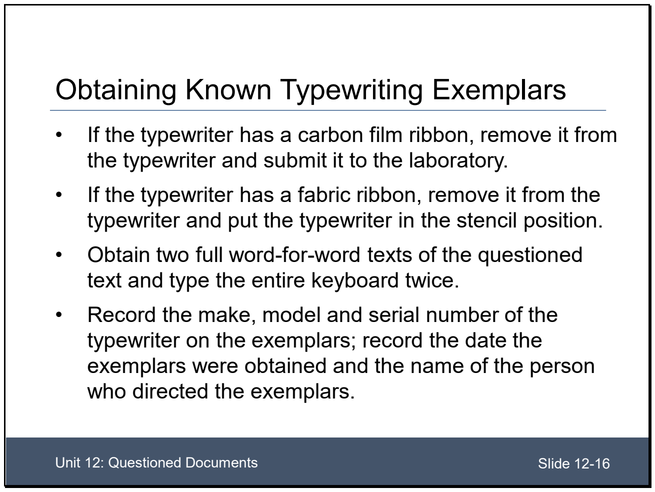
- Questioned typewriting can occasionally be identified with the typewriter that produced it.
- Comparison of questioned typewriting with reference standards can sometimes determine a possible make and model of the typewriter and/or the typewriter elements.

Unit 12: Questioned Documents Slide 12-15

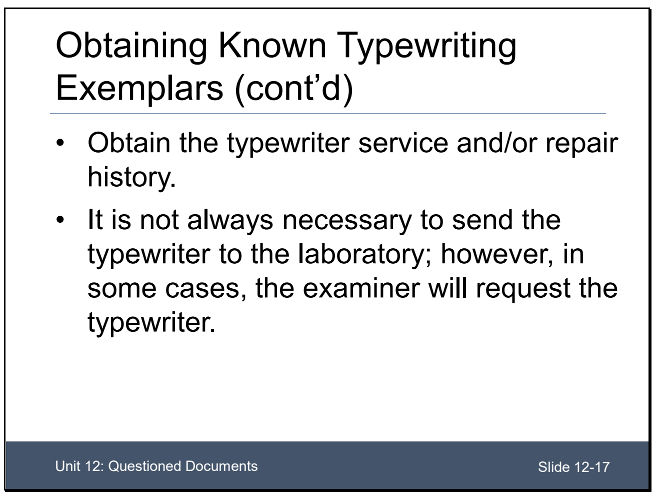
Key Information

Questioned typewriting can occasionally be identified with the typewriter that produced it through unique characteristics created during the manufacturing process, as well as through regular use and abuse. Comparison of questioned typewriting with reference standards can sometimes determine a possible make and model of the typewriter and/or the typewriter elements (FBI, 2019).

Slide 12-16: Obtaining Known Typewriting Exemplars



Slide 12-17: Obtaining Known Typewriting Exemplars (cont’d)



Key Information

According to the FBI “Handbook of Forensic Services” (2019), the following are procedures for obtaining known typewriting exemplars.

- If the typewriter has a carbon film ribbon, remove it from the typewriter and submit it to the laboratory.
  - Carbon film ribbons can sometimes be read for content or specific wording and can sometimes be identified with questioned typewritten impressions.

  - Submit the correction tape.

  - Insert a new ribbon in the typewriter prior to obtaining exemplars.

- If the typewriter has a fabric ribbon, remove it from the typewriter and put the typewriter in the stencil position.

  - Place a sheet of carbon paper over a sheet of blank paper and insert both into the typewriter.

  - Allow the typeface to strike the carbon paper.

  - Submit the fabric ribbon strike and the carbon paper strike exemplars to the laboratory.

  - Fabric ribbons cannot be read.

- Obtain two full word-for-word texts of the questioned text and type the entire keyboard (all symbols, numbers, and uppercase and lowercase letters) twice.

- Record the make, model and serial number of the typewriter on the exemplars. Record the date the exemplars were obtained and the name of the person who directed the exemplars.

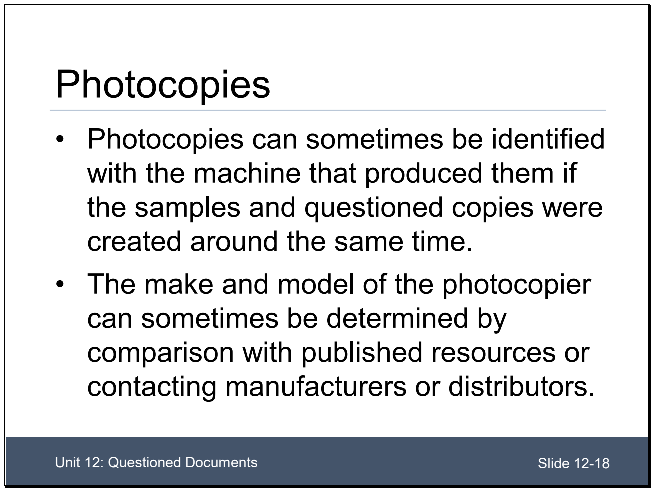
- Obtain the typewriter service and/or repair history.

- It is not always necessary to send the typewriter to the laboratory; however, in some cases, the examiner will request the typewriter.

  - It must be packed securely to prevent damage during shipment.

  - Typewriter elements (e.g., ball, printwheel or thimble) must also be submitted to the laboratory.

Slide 12-18: Photocopies



Key Information

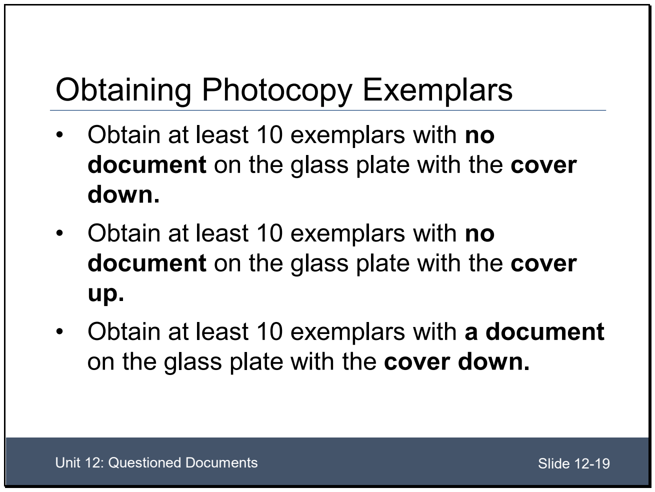
Photocopies can sometimes be identified with the machine that produced them if the samples and questioned copies were created around the same time. The make and model of the copier or printer can sometimes be determined by comparison with published resources or contacting manufacturers or distributors (FBI, 2019).

Modern technology has greatly reduced the need for photocopies (e.g., email, PDFs, etc.). These new technologies, such as mobile scanning apps, present new challenges for identifying information that connects a document or file to its source. An internet protocol (IP) address may be used to identify the source or examine the memory of the individual machine.

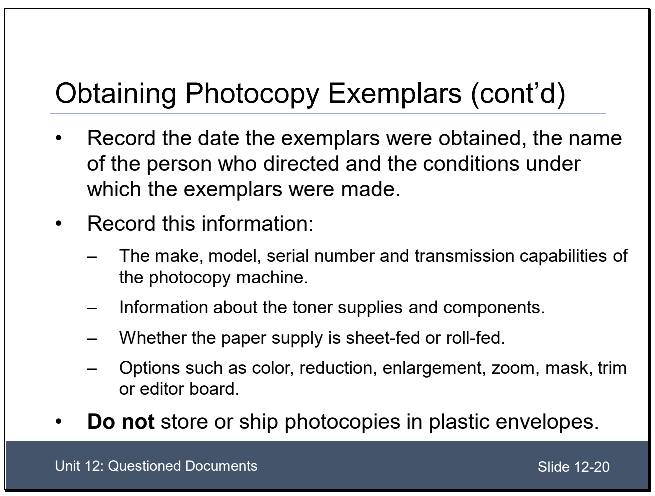
Investigators need to determine how the photocopy or copy was made, such as:

- Through traditional means of using a copier or printer.
- Using a copier or printer to scan and send an item to a computer via an IP address and internet or local connection.
- Using a computer or other electronic device (e.g., desktop, smartphone, tablet, etc.) to send a document to a copier or printer through Wi-Fi or Bluetooth.

Slide 12-19: Obtaining Photocopy Exemplars



Slide 12-20: Obtaining Photocopy Exemplars (cont'd)



Key Information

Guidelines for obtaining known photocopy exemplars include:

- Obtain at least 10 exemplars with **no document** on the glass plate with the **cover down.**

- Obtain at least 10 exemplars with **no document** on the glass plate with the **cover up.**

- Obtain at least 10 exemplars with **a document** on the glass plate with the **cover down.**

- Record the date the exemplars were obtained, the name of the person who directed and the conditions under which the exemplars were made.

- Record this information:

  - The make, model, serial number and transmission capabilities of the photocopy machine.

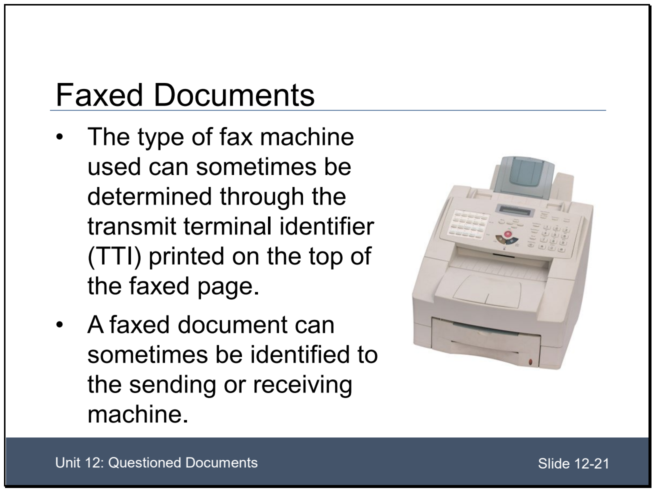
  - Information about the toner supplies and components.

  - Whether the paper supply is sheet-fed or roll-fed.

  - Options such as color, reduction, enlargement, zoom, mask, trim or editor board.

- **Do not** store or ship photocopies in plastic envelopes.

Slide 12-21: Faxed Documents

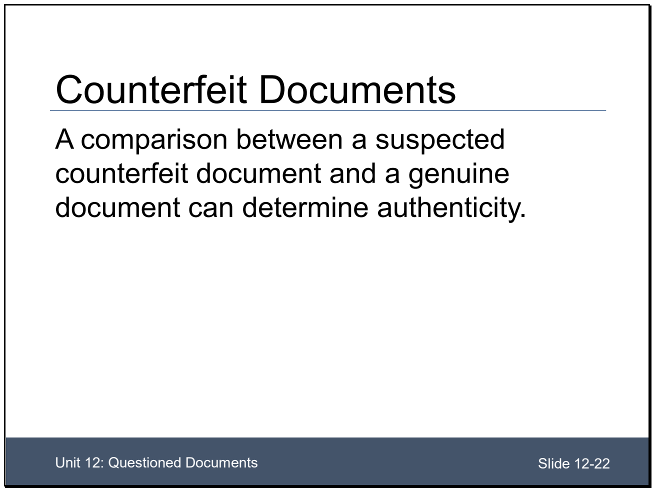


Key Information

The type of machine used to fax a document can sometimes be determined through the transmit terminal identifier (TTI) printed on the top of the faxed page. A faxed document can sometimes be identified to the sending or receiving machine.

Investigators should follow the same procedures as previously discussed for a photocopy.

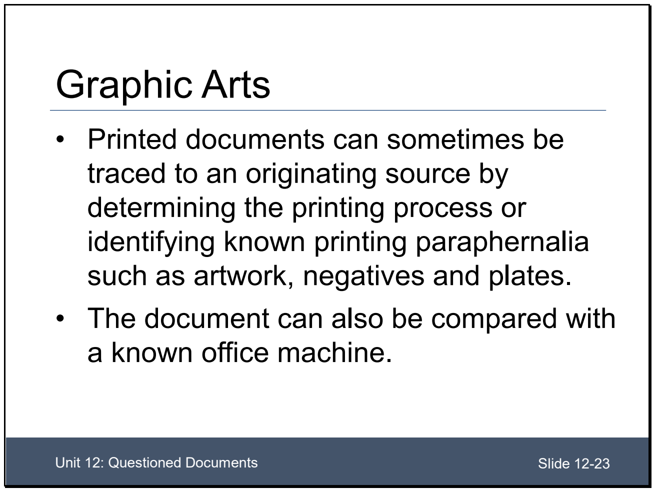
Slide 12-22: Counterfeit Documents



Key Information

Counterfeit documents can sometimes be determined by comparing them to a genuine document.

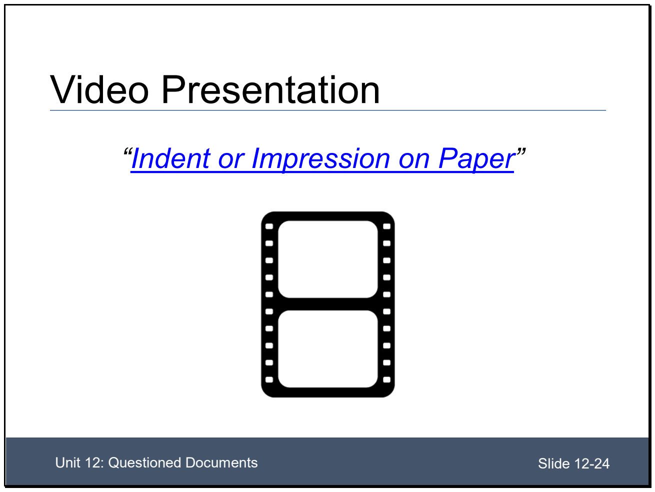
Slide 12-23: Graphic Arts



Key Information

Printed documents can sometimes be traced to an originating source by determining the printing process or identifying with known printing paraphernalia such as artwork, negatives and plates. The document can also be compared with a known office machine.

Slide 12-24: Video Presentation



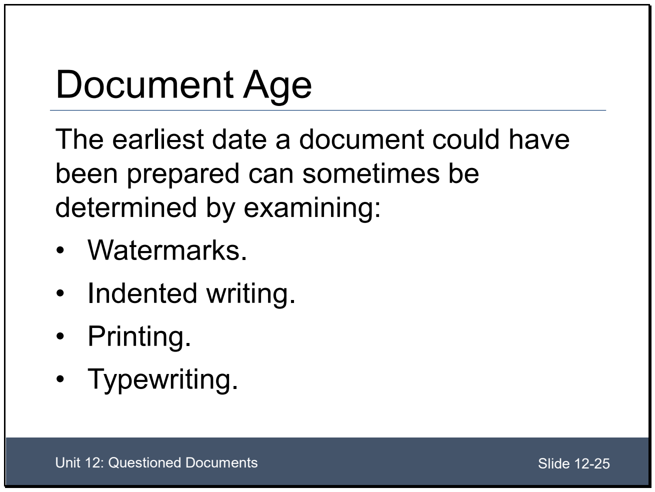
Key Information

The manufacturer can sometimes be determined if a watermark is present. Paper can also be examined for indented writing if not chemically processed.

- **Do not** rub the indentations with a pencil.
- **Do not** add extraneous indentations by writing on top of the evidence.
- **Do not** request a biological examination on paper items when indented writing may be the more probative evidence (FBI, 2019).

For more information, visit "Indent or Impression on Paper" section in the "IAAI Fire Scene Evidence Collection Guide."

Slide 12-25: Document Age

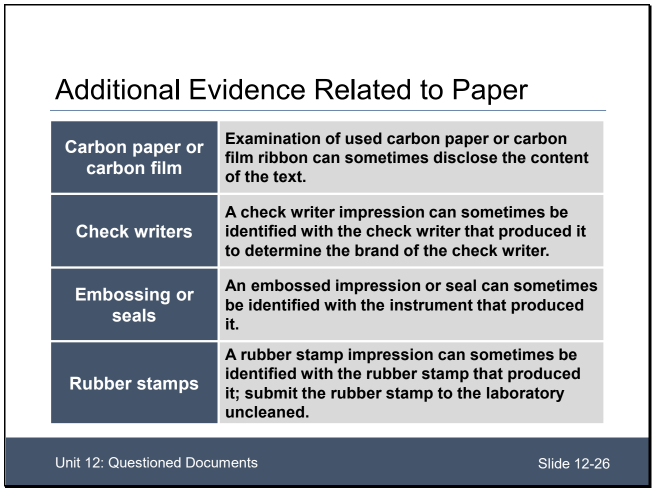


Key Information

The earliest date a document could have been prepared can sometimes be determined by examining:

- Watermarks.
- Indented writing.
- Printing.
- Typewriting.

Slide 12-26: Additional Evidence Related to Paper



Key Information

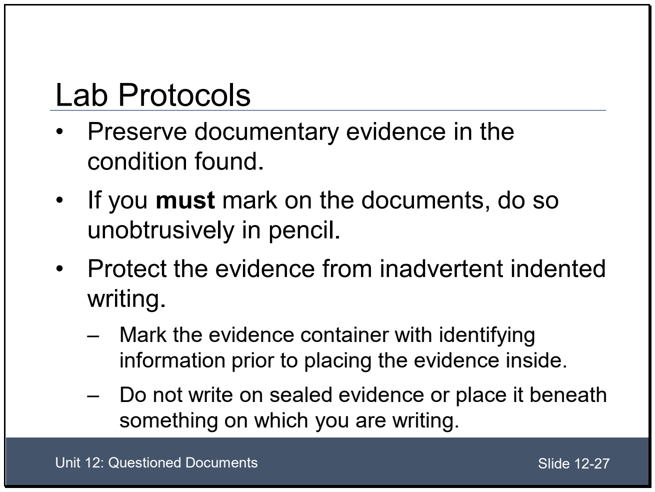
- An examination of used **carbon paper or carbon film ribbon** can sometimes disclose the content of the text.

- A **check writer** impression can sometimes be identified with the check writer that produced it to determine the brand of the check writer.

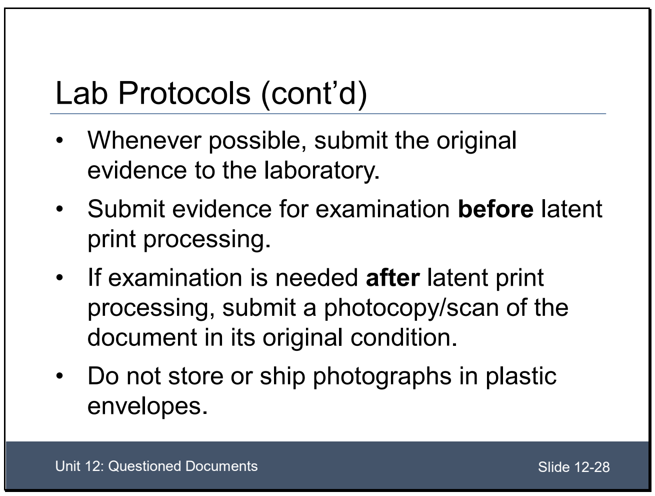
- An **embossed impression or seal** can sometimes be identified with the instrument that produced it.

- A **rubber stamp** impression can sometimes be identified with the rubber stamp that produced it. Submit the rubber stamp to the laboratory uncleaned.

Slide 12-27: Lab Protocols



Slide 12-28: Lab Protocols (cont'd)



Key Information

Preserve documentary evidence in the condition in which it was found. Evidence must not be folded, torn, marked, soiled, stamped, written on, hole-punched or handled unnecessarily. If you need to mark on the documents, do so unobtrusively by writing the information in pencil.

Protect the evidence from inadvertent indented writing.

- Whenever possible, mark the evidence container with identifying information prior to placing the evidence inside.

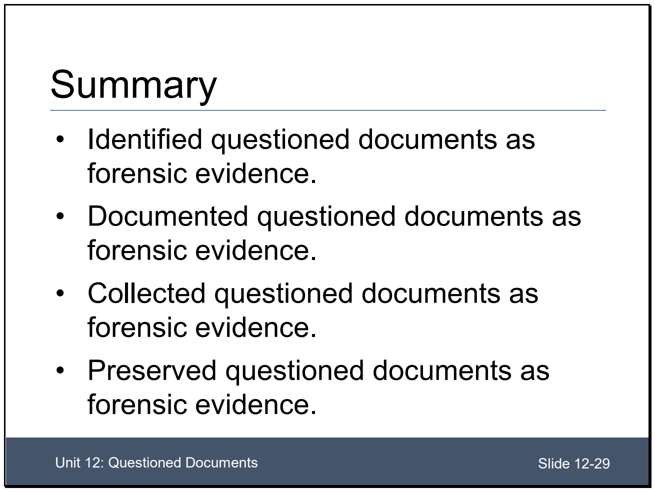
- Do not write on sealed evidence or place it beneath something on which you are writing.

- Whenever possible, submit the original evidence to the laboratory; lack of detail in photocopies makes the examination difficult.

- **Do not process the documents for fingerprints prior to a document examination.** Submit evidence for examination before latent print processing. If examination is needed after latent print processing, please submit a photocopy or scan of the document in its original condition before it was processed.

- Do not store or ship photographs in plastic envelopes.

Slide 12-29: Summary



Key Information

Students should now be able to:

- Identify questioned documents as forensic evidence.
- Document questioned documents as forensic evidence.
- Collect questioned documents as forensic evidence.
- Preserve questioned documents as forensic evidence.

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 13: Explosives

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Organize post-blast and explosive evidence for identification and processing by a laboratory.

Unit Enabling Learning Objectives (ELOs)

13.1 Identify explosives as forensic evidence.
13.2 Document explosives as forensic evidence.
13.3 Collect explosives as forensic evidence.
13.4 Preserve explosives as forensic evidence.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Organize post-blast and explosive evidence for identification and processing by a laboratory.	Practicum Part I: Crime Scene Investigation/Final Exam

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Identify explosives as forensic evidence.	Class dialogue/ facilitated discussion	Final Exam
Document explosives as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 13.1	Practicum Part I: Crime Scene Investigation
Collect explosives as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 13.1	Practicum Part I: Crime Scene Investigation
Preserve explosives as forensic evidence.	Class dialogue/ facilitated discussion/ Activity 13.1	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Lesson	90 min.
Activity 13.1: Explosives: Collection	75 min.
Summary	5 min.

Audiovisual

Slides 13-1 to 13-68

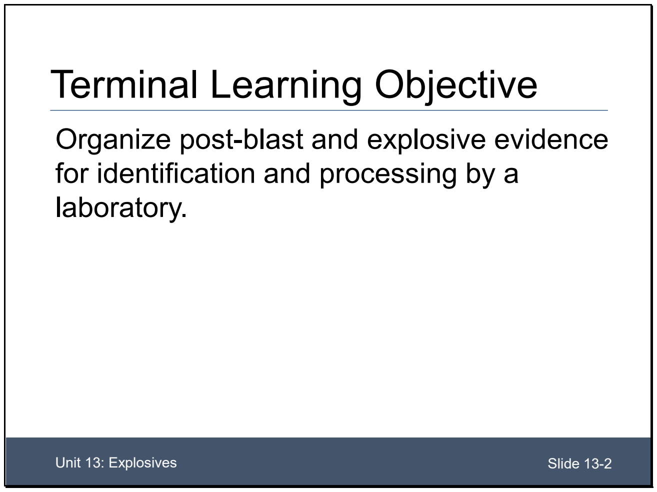
Videos:
“New Footage of Boston Bombing Blast Shown in Court”
“CAPECO Oil Depot, Puerto Rico (Video 1)”
“CAPECO Oil Depot, Puerto Rico (Video 2)”
“Video of Steam Boiler Explosion.wmv”
“Texas Fertilizer Plant Explosion Caught on Video”
“Bombing of Sandy Springs Documentary”

Slide 13-1: Explosives

Key Information

Welcome to Unit 13: Explosives!

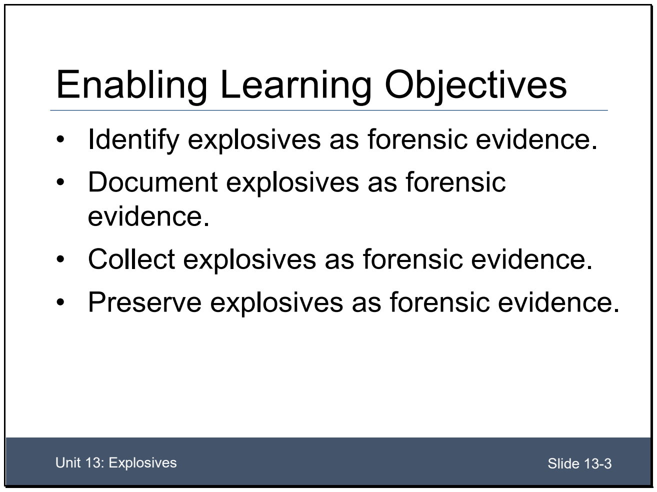
Slide 13-2: Terminal Learning Objective



Key Information

Organize post-blast and explosive evidence for identification and processing by a laboratory.

Slide 13-3: Enabling Learning Objectives

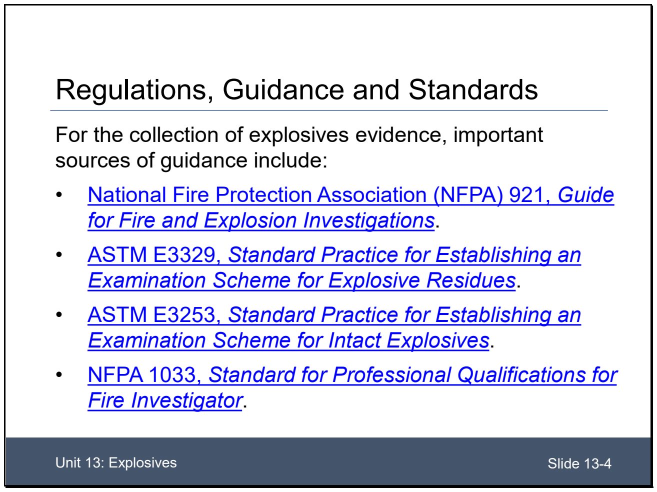


Key Information

After completing this unit, students will be able to:

- Identify explosives as forensic evidence.
- Document explosives as forensic evidence.
- Collect explosives as forensic evidence.
- Preserve explosives as forensic evidence.

Slide 13-4: Regulations, Guidance and Standards



Key Information

Regulations, guidance and standards:

For the collection of explosives evidence, important sources of guidance include:

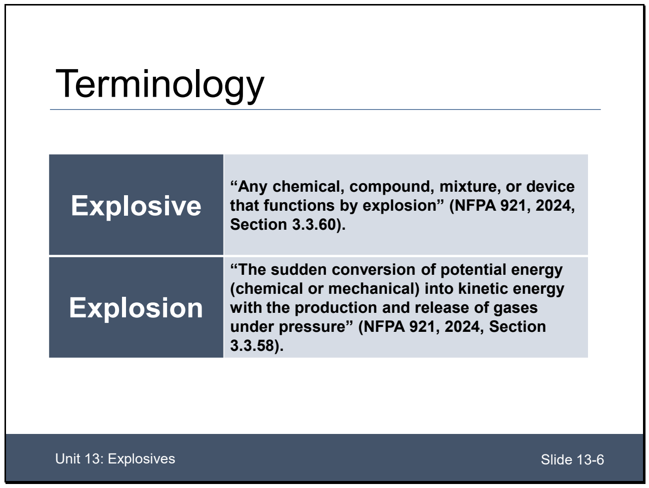
- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations*.
- ASTM E3329, *Standard Practice for Establishing an Examination Scheme for Explosive Residues*.
- ASTM E3253, *Standard Practice for Establishing an Examination Scheme for Intact Explosives*.
- NFPA 1033, *Standard for Professional Qualifications for Fire Investigator*.

Slide 13-5: Explosion Scenes

Key Information

Collecting evidence from an explosion scene can be complicated and often involves skills used in other forms of forensic evidence collection. **Safety is always the first concern.**

Slide 13-6: Terminology

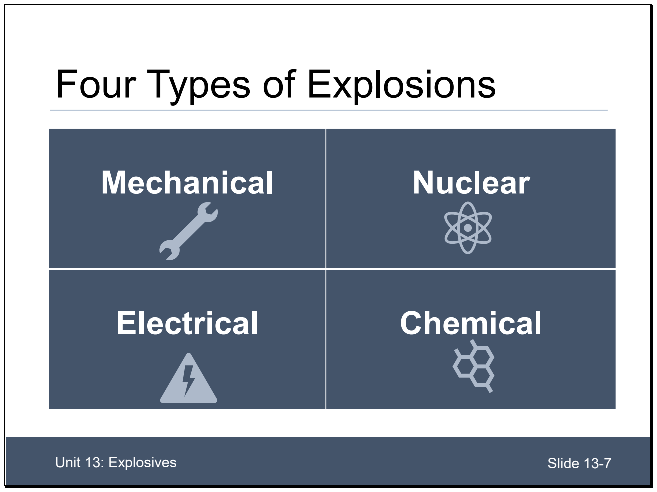


Key Information

Explosive: “Any chemical compound, mixture, or device that functions by explosion” (NFPA 921, 2024, Section 3.3.60).

Explosion: “The sudden conversion of potential energy (chemical or mechanical) into kinetic energy with the production and release of gases under pressure” (NFPA 921, 2024, Section 3.3.58).

Slide 13-7: Four Types of Explosions



Key Information

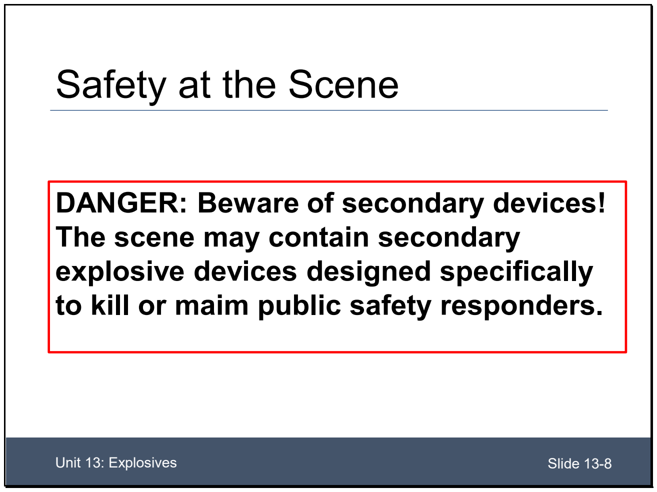
Mechanical: rupture of a closed container, cylinder, tank, boiler or similar storage vessel resulting in the release of pressurized gas or vapor.

Nuclear: High pressure is created by the enormous quantities of heat produced by the fusion or fission of the nuclei of atoms.

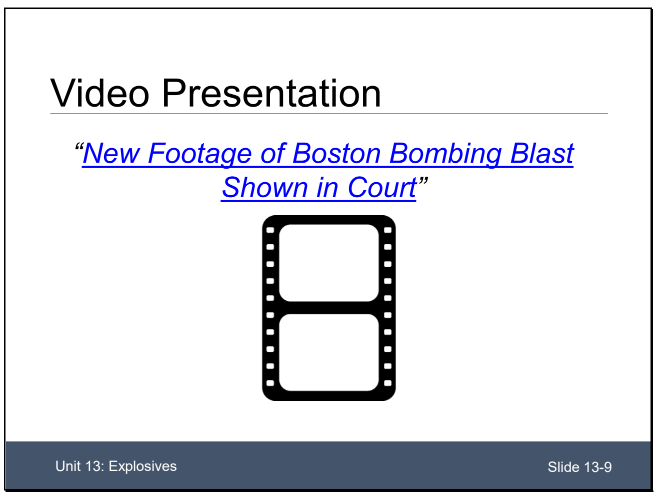
Electrical: High-energy electrical arcs may generate sufficient heat to cause an explosion.

Chemical: The generation of the overpressure is the result of exothermic reactions wherein the fundamental chemical nature of the fuel is changed (Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), n.d.).

Slide 13-8: Safety at the Scene



Slide 13-9: Video Presentation

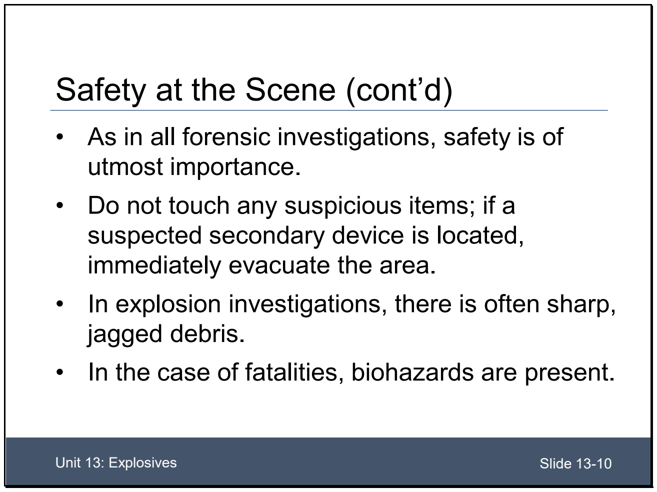


Key Information

Investigators need to be aware that explosion scenes may contain secondary explosive devices designed specifically to kill or maim public safety responders.

For more information watch "New Footage of Boston Bombing Blast Shown in Court." (2:19)

Slide 13-10: Safety at the Scene (cont'd)

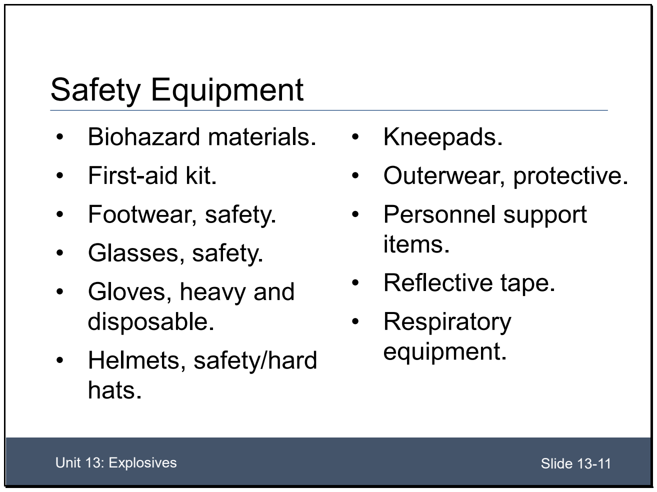


Key Information

As in all forensic investigations, safety is of utmost importance. Do not touch any suspicious items. If a suspected secondary device is located, immediately evacuate the area and contact bomb disposal personnel.

In explosion investigations, there is often sharp, jagged debris, so investigators must exercise caution. In the case of fatalities, biohazards are also present.

Slide 13-11: Safety Equipment



Key Information

This safety equipment should be available at the crime scene to properly collect evidence from an explosive:

- Biohazard materials (e.g., bags, tags, labels).
- First-aid kit.
- Footwear, safety (e.g., protective shoes/boots).
- Glasses, safety.
- Gloves, heavy and disposable (e.g., surgical, latex).
- Helmets, safety/hard hats.
- Kneepads.
- Protective outerwear (e.g., disposable suits, weather gear).
- Personnel support items (e.g., food, water, hygiene items, shelter).
- Reflective tape.
- Respiratory equipment (e.g., particle masks, breathing equipment).

Slide 13-12: Collection Tools Involved

Key Information

The following items should be available at the crime scene to properly collect explosives evidence:

- Anti-static bags.
- Barrier tape/perimeter rope.
- Battery.
- Binoculars.
- Communications equipment.
- Evidence collection kits.
- Flashlights.
- Generator.
- Hand tools.
- Lighting.
- Tarps/tents.
- Thermometer.
- Trashcans.
- Tweezers/forceps.
- Utility knives.
- Vacuum.

Slide 13-13: Initial Scene Arrival

Initial Scene Arrival

- Upon arrival, meet with Incident Command.
- Establish control and restrict scene access to essential personnel.
- Request additional personnel as needed:
  - Bomb technicians.
  - Firefighters.
  - Emergency medical services (EMS) personnel.
  - Law enforcement officers.

Unit 13: Explosives Slide 13-13

Key Information

Upon arrival, meet with Incident Command, establish control and restrict scene access to essential personnel. Request emergency services from bomb technicians, firefighters, emergency medical services (EMS) personnel and law enforcement officers, as necessary.

Slide 13-14: Scene Examination

Scene Examination

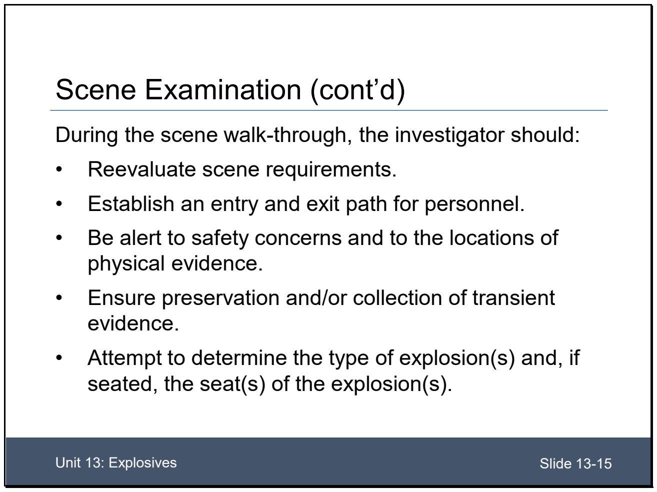
- Identify scene hazards.
  - Structural collapse.
  - Bloodborne pathogens.
  - Hazardous chemicals.
  - **Beware of possible secondary devices.**
- Identify witnesses and victims.

Unit 13: Explosives Slide 13-14

Key Information

Identify scene hazards, such as structural collapse, bloodborne pathogens, hazardous chemicals and secondary explosive devices. Then, identify witnesses, victims and the presence of evidence. Be sure to preserve potentially transient physical evidence as soon as safely possible.

Slide 13-15: Scene Examination (cont'd)

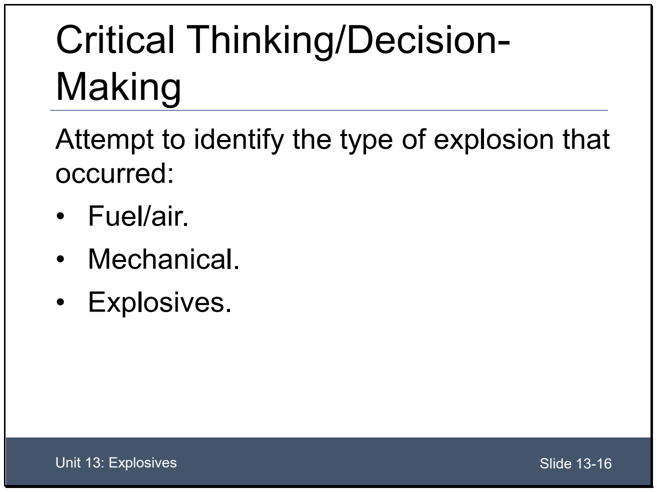


Key Information

The investigator's initial walk-through is an opportunity to identify evidence and the presence of safety hazards. During the walk-through, the investigator should:

- Reevaluate scene requirements.
- Establish an entry and exit path for personnel.
- Be alert to safety concerns and to the locations of physical evidence.
- Ensure preservation and/or collection of transient evidence.
- Attempt to determine the type of explosion(s) and, if seated, the seat(s) of the explosion(s).

Slide 13-16: Critical Thinking/Decision-Making



Key Information

The first step is to attempt to identify the type of explosion that occurred:

- Fuel/air.
- Mechanical.
- Explosives.

Slide 13-17: Blast Characteristics: Determining Explosion Type

Blast Characteristics: Determining Explosion Type

Seated Explosions	Unseated Explosions
Crater	No crater
Potentially more shattering	Potentially more pushing/shoving
High explosive	Less shattering effect
Pipe bomb	Whole structure involved
Device fragments	Nonlocalized

Unit 13: Explosives Slide 13-17

Key Information

Blast characteristics vary depending on the type of explosion (i.e., seated or unseated). These characteristics include:

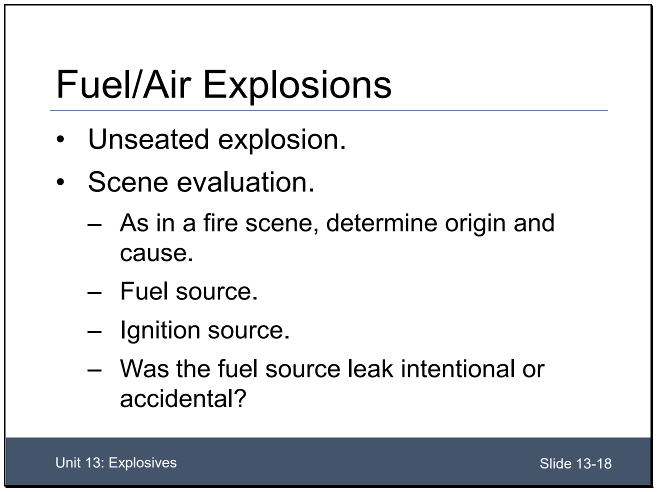
Seated explosions

- Crater.
- Potentially more shattering.
- High explosive.
- Pipe bomb.
- Device fragments.

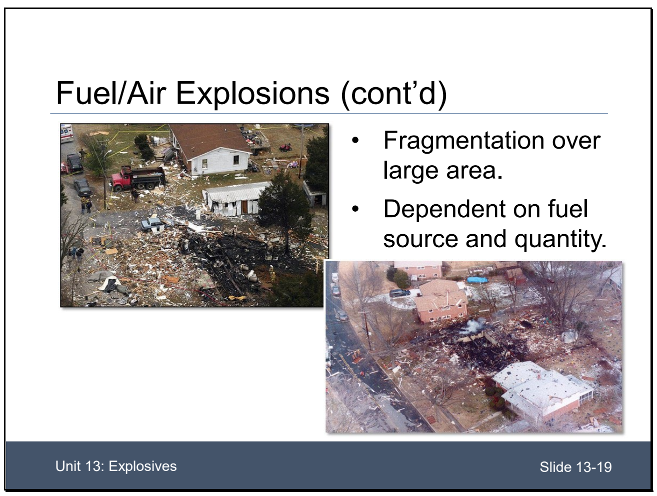
Unseated explosions

- No crater.
- Potentially more pushing/shoving.
- Less shattering effect.
- Whole structure involved.
- Nonlocalized.

Slide 13-18: Fuel/Air Explosions



Slide 13-19: Fuel/Air Explosions (cont'd)



Key Information

Considerations for fuel/air explosions include determining the exact fuel source and whether the leak was intentional or accidental.

- Unseated explosion.
- Fragmentation over large area.
- Dependent on fuel source and quantity.

(See images on next page.)

ATF

ATF

Slide 13-20: Fuel/Air Explosions: Intentional/Disconnected Lines

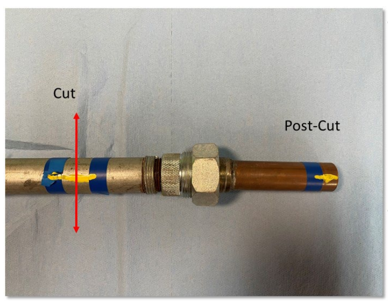
Fuel/Air Explosions: Intentional/ Disconnected Lines

- Collect lines and connections. Be sure to "witness mark."
- Collect tools that may have been utilized.
- Identify ignition sources.
- Items should be collected similar to a fire investigation.

Unit 13: Explosives Slide 13-20

Slide 13-21: Intentional/Disconnected Fuel Lines Example

Intentional/Disconnected Fuel Lines Example



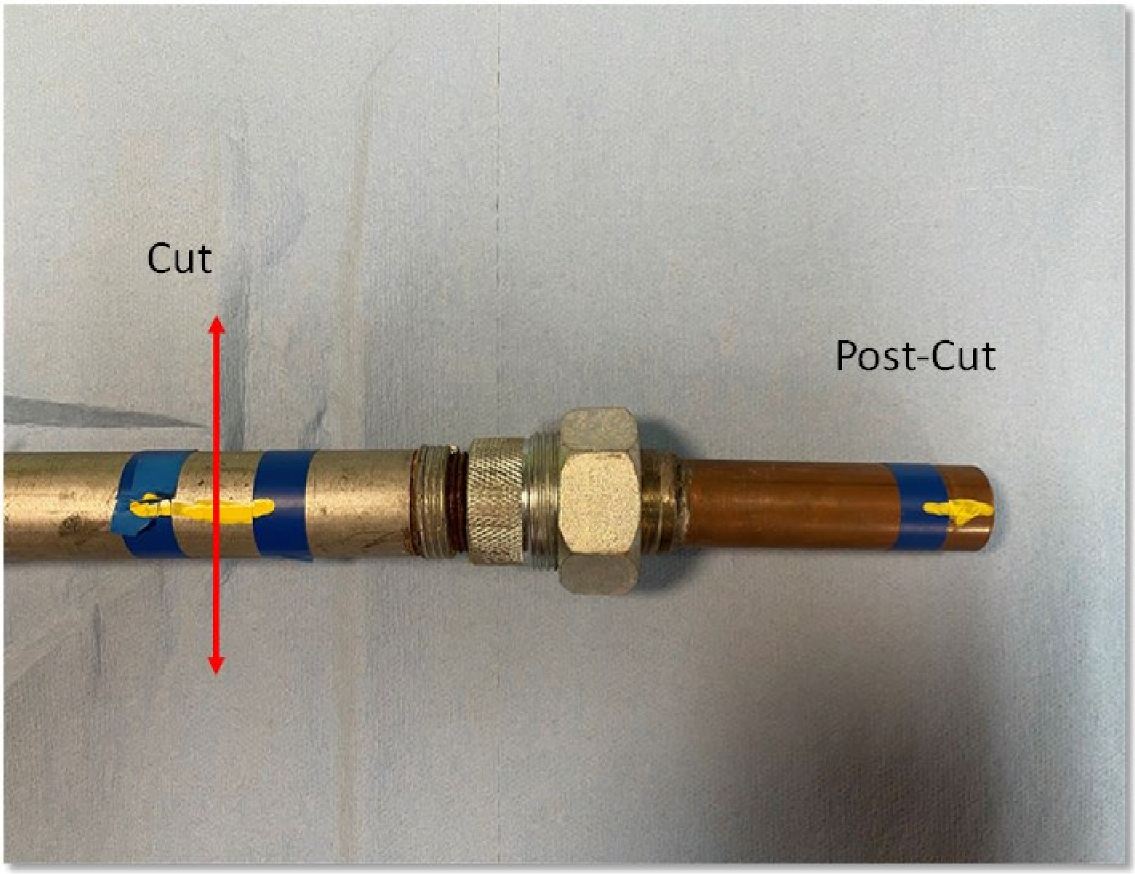
- Loosened connection collected for evidence and possible toolmark identification.
- Witness-marked pipe with paint pen and tape.

Unit 13: Explosives Slide 13-21

Key Information

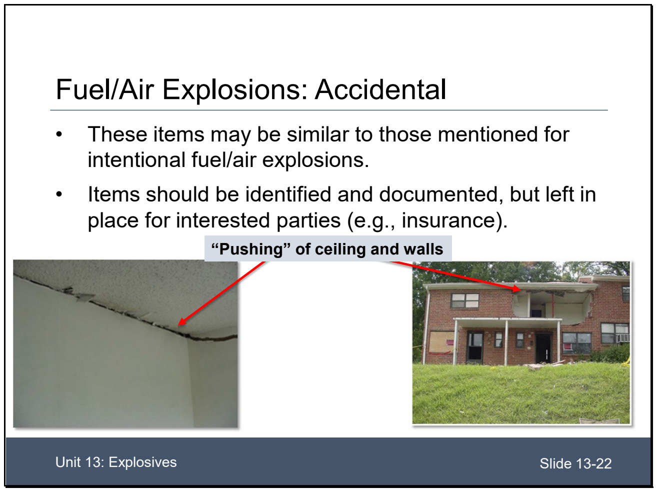
Considerations for examining fuel/air explosions involving intentional/disconnected lines include:

- Collection of lines. Be sure to "witness mark."
- Collection of tools that may have been utilized.
- Identification of ignition sources.
- Items should be collected similarly to a fire investigation.
- DNA.
- Toolmarks.



This is an example of a loosened connection collected for evidence and possible toolmark identification. Note the witness-marked pipe with paint pen and tape.

Slide 13-22: Fuel/Air Explosions: Accidental



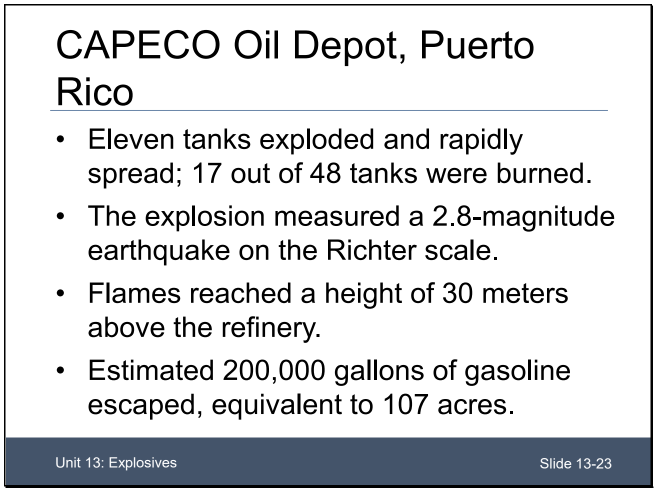
Key Information

Considerations for examining accidental fuel/air explosions may be similar to those mentioned for intentional fuel/air explosions. Potential evidence should be identified and documented but left in place for interested parties (e.g., insurance).

Image 1: painter used oil-based paint, applied with sprayer and failed to shut off electrical service. The refrigerator motor turned on, and a spark ignited paint vapors.

Image 2: pushing of ceiling/roof from fuel/air explosion.

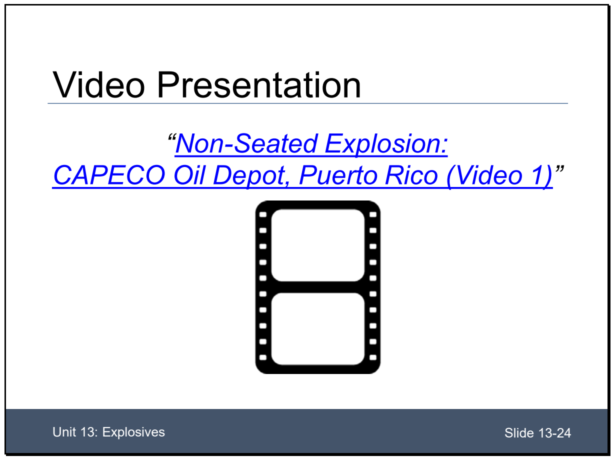
Slide 13-23: CAPECO Oil Depot, Puerto Rico



Key Information

Non-seated explosion example: An explosion occurred at the CAPECO oil depot in Béyamon, Puerto Rico, on Oct. 23, 2009. Eleven tanks exploded and rapidly spread. Eventually, 17 out of 48 tanks were burned. The explosion registered as a 2.8-magnitude earthquake on the Richter scale with flames reaching a height of 30 meters above the refinery. An estimated 200,000 gallons of gasoline escaped, equivalent to 107 acres.

Slide 13-24: Video Presentation

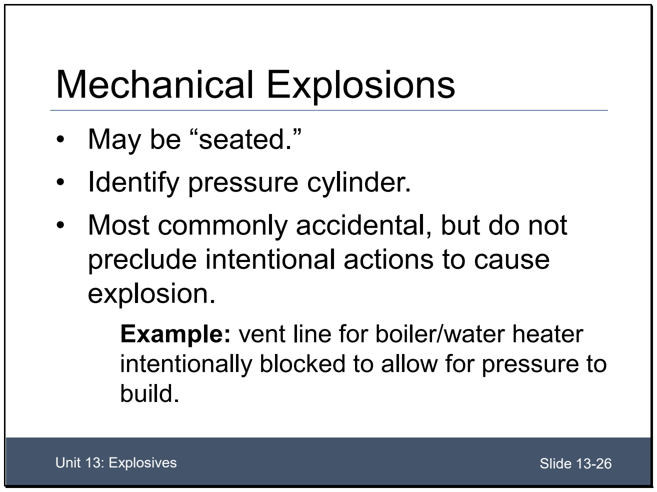


Slide 13-25: Video Presentation

Key Information

This video surveillance footage captures the ignition of fuel vapors.

Slide 13-26: Mechanical Explosions

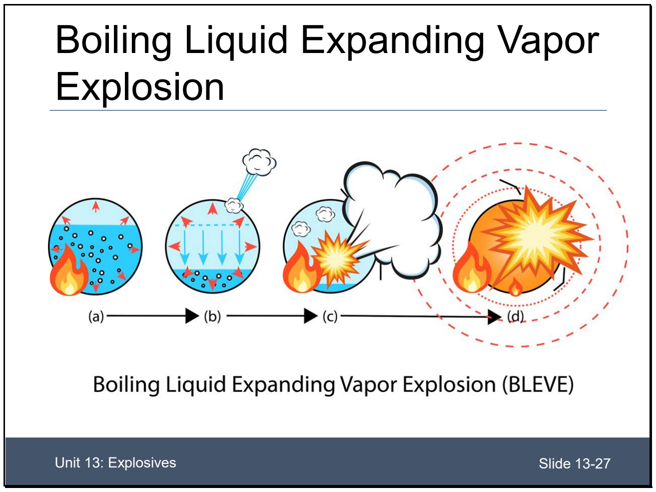


Key Information

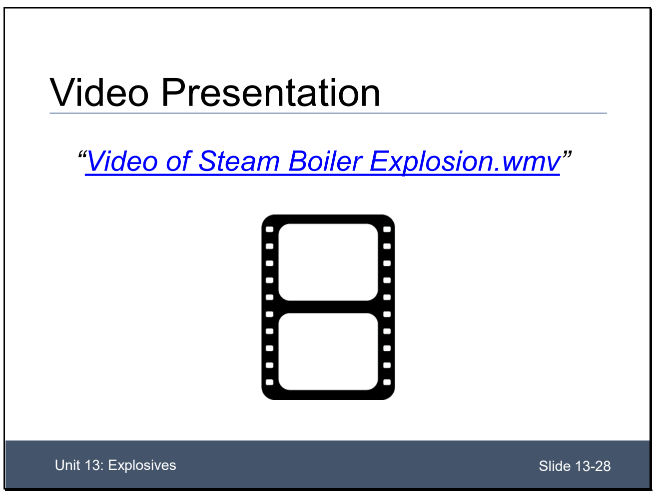
When examining mechanical explosions, important considerations include identifying the pressure cylinder and determining the root cause. These incidents are typically accidental, but the investigator must not dismiss possible intentional actions. Mechanical explosions may be seated.

Example: a vent line for a boiler/water heater intentionally blocked to allow for pressure to build.

Slide 13-27: Boiling Liquid Expanding Vapor Explosion



Slide 13-28: Video Presentation

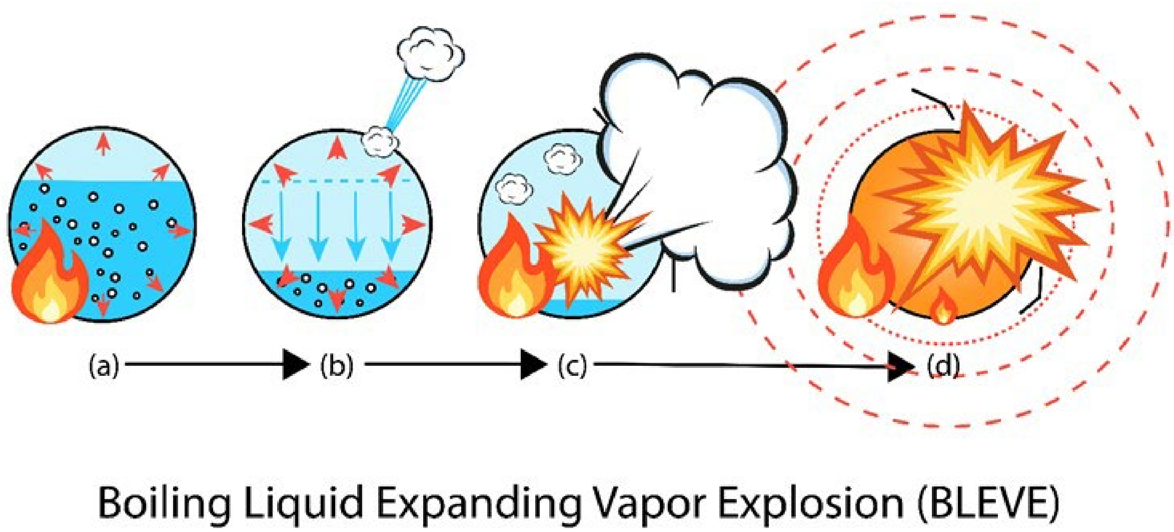


Key Information

A **Boiling Liquid Expanding Vapor Explosion (BLEVE)** occurs when liquid inside a container expands as heated. As the pressure rises higher than the safety valve can release, the tank fails, causing an explosion.

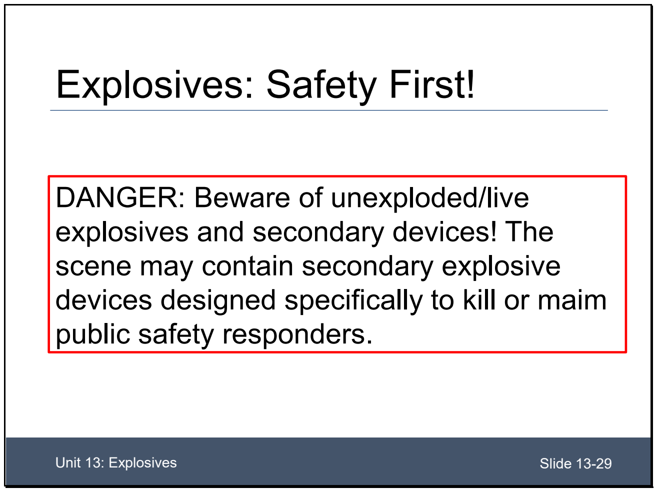
For more information, watch "Video of Steam Boiler Explosion.wmv." (1:14)

Image 1: BLEVE phenomenon explained.

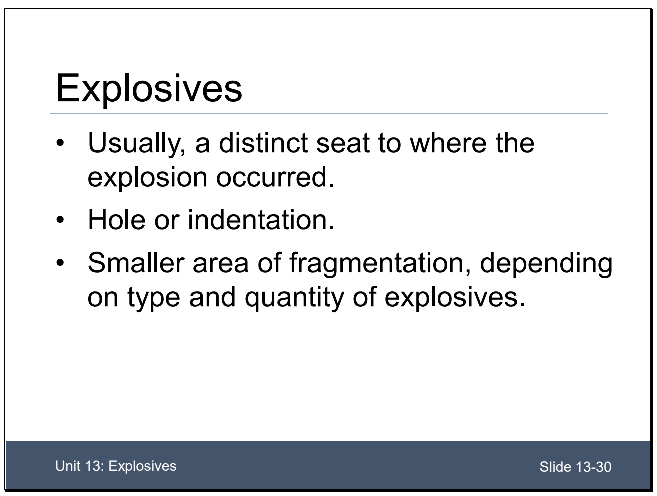


A fire impinges on a vessel containing a liquid. The heat causes the liquid to convert into a vapor state, causing the pressure inside the vessel to increase. The pressure builds to beyond the capability of the vessel to hold the pressure. The sudden release of the pressure from inside the vessel causes an explosion, known as a BLEVE.

Slide 13-29: Explosives: Safety First!



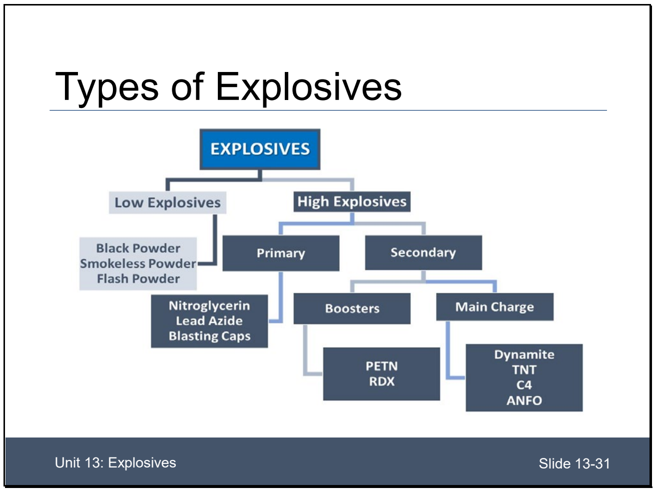
Slide 13-30: Explosives



Key Information

Explosives usually have a distinct seat where the explosion occurred. This creates a hole or indentation. Such instances may have a smaller area of fragmentation, depending on the type and quantity of explosives.

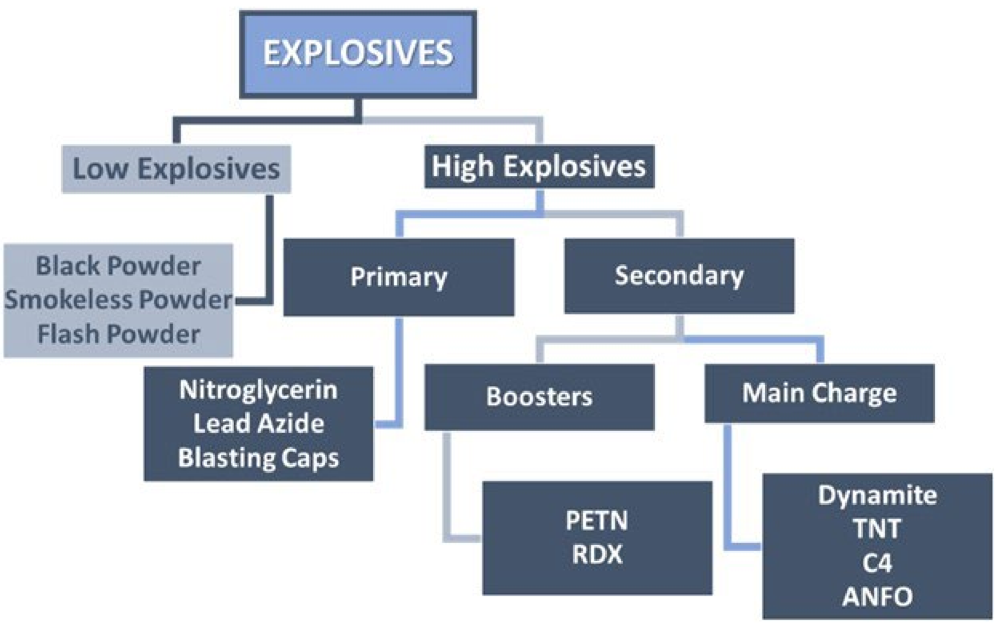
Slide 13-31: Types of Explosives



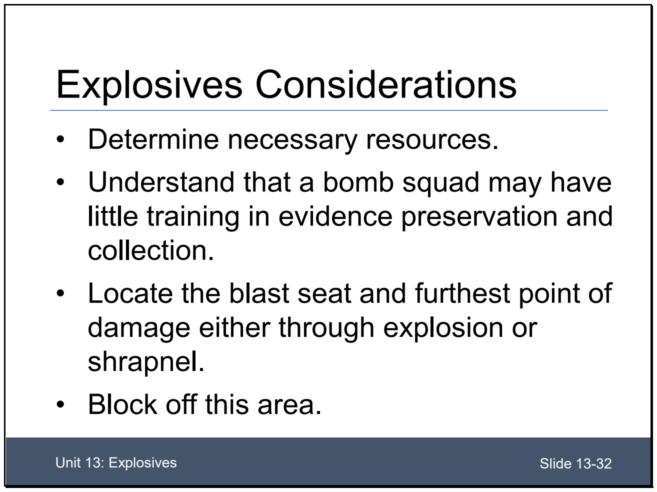
Key Information

Low explosives: compounds wherein the rate of decomposition proceeds through the material at less than the speed of sound.

High explosives: explosive materials that detonate, meaning that the explosive shock front passes through the material at a supersonic speed.



Slide 13-32: Explosives Considerations

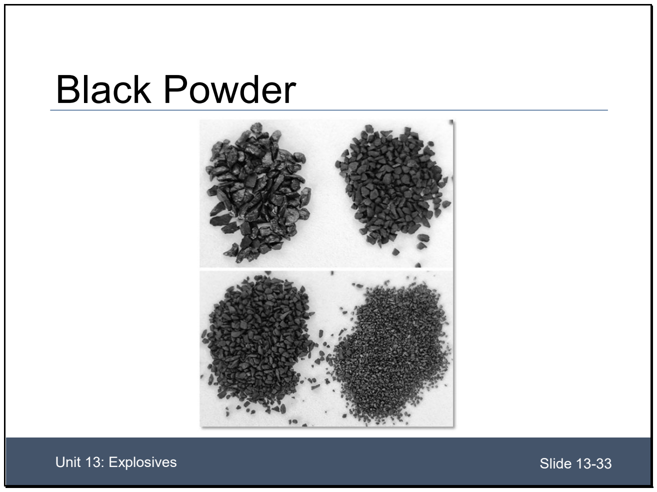


Key Information

When examining explosives, important considerations include:

- Determine necessary resources.
- Understand that a bomb squad may have little training in evidence preservation and collection.
- Locate the blast seat and furthest point of damage either through explosion or shrapnel.
- Block off this area.

Slide 13-33: Black Powder



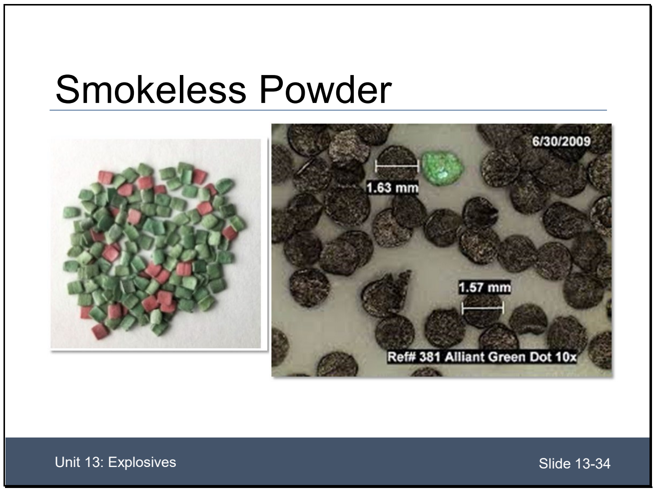
Key Information

Black powder:

There are different brands of black powder. The lab has the capability to identify the type used in an explosive device.

Image: black powder.

Slide 13-34: Smokeless Powder



Key Information

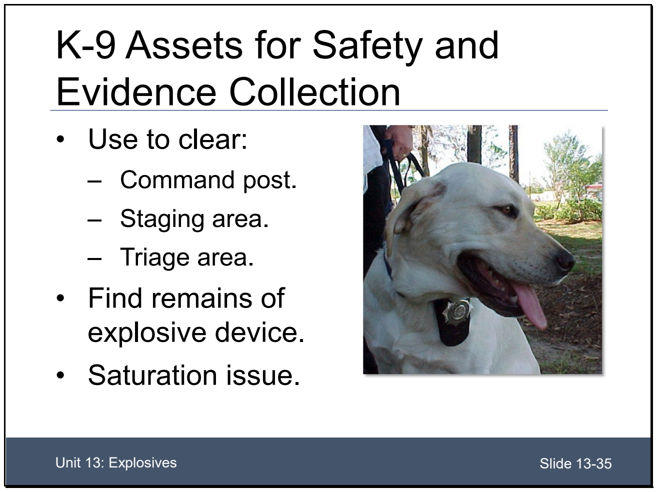
Smokeless powder:

There are different brands of smokeless powder. The lab has the capability to identify the type used in an explosive device.

Image: smokeless powder.

Image 2: smokeless powder, close-up.

Slide 13-35: K-9 Assets for Safety and Evidence Collection

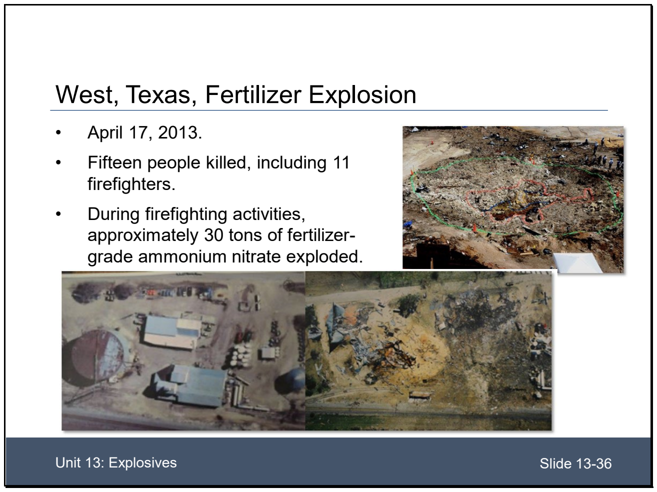


Key Information

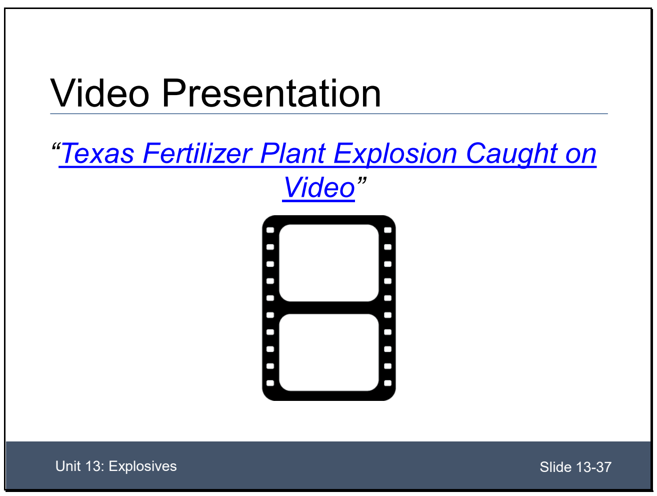
Considerations for K-9 assets in the service of safety and evidence collection include:

- Use to clear command post and staging and triage areas.
- Use to find remains of explosive devices.
- Saturation issue: Remember, a K-9, just as an ignitable liquid detection canine (ILDC), can be overwhelmed due to the amount of explosive residue at a scene.

Slide 13-36: West, Texas, Fertilizer Explosion



Slide 13-37: Video Presentation



Key Information

Example: On April 17, 2013, an explosion occurred at the West Fertilizer Company storage facility in West, Texas. The facility housed agricultural grade fertilizer, which was subsequently sensitized by fire. The resultant explosion killed 15 people, including 11 firefighters.

For more information, watch "Texas Fertilizer Plant Explosion Caught on Video." (1:35)

Image 1: shows the blast crater formed at the seat of the explosion. The crater measured 90 feet in diameter and 10 feet deep.

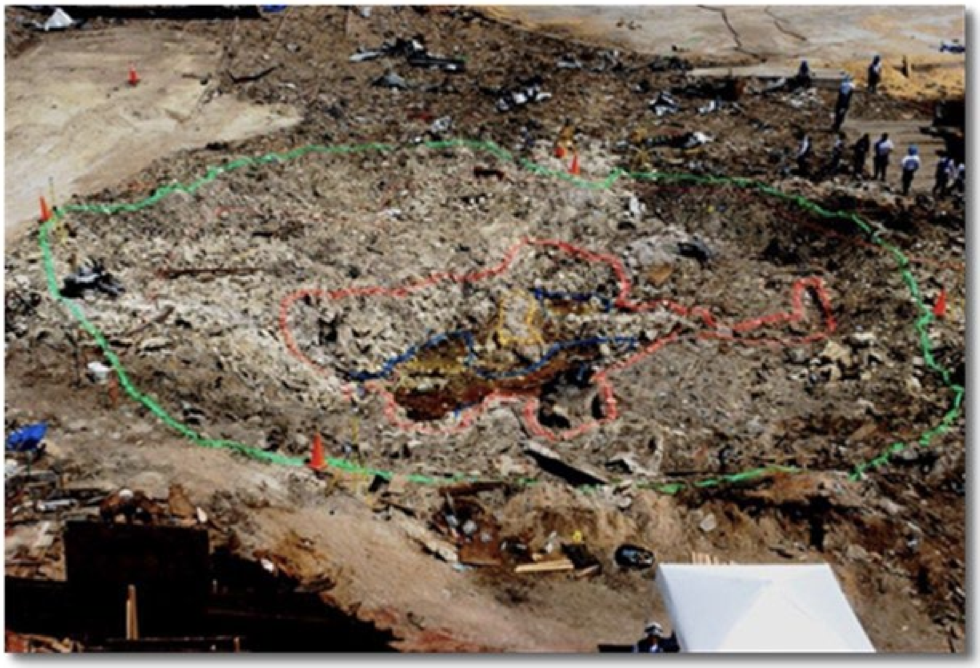
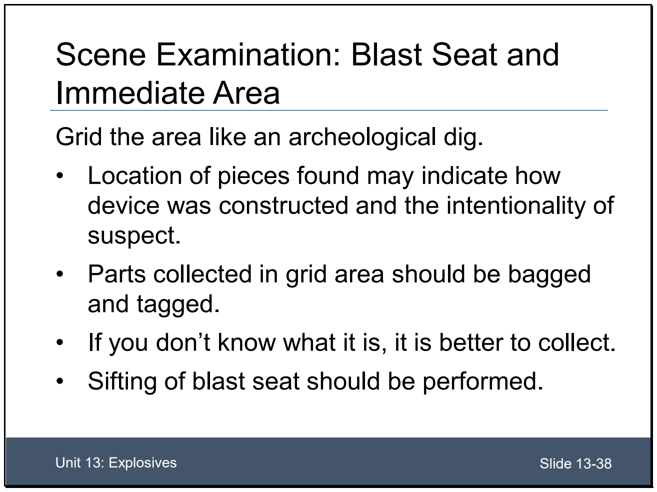


Image 2: shows overhead comparison photos of the West, Texas, site, before and after the explosion.

Slide 13-38: Scene Examination: Blast Seat and Immediate Area



Key Information

Blast seat and the immediate area: Grid off the area like an archeological dig.

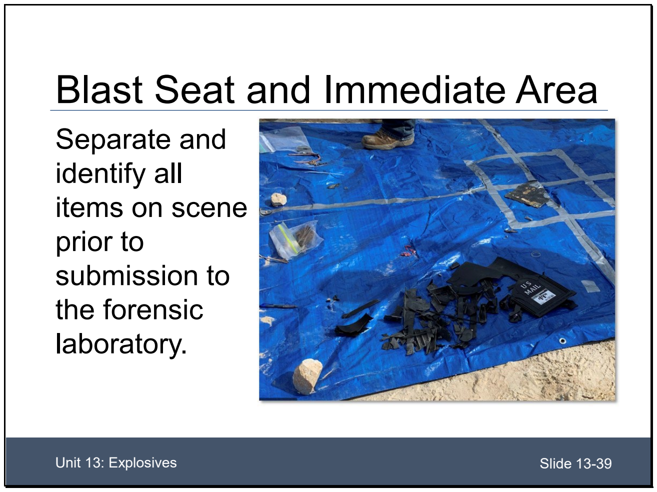
- The location of found pieces may indicate how the device was constructed and the intentionality of the suspect (e.g., whether placed to “aim” it a certain location).

- Parts collected in the grid area should be bagged and tagged as in examples of previous cases.

- If you do not know what an item is, it is better to collect the item as potential evidence than to not collect it.

- A sifting of the blast seat should be performed.

Slide 13-39: Blast Seat and Immediate Area

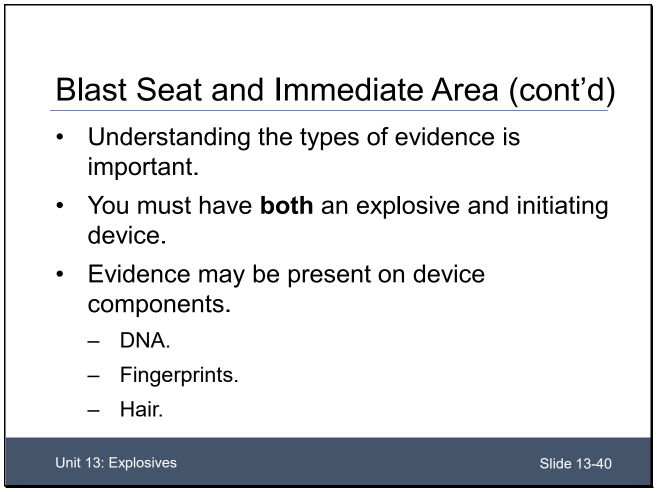


Key Information

Separate and identify all items on the scene prior to submission to the forensic laboratory.

Image: separation and identification of items.

Slide 13-40: Blast Seat and Immediate Area (cont'd)

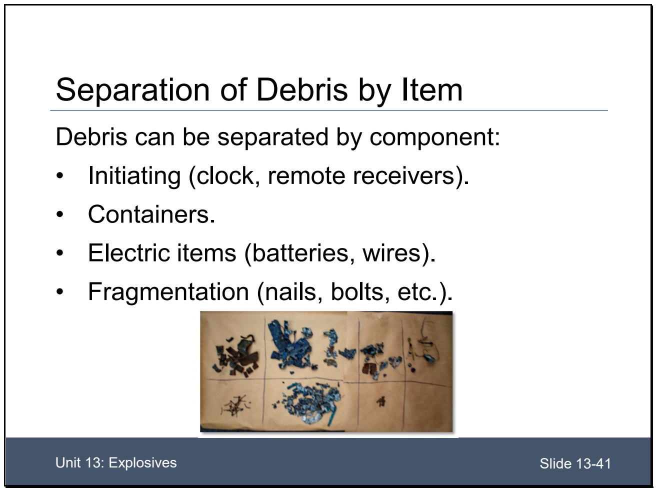


Key Information

Additional considerations for examining the blast seat and immediate area include:

- Understanding the types of evidence is important.
- Understand that you must have **both** an explosive and initiating device.
- Evidence may be found on the device components, such as DNA, fingerprints or hair.

Slide 13-41: Separation of Debris by Item

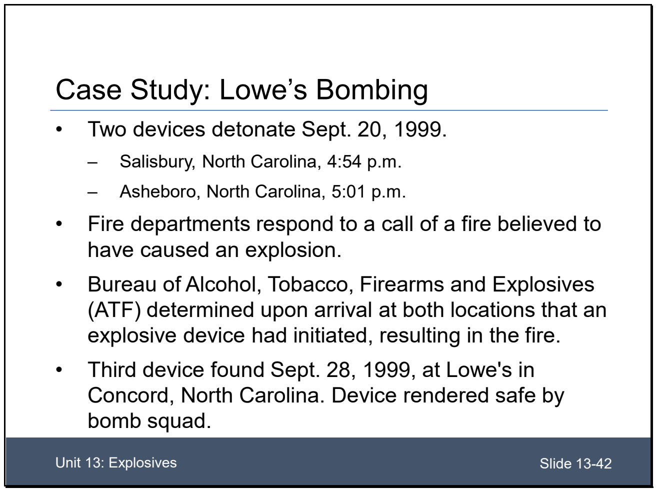


Key Information

Debris can be separated by component:

- Initiating (clock, remote receivers).
- Containers.
- Electric items (batteries, wires).
- Fragmentation (nails, bolts, etc.).

Slide 13-42: Case Study: Lowe’s Bombing

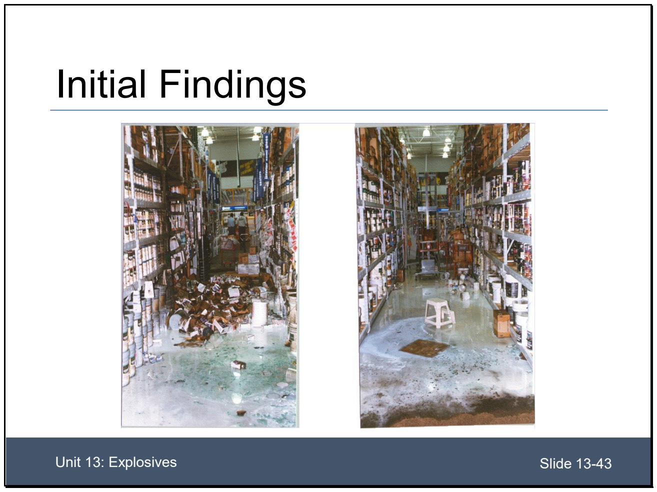


Key Information

Case study: Lowe’s bombing: The fire department initially determined that a fire had caused an explosion. However, once agents from the ATF arrived, device components were found, indicating the explosion preceded the fire. The device was placed in the paint department behind the ignitable liquids. When it exploded, a fire ensued.

- **Two devices detonate on Sept. 20, 1999.**
  - Salisbury, North Carolina, at 4:54 p.m.
  - Asheboro, North Carolina, at 5:01 p.m.
- **Fire departments respond to a call of a fire believed to have caused an explosion.**
- **ATF determined upon arrival at both locations that an explosive device had been initiated, resulting in the fire.**
- **Third device found on Sept. 28, 1999.**
  - Concord, North Carolina at 4:00 p.m.
  - Third device rendered safe by bomb squad.

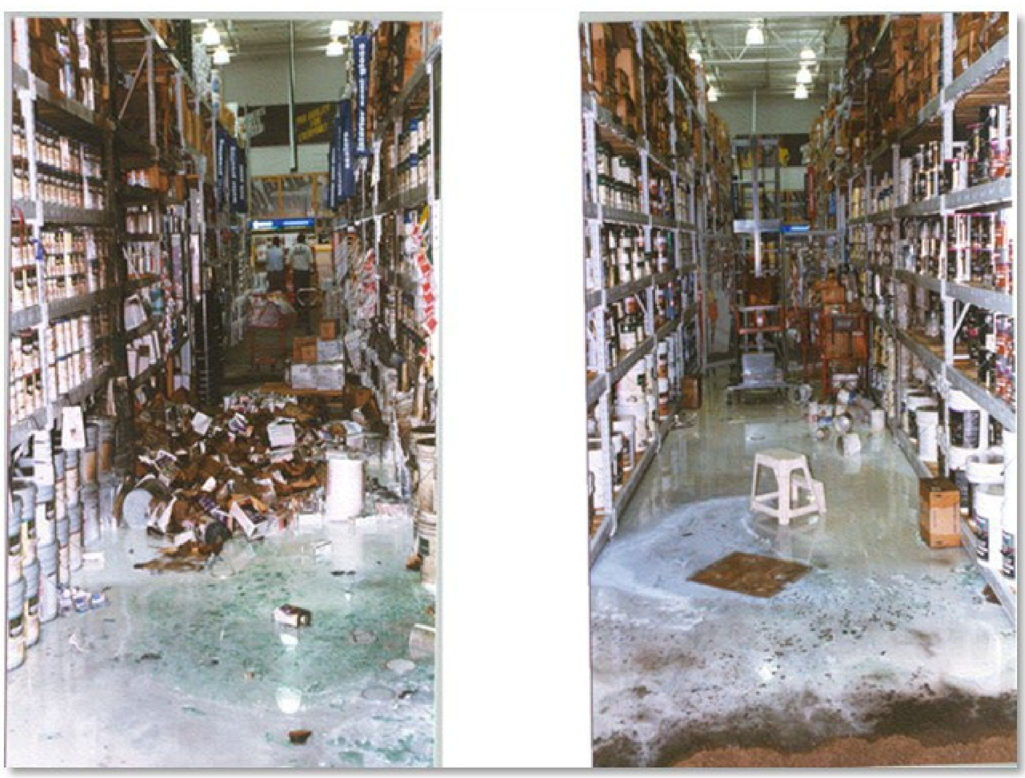
Slide 13-43: Initial Findings



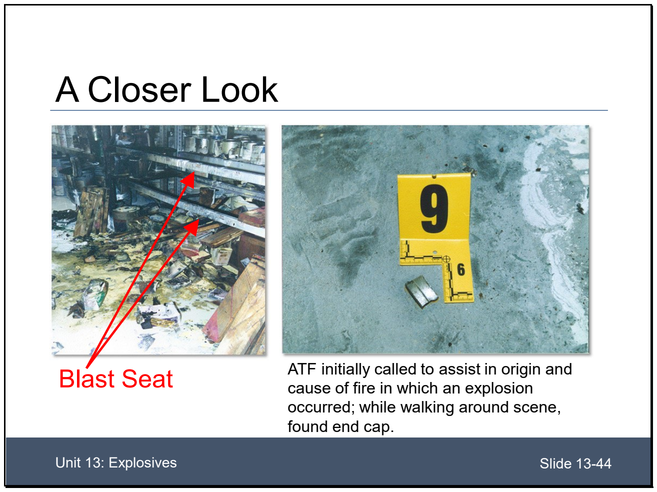
Key Information

During the fire, the sprinkler system was activated, as shown in the images. The fire department cleared items from the area to ensure the fire was extinguished. Prior to the arrival of investigators, store employees began covering the area with vermiculite. This reinforces the need to maintain scene security during an investigation.

Image: water from the sprinkler system, along with vermiculite spread by employees.



Slide 13-44: A Closer Look



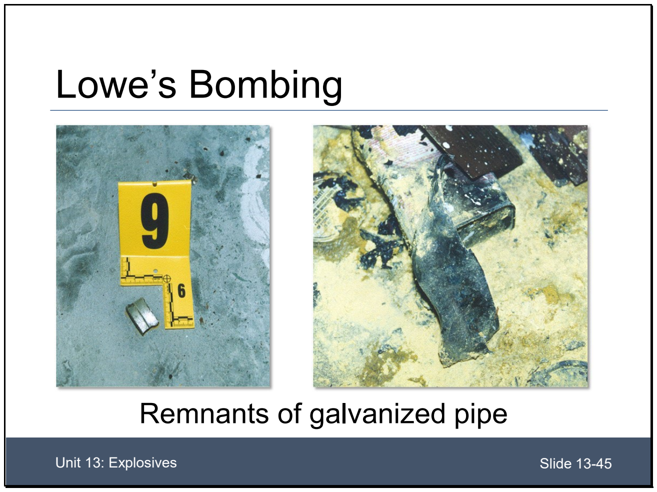
Key Information

The slide shows the blast site and evidence found.

Image 1: blast seat. The bending of the shelf framing outward indicates there was a blast seat and not a fuel/air explosion.

Image 2: end cap found as potential evidence.

Slide 13-45: Lowe's Bombing



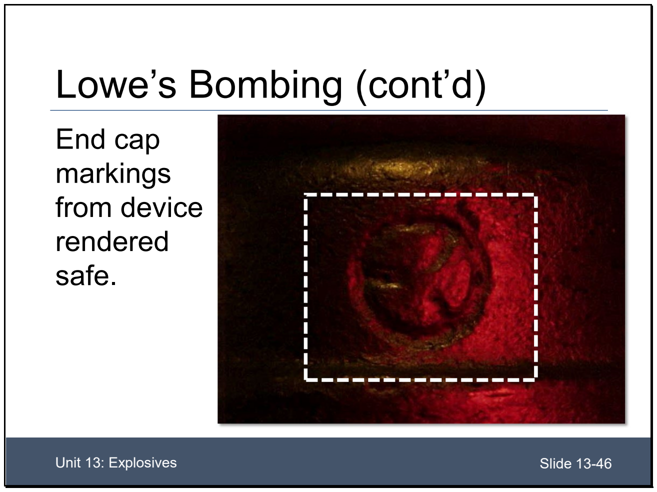
Key Information

Pieces of the device were located within the store.

Image 1: portion of the device end cap.

Image 2: portion of galvanized pipe.

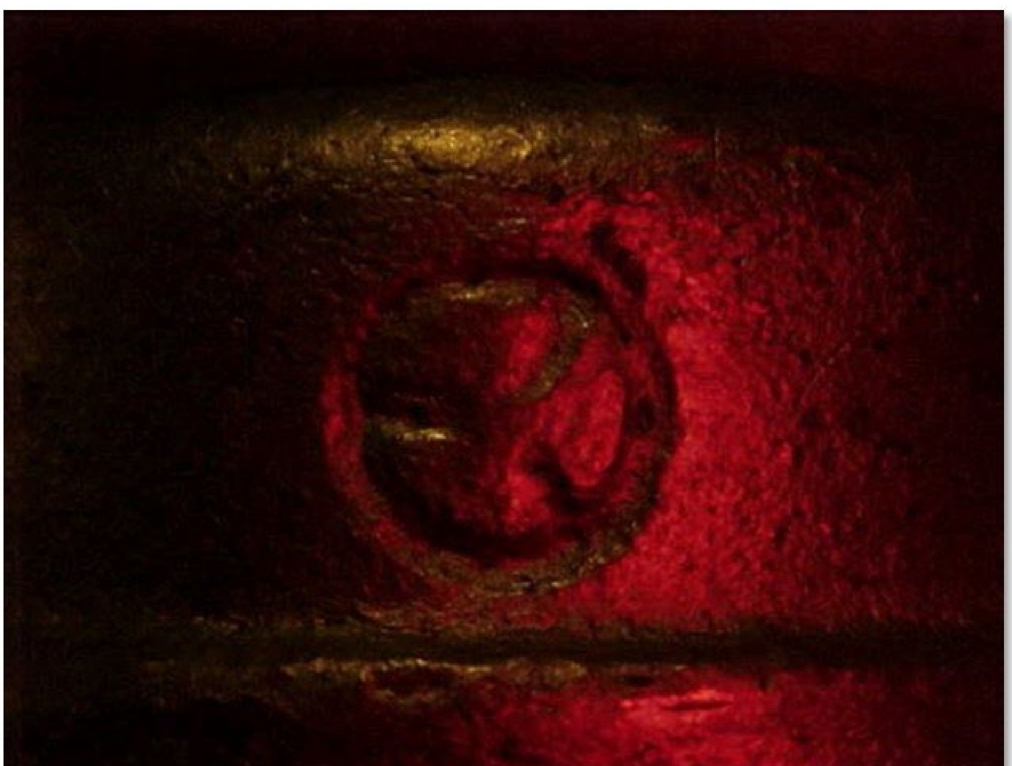
Slide 13-46: Lowe's Bombing (cont'd)



Key Information

The symbol found on this piece of evidence identified the end cap, which was mainly sold by Home Depot. This information allowed investigators to narrow their search.

Image: end cap markings, close-up.



Slide 13-47: End Caps Only Sold at Home Depot

Key Information

As a result of the information obtained from the markings on the end cap, investigators directed their search to determine potential locations where the end cap was sold to the perpetrator.

Image: list of end caps shipped.

CUSTOMER #	SHIPTO	NAME	CITY	STATE	ZIP	ITEM	DESCRIPTION
116489	1301	HOME DEPOT - ANCHORAGE #1301	ANCHORAGE	AK	99503	511-407HC	CAP GALVANIZED 1 1/2
127131	8	TRUSERV CORPORATION	KINGMAN	AZ	86401	511-407HC	CAP GALVANIZED 1 1/2
116489	1501	HOME DEPOT - AURORA # 1501	AURORA	CO	80012	511-407HC	CAP GALVANIZED 1 1/2
116489	1502	HOME DEPOT - ARVADA # 1502	ARVADA	CO	80002	511-407HC	CAP GALVANIZED 1 1/2
116489	1503	HOME DEPOT - THORNTON #1503	THORNTON	CO	80229	511-407HC	CAP GALVANIZED 1 1/2
116489	1504	HOME DEPOT - CO SPRINGS #1504	COLORADO SPRING	CO	80909	511-407HC	CAP GALVANIZED 1 1/2
116489	1507	HOME DEPOT - DENVER # 1507	DENVER	CO	80123	511-407HC	CAP GALVANIZED 1 1/2
116489	1510	HOME DEPOT - CO SPRINGS #1510	COLORADO SPRING	CO	80920	511-407HC	CAP GALVANIZED 1 1/2
116489	1512	HOME DEPOT - FT COLLINS # 1512	FORT COLLINS	CO	80525	511-407HC	CAP GALVANIZED 1 1/2
116489	1514	HOME DEPOT - LAKEWOOD # 1514	LAKEWOOD	CO	80226	511-407HC	CAP GALVANIZED 1 1/2
116489	1515	HOME DEPOT - GREELEY #1515	GREELEY	CO	80634	511-407HC	CAP GALVANIZED 1 1/2
101300	5839	SODIMAC-COLOMBIA	MIAMI	FL	33172	511-407HC	CAP GALVANIZED 1 1/2
114988	33781	CASTLE SUPPLY CO INC	PINELLAS PARK	FL	33781	511-407HC	CAP GALVANIZED 1 1/2
116488	6402	HOME DEPOT-#6402 PUERTO RICO	JACKSONVILLE	FL	32254	511-407HC	CAP GALVANIZED 1 1/2
123295	2	COMERICAL FELO, INC.	JACKSONVILLE	FL	32218	511-407HC	CAP GALVANIZED 1 1/2
147500	7081	AUGUSTO QUAN LTD.	MEDLEY	FL	33178	511-407HC	CAP GALVANIZED 1 1/2
183298	1	FERRETERIA J&B INC	JACKSONVILLE	FL	32218	511-407HC	CAP GALVANIZED 1 1/2
127131	4	TRUSERV CORPORATION	JONESBORO	GA	30236	511-407HC	CAP GALVANIZED 1 1/2
116484	2103	HOME DEPOT-W. DES MOINES	WEST DES MOINES	IA	50266	511-407HC	CAP GALVANIZED 1 1/2
116484	2104	HOME DEPOT - DESMOINES #2104	DES MOINES	IA	50320	511-407HC	CAP GALVANIZED 1 1/2
116489	1801	HOME DEPOT - BOISE # 1801	BOISE	ID	83704	511-407HC	CAP GALVANIZED 1 1/2
116489	1802	HOME DEPOT - IDAHO FALLS #1802	IDAHO FALLS	ID	83404	511-407HC	CAP GALVANIZED 1 1/2
116489	1803	HOME DEPOT-COEUR D'ALENE #1803	COEUR D'ALENE	ID	83815	511-407HC	CAP GALVANIZED 1 1/2
101251	IQ	ACE HARDWARE #61388	PRINCETON	IL	61356	511-407HC	CAP GALVANIZED 1 1/2
116484	1901	1901 HOME DEPOT-BROADVIEW	BROADVIEW	IL	60153	511-407HC	CAP GALVANIZED 1 1/2
116484	1902	1902 HOME DEPOT - EVANSTON	EVANSTON	IL	60201	511-407HC	CAP GALVANIZED 1 1/2
116484	1903	1903 HOME DEPOT - CHICAGO	CHICAGO	IL	60635	511-407HC	CAP GALVANIZED 1 1/2
116484	1904	1904 HOME DEPOT - SCHAUMBURG	SCHAUMBURG	IL	60174	511-407HC	CAP GALVANIZED 1 1/2
116484	1908	1908 HOME DEPOT-BEDFORD PARK	BEDFORD PARK	IL	60638	511-407HC	CAP GALVANIZED 1 1/2
116484	1909	1909 HOME DEPOT - CALUMET CITY	CALUMET CITY	IL	60409	511-407HC	CAP GALVANIZED 1 1/2
116484	1913	1913 HOME DEPOT - RANDHURST	MT. PROSPECT	IL	60056	511-407HC	CAP GALVANIZED 1 1/2
116484	1914	1914 HOME DEPOT- DAN RYAN	CHICAGO	IL	60620	511-407HC	CAP GALVANIZED 1 1/2
116484	1918	1918 HOME DEPOT - NAPERVILLE	NAPERVILLE	IL	60540	511-407HC	CAP GALVANIZED 1 1/2
116484	1926	HOME DEPOT 1926	DEERFIELD	IL	60015	511-407HC	CAP GALVANIZED 1 1/2
116484	1927	1927 HOME DEPOT - PALATINE	PALATINE	IL	60067	511-407HC	CAP GALVANIZED 1 1/2
116484	1928	1928 HOME DEPOT - ROCKFORD	ROCKFORD	IL	61107	511-407HC	CAP GALVANIZED 1 1/2
116484	1934	HOME DEPOT - ELGIN # 1934	ELGIN	IL	60123	511-407HC	CAP GALVANIZED 1 1/2
116484	1936	HOME DEPOT - HOMEWOOD # 1936	HOMEWOOD	IL	60430	511-407HC	CAP GALVANIZED 1 1/2
127131	1	TRUSERV CORPORATION	HARVARD	IL	60033	511-407HC	CAP GALVANIZED 1 1/2
127133	31	TRUSERV CORPORATION ""IMPORT""	HARVARD	IL	60033	511-407HC	CAP GALVANIZED 1 1/2
127134	842	BROADVIEW TV HDWE # 0842-5	BROADVIEW	IL	60153	511-407HC	CAP GALVANIZED 1 1/2
109986	46705	BOSTWICK BRAUN CO	ASHLEY	IN	46705	511-407HC	CAP GALVANIZED 1 1/2
116484	1937	HOME DEPOT - SCHERERVILLE 1937	SCHERERVILLE	IN	46375	511-407HC	CAP GALVANIZED 1 1/2
127131	4	WESTFIELD DIST. CENTER	WESTFIELD	MA	1085	511-407HC	CAP GALVANIZED 1 1/2
114981	20722	CASTLE WHOLESALERS INC	COTTAGE CITY	MD	20722	511-407HC	CAP GALVANIZED 1 1/2
127131	27	TRUSERV CORPORATION	HAGERSTOWN	MD	21740	511-407HC	CAP GALVANIZED 1 1/2
116484	2701	2701 HOME DEPOT- PONTIAC	PONTIAC	MI	48341	511-407HC	CAP GALVANIZED 1 1/2
116484	2702	2702 HOME DEPOT - WARREN	WARREN	MI	48089	511-407HC	CAP GALVANIZED 1 1/2
116484	2703	2703 HOME DEPOT- CANTON	CANTON	MI	48187	511-407HC	CAP GALVANIZED 1 1/2
116484	2704	2704 HOME DEPOT - NORTHVILLE	NORTHVILLE	MI	48167	511-407HC	CAP GALVANIZED 1 1/2
116484	2705	2705 HOME DEPOT- REDFORD	REDFORD	MI	48239	511-407HC	CAP GALVANIZED 1 1/2
116484	2707	2707 HOME DEPOT- ROSEVILLE	ROSEVILLE	MI	48066	511-407HC	CAP GALVANIZED 1 1/2
116484	2708	2708 HOME DEPOT- UTICA	UTICA	MI	48317	511-407HC	CAP GALVANIZED 1 1/2
116484	2709	2709 HOME DEPOT- TAYLOR	TAYLOR	MI	48180	511-407HC	CAP GALVANIZED 1 1/2
116484	2710	2710 HOME DEPOT - DEARBORN HTS	DEARBORN HEIGHT	MI	48125	511-407HC	CAP GALVANIZED 1 1/2
116484	2711	2711 HOME DEPOT - SOUTHFIELD	SOUTHFIELD	MI	48076	511-407HC	CAP GALVANIZED 1 1/2
116484	2713	2713 HOME DEPOT- NORTHLAND	SOUTHFIELD	MI	48075	511-407HC	CAP GALVANIZED 1 1/2
116484	2714	2714 HOME DEPOT - SAGINAW	SAGINAW	MI	48604	511-407HC	CAP GALVANIZED 1 1/2
116484	2715	2715 HOME DEPOT- GRAND RAPIDS	GRAND RAPIDS	MI	49512	511-407HC	CAP GALVANIZED 1 1/2
116484	2716	2716 HOME DEPOT- FLINT	FLINT TOWNSHIP	MI	48532	511-407HC	CAP GALVANIZED 1 1/2
116484	2717	2717 HOME DEPOT- BURTON	BURTON	MI	48519	511-407HC	CAP GALVANIZED 1 1/2
116484	2721	HOME DEPOT-ANN ARBOR	PITTSFIELD TWSP	MI	48108	511-407HC	CAP GALVANIZED 1 1/2
116484	2722	2722 HOME DEPOT - COMMERCE TWN	COMMERCE TWNSHP	MI	48390	511-407HC	CAP GALVANIZED 1 1/2
116484	2726	2726 HOME DEPOT - TRAVERSE CITY	TRAVERSE CITY	MI	49684	511-407HC	CAP GALVANIZED 1 1/2
116484	2727	HOME DEPOT - ROCHESTER # 2727	ROCHESTER HILLS	MI	48307	511-407HC	CAP GALVANIZED 1 1/2
116484	2734	HOME DEPOT - CHESTERFIELD#2734	CHESTERFIELD	MI	48047	511-407HC	CAP GALVANIZED 1 1/2
116484	2738	HOME DEPOT - WOODHAVEN # 2738	WOODHAVEN	MI	48183	511-407HC	CAP GALVANIZED 1 1/2
116484	2739	HOME DEPOT - BAY CITY # 2739	BAY CITY	MI	48706	511-407HC	CAP GALVANIZED 1 1/2
116484	2740	HOME DEPOT STERLING HGTS #2740	STERLING HEIGHT	MI	99999	511-407HC	CAP GALVANIZED 1 1/2
181438	48038	PREMIER DISTRIBUTORS	CLINTON TWP	MI	48038	511-407HC	CAP GALVANIZED 1 1/2

Slide 13-48: Electrical Components: Batteries

Key Information

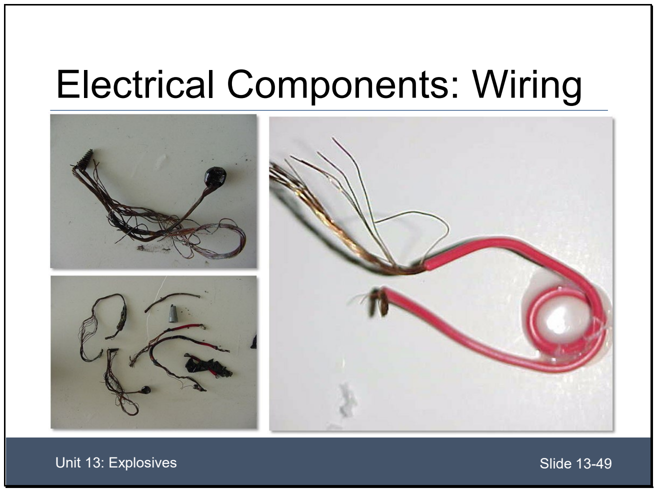
Batteries were found at the scene and identified.

Image 1: batteries found at the scene.

Image 2: additional battery found at the scene (1).

Image 3: additional battery found at the scene (2).

Slide 13-49: Electrical Components: Wiring



Key Information

Investigators worked to identify portions of wire found at the scene by comparing it with new samples.

Image 1: wire evidence found at the scene.

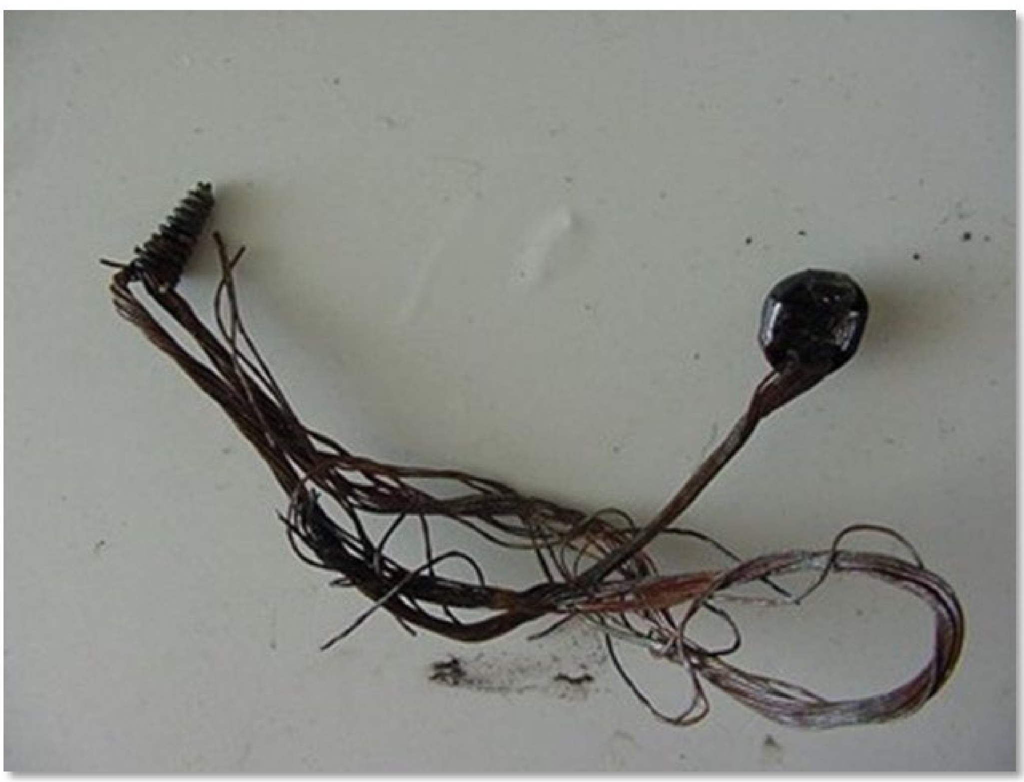


Image 2: additional wire evidence found at the scene.

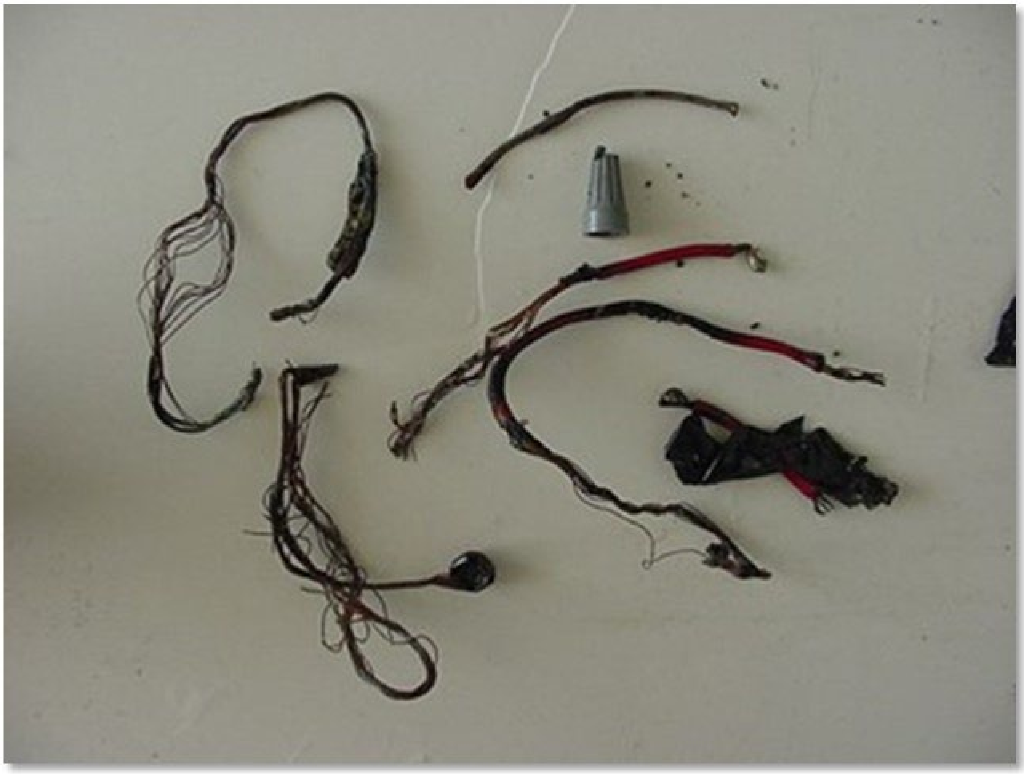
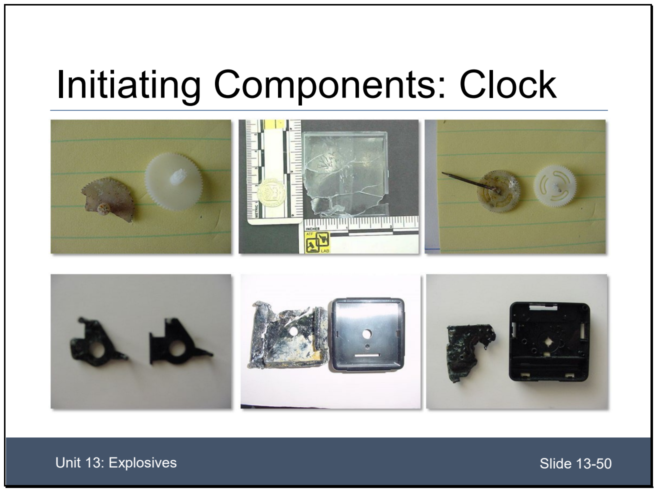


Image 3: wire used for comparison.

Slide 13-50: Initiating Components: Clock



Key Information

Evidence recovered from the scene was identified by comparison to undamaged clock parts.

Image 1: comparison of parts (1).

Image 2: comparison of parts (2).

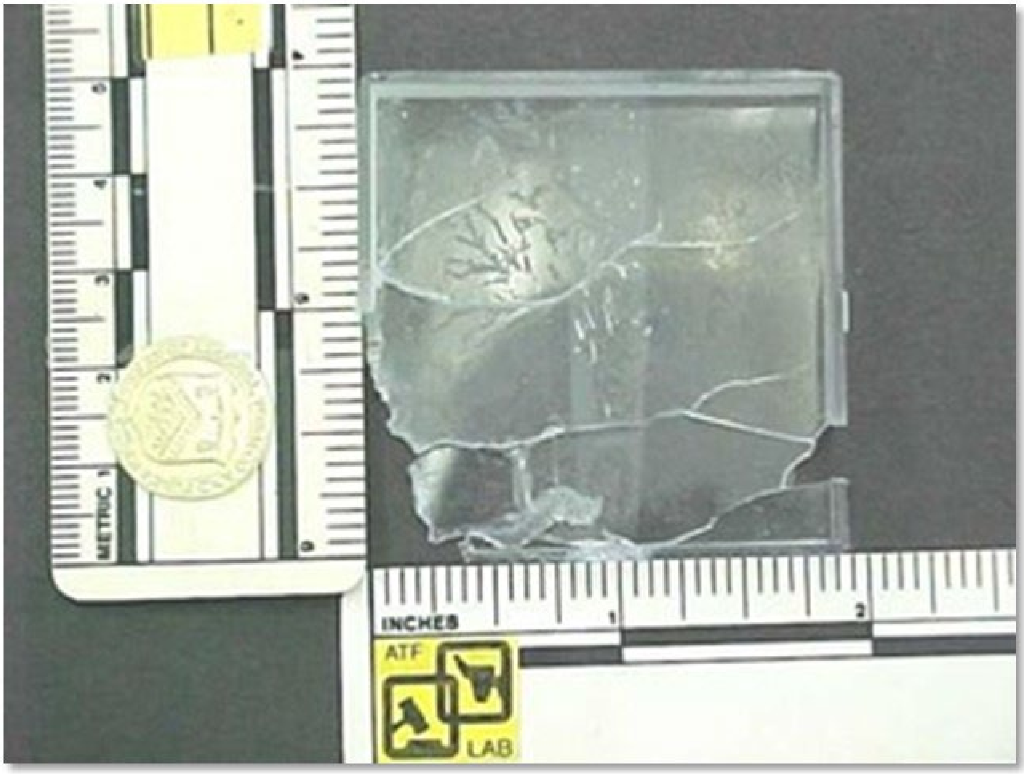


Image 3: comparison of parts (3).

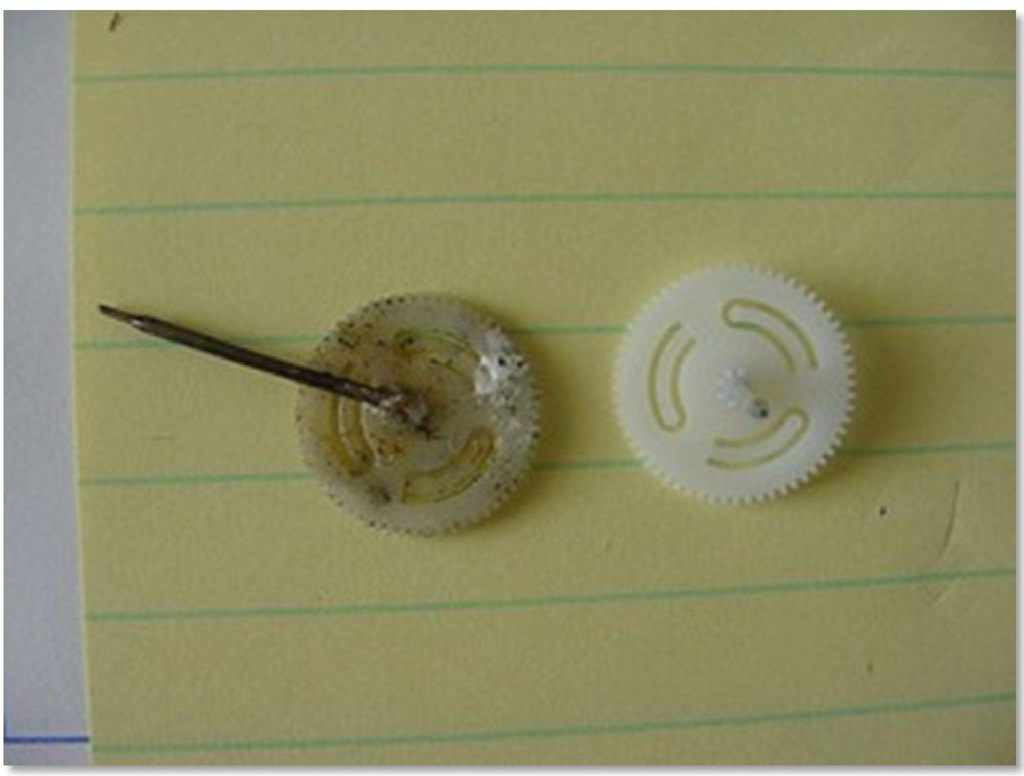
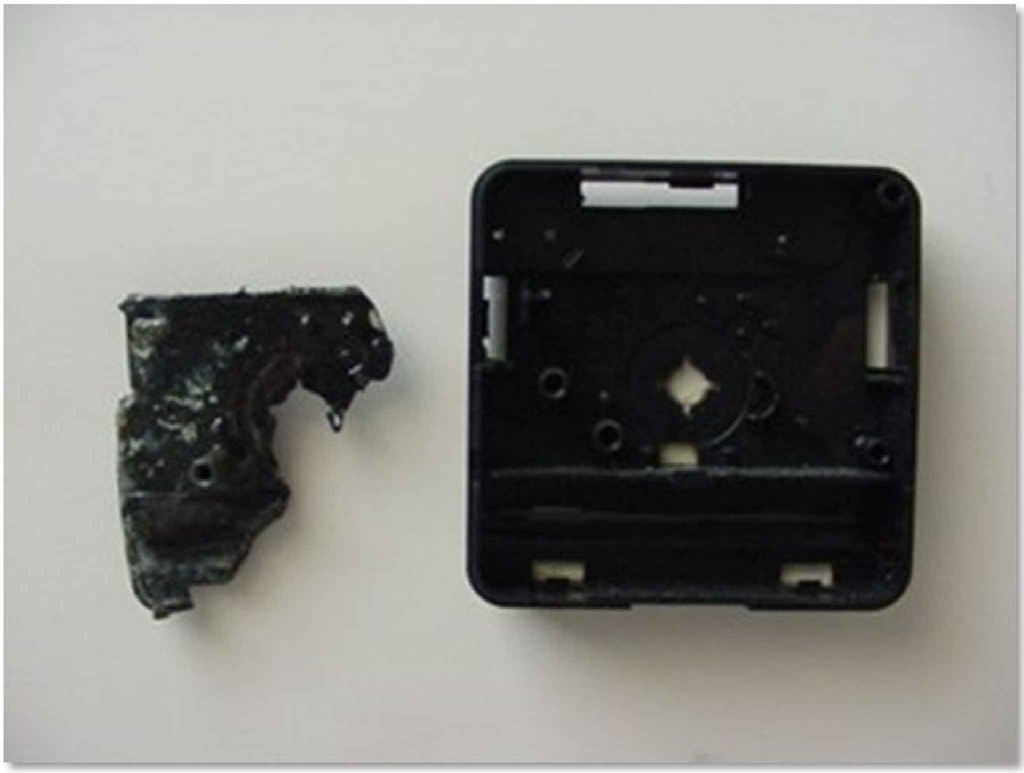


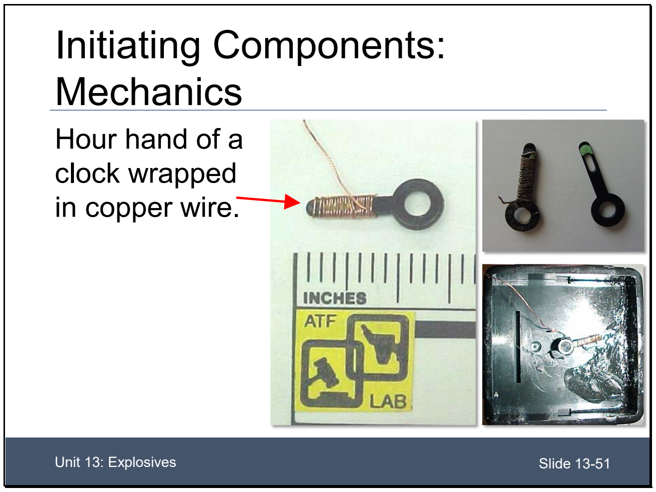
Image 4: comparison of parts (4).

Image 5: comparison of parts (5).

Image 6: comparison of parts (6).



Slide 13-51: Initiating Components: Mechanics



Key Information

Additional comparison of parts was done and included recreating components of the device using undamaged parts.

Image 1: copper wire wrapped around a clock hand.

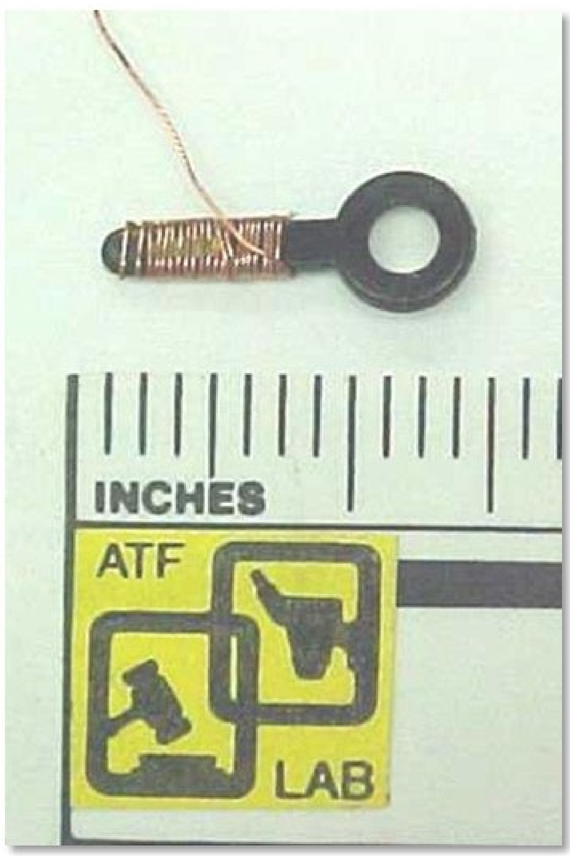
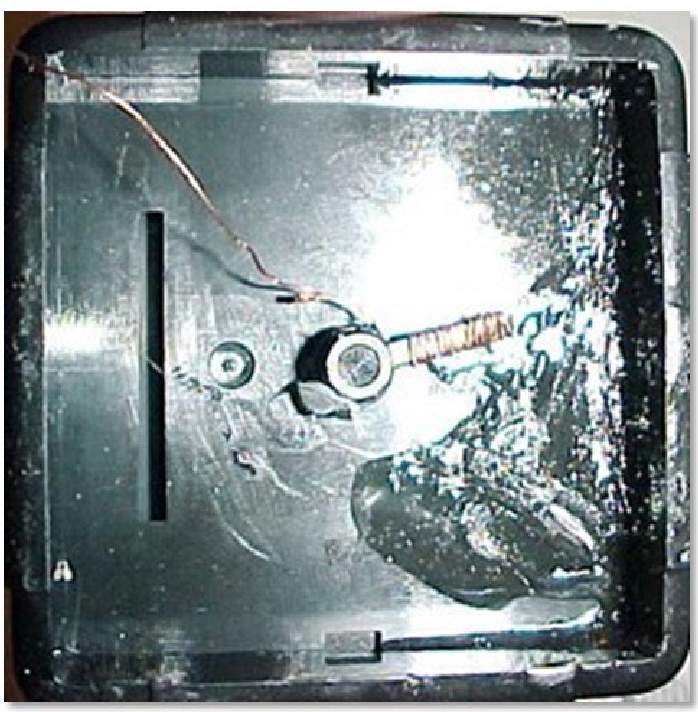
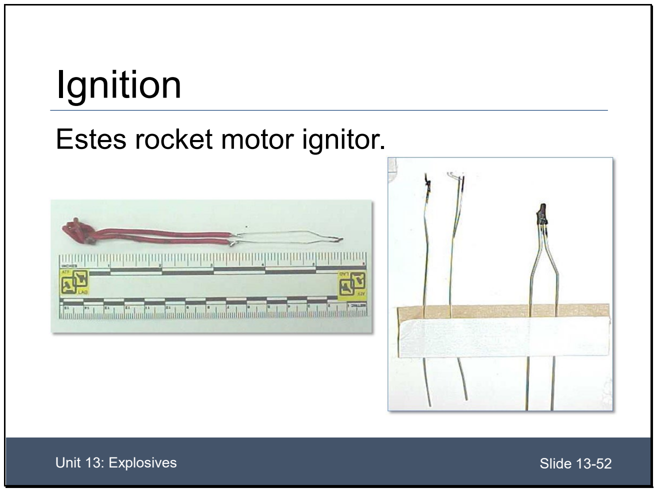


Image 2: evidence taken from the scene (left) compared to an undamaged clock hand (right).

Image 3: recreation of the explosive device using undamaged components for comparison.



Slide 13-52: Ignition



Key Information

Ignition components from the device were identified.

Image 1: Estes rocket motor ignitor (1).

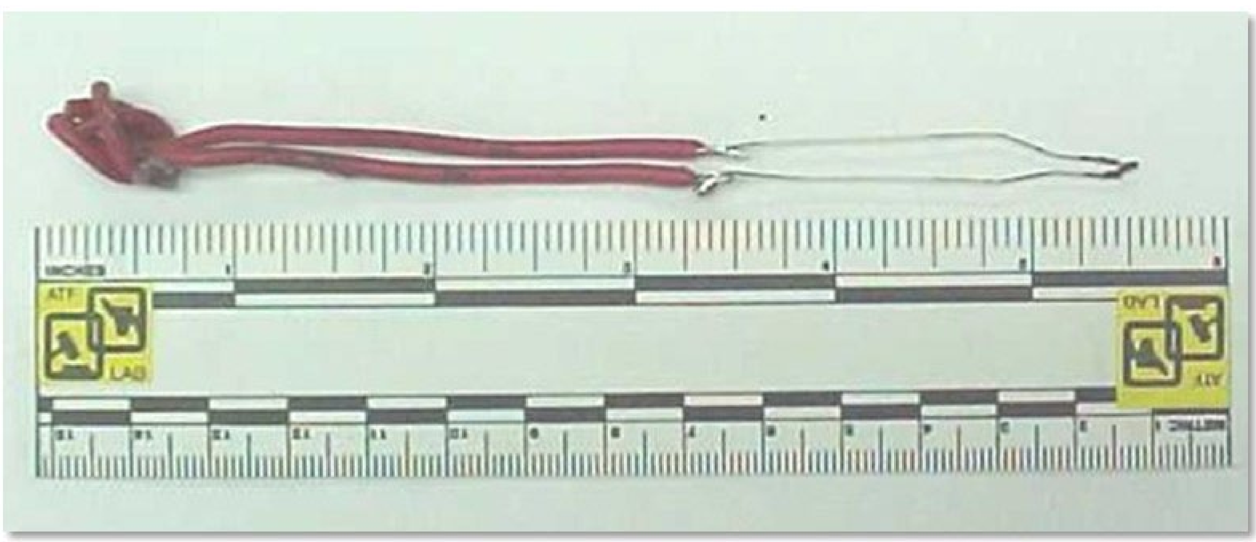
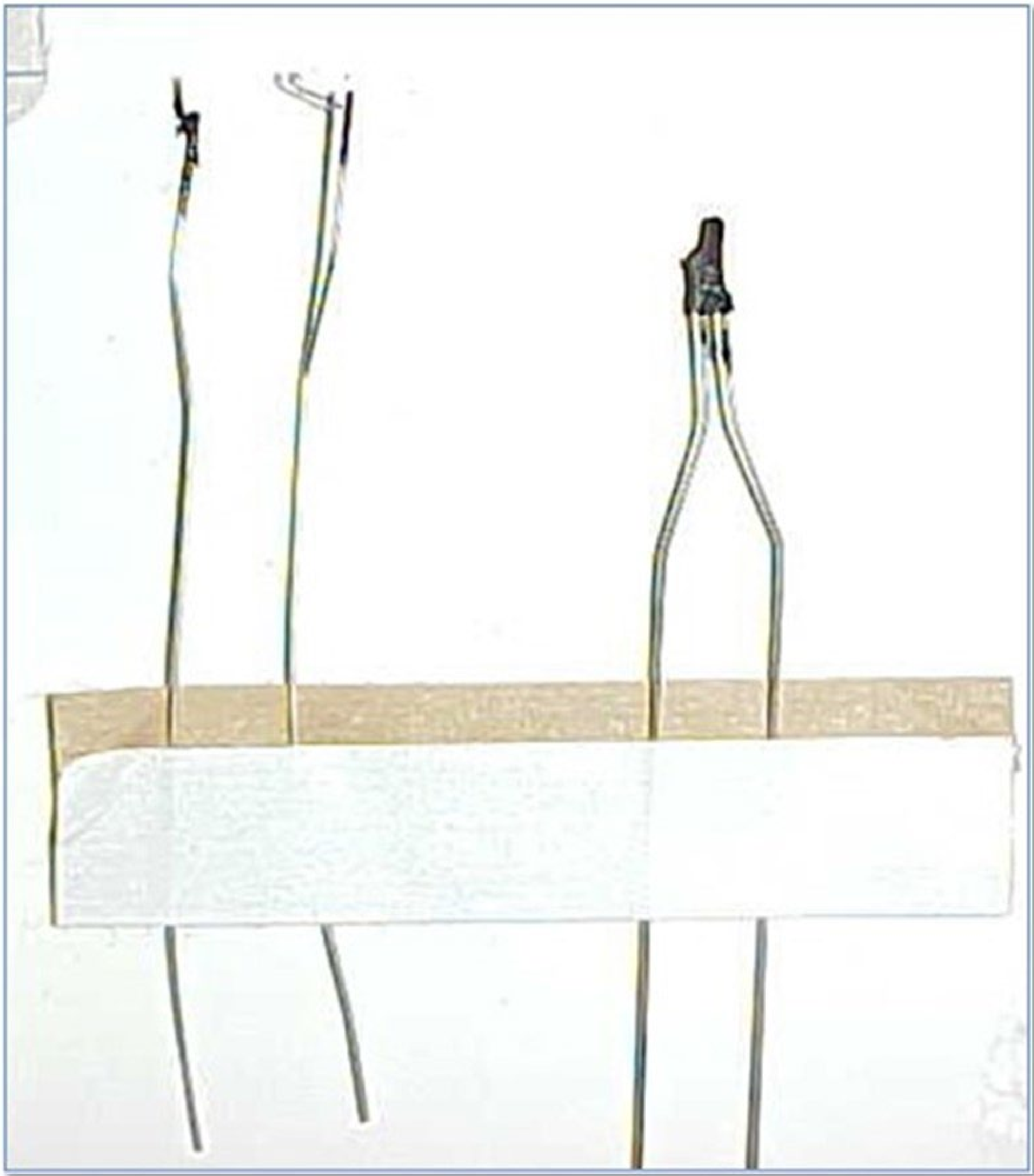


Image 2: Estes rocket motor ignitor (2).

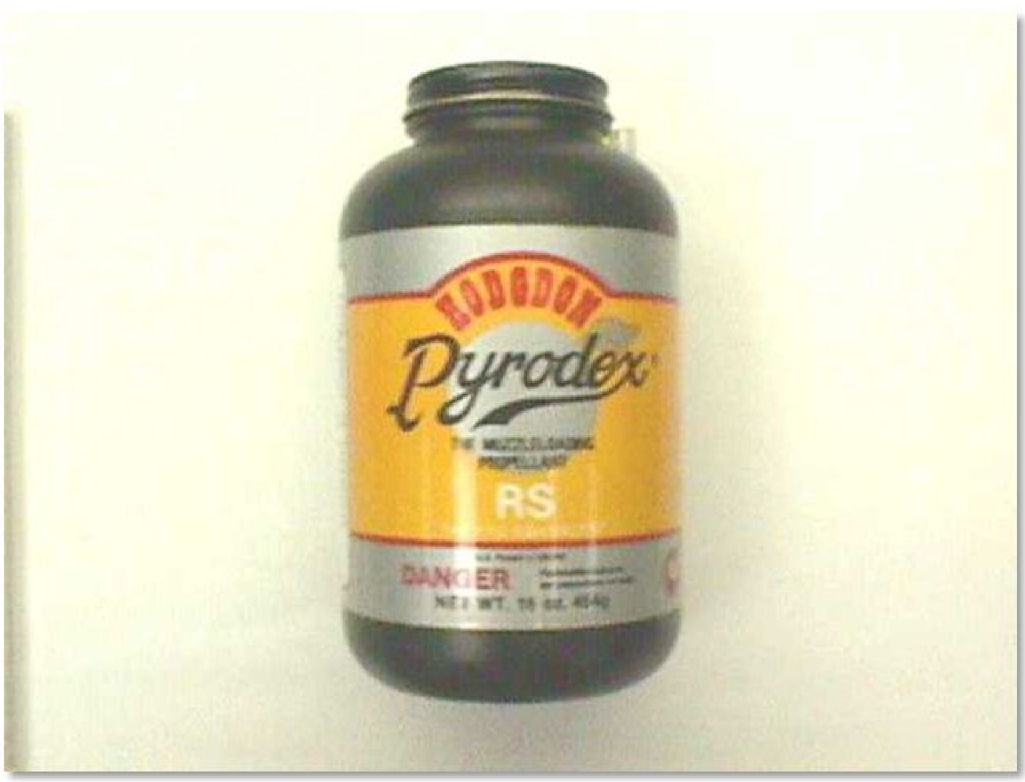


Slide 13-53: Explosive

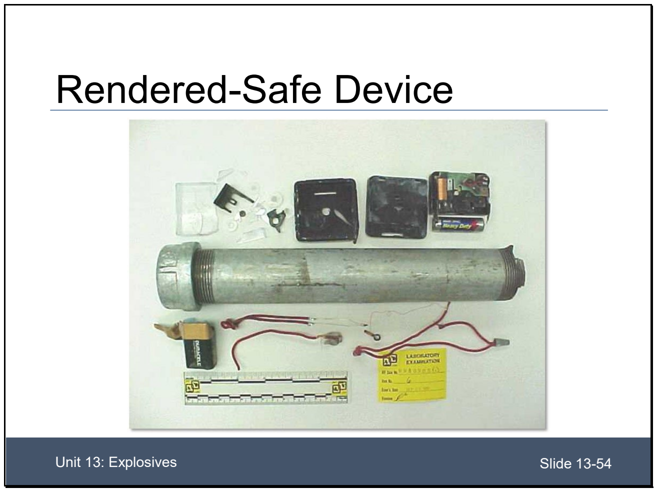
Key Information

Explosive material was identified.

Image 1: explosive material.



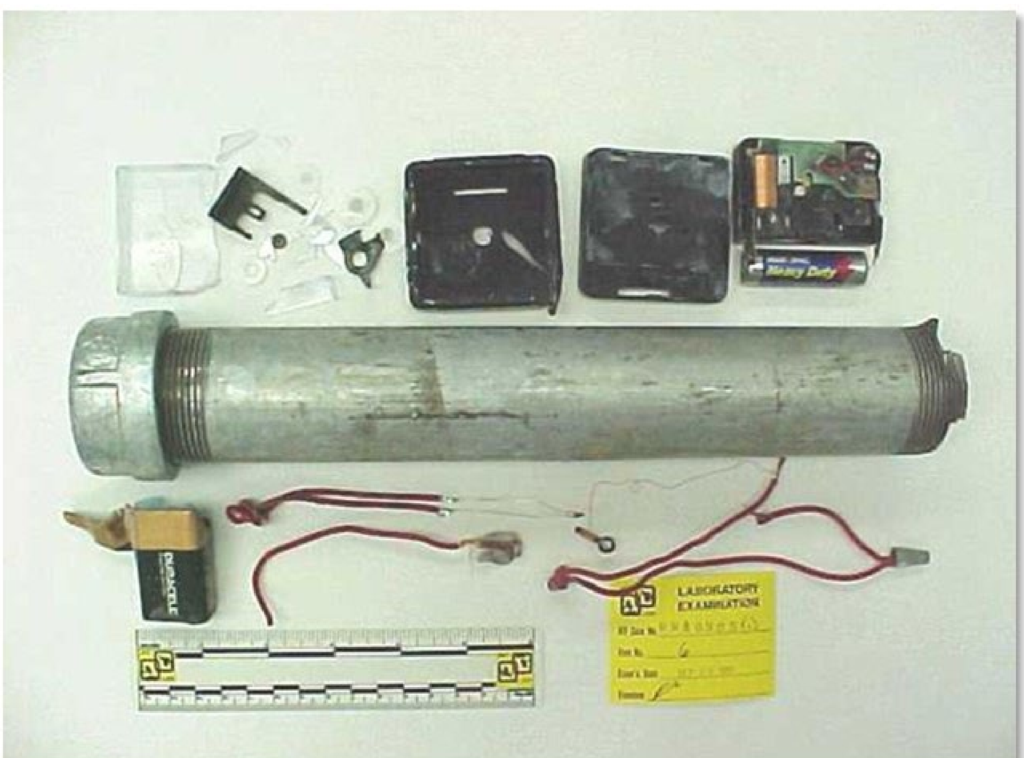
Slide 13-54: Rendered-Safe Device



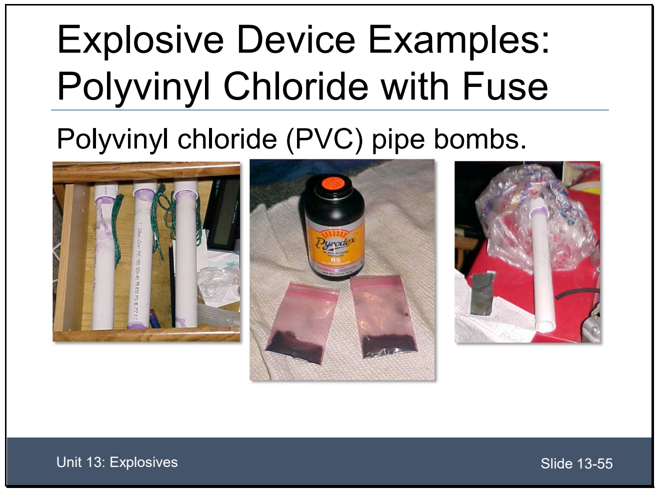
Key Information

These are the components that were left from the device that was rendered safe by the bomb squad. An analysis of these components, along with those found in the Concord and Asheboro, North Carolina, bombings, determined that the devices were all manufactured by the same person.

Image 1: explosive device components.



Slide 13-55: Explosive Device Examples: Polyvinyl Chloride with Fuse



Key Information

Explosive devices can be made from polyvinyl chloride (PVC) pipe.

Image 1: PVC pipe bombs.

Image 2: PVC explosive device components (1).

Image 3: PVC explosive device components (2).

Slide13-56: Explosive Device Examples: Galvanized Pipe with Fuse

Key Information

Another type of explosive device can be made from galvanized pipe.

Image 1: galvanized explosive device, close-up.

Image 2: galvanized explosive device and ball bearings.

Slide 13-57: Accidental Explosive Scenes

Accidental Explosive Scenes

- **Safety is the primary concern.**
- Determine role authority having jurisdiction (AHJ) should perform based on other concerns.
  - Prevent future incidents.
  - Code violations.

Unit 13: Explosives Slide 13-57

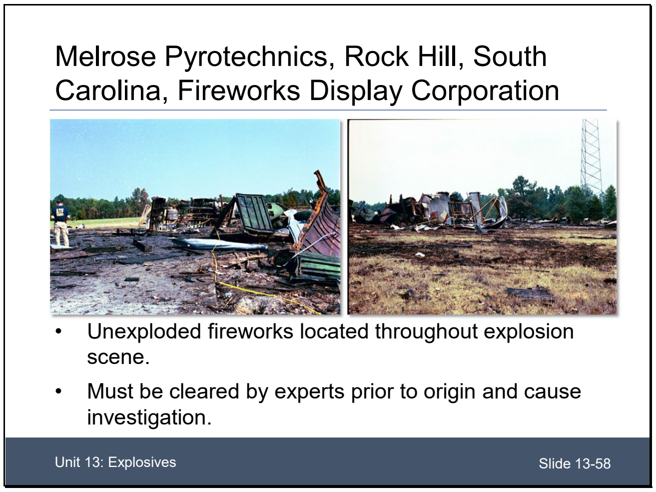
Key Information

The goal of any explosives investigation should be to determine the origin and cause, but also how to prevent further incidents. Was the explosion due to a code violation, which could have been prevented, or was this a malicious act? Understanding the cause (and the intent) will inform any steps to prevention.

Above all, safety is the primary concern.

Determine the role the authority having jurisdiction (AHJ) should perform based on other concerns. Use what you learn to prevent future incidents and code violations (where appropriate).

Slide 13-58: Melrose Pyrotechnics, Rock Hill, South Carolina, Fireworks Display Corporation



Key Information

Fireworks explosion: In this example, individuals were removing fuses from fireworks that had not been used during the Fourth of July. Unfortunately, these individuals were using improper tools and failed to follow proper safety protocols. As a result, one mortar ignited, firing into the trailer holding the remaining fireworks and causing a cascading reaction with nearby containers.

Unexploded fireworks were located throughout the scene. In such instances, the area must be cleared by experts prior to any origin and cause investigation.

(See images on next page.)

Image 1: Melrose Pyrotechnics, Rock Hill, South Carolina (1).

Image 2: Melrose Pyrotechnics, Rock Hill, South Carolina (2).

Slide 13-59: Melrose Pyrotechnics, Rock Hill, South Carolina

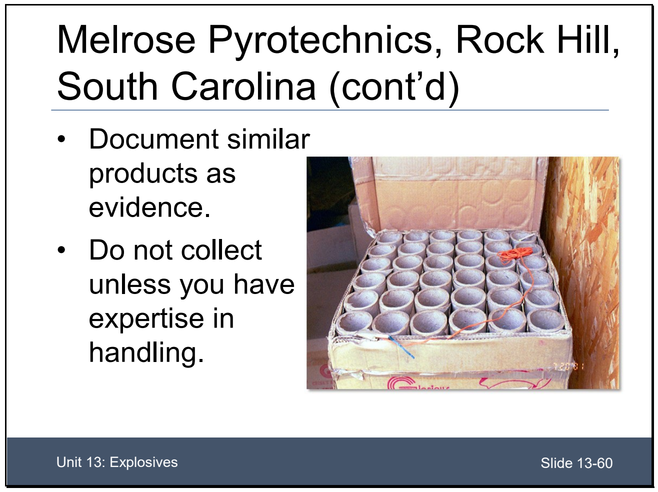
Key Information

This slide shows additional images of the scene, including the recovery of the victims' clothing.

Image 1: recovery of clothing.

Image 2: storage in cargo container.

Slide 13-60: Melrose Pyrotechnics, Rock Hill, South Carolina (cont'd)

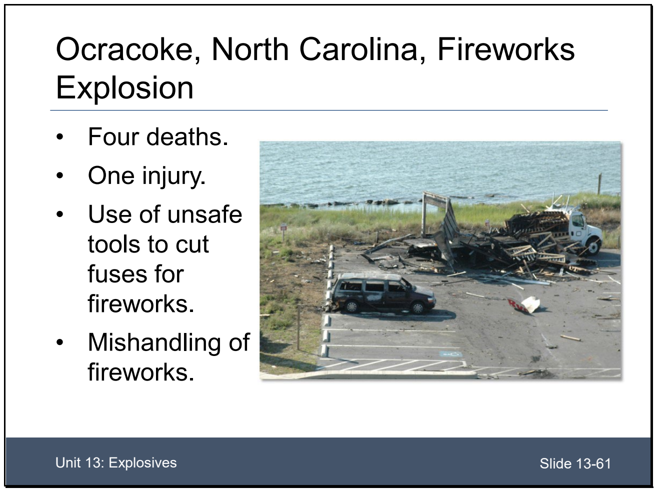


Key Information

Document similar products as evidence. Do not collect anything unless you have expertise in handling.

Image 1: similar items to be documented as evidence.

Slide 13-61: Ocracoke, North Carolina, Fireworks Explosion



Key Information

Another fireworks explosion occurred in Ocracoke, North Carolina, resulting in four deaths and one injury. Again, the mishandling of fireworks and use of unsafe tools caused this tragedy, emphasizing the importance of exercising extreme caution when dealing with explosive devices.

Image: Ocracoke, North Carolina, fireworks explosion site.

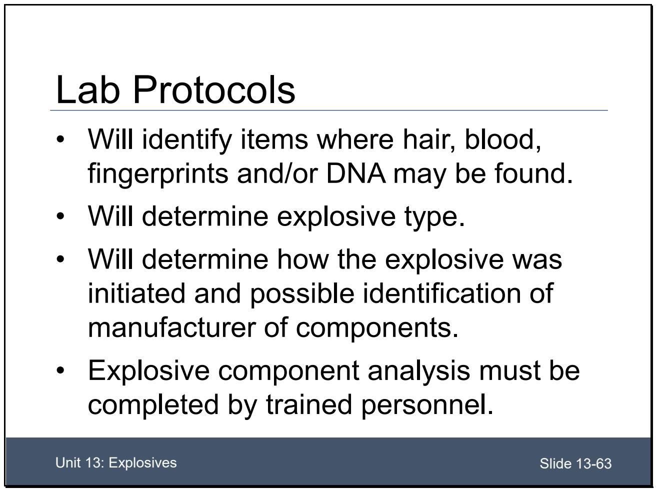
Slide 13-62: Ocracoke, North Carolina, Explosion Debris

Key Information

Image 1: Ocracoke, North Carolina, explosion debris, with improper tools as evidence (1).

Image 2: Ocracoke, North Carolina, explosion debris, with improper tools as evidence (2).

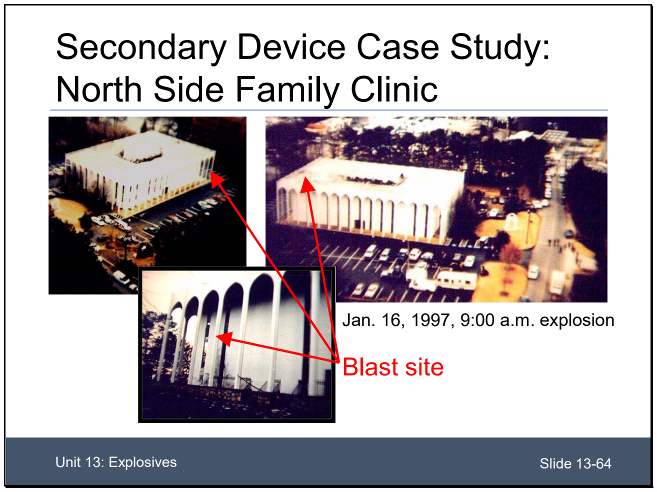
Slide 13-63: Lab Protocols



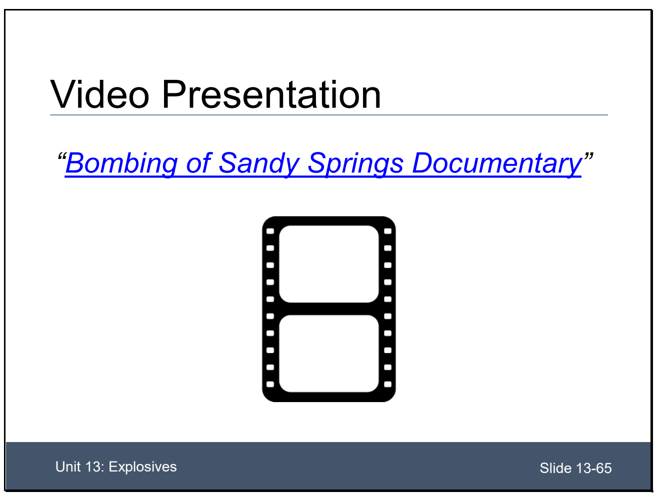
Key Information

- For explosives, the laboratory may identify or determine:
  - Items in which hair, blood, fingerprints and/or DNA may be found.
  - The type of explosives used.
  - How the explosive was initiated.
  - The manufacturer of components.
- A chemical laboratory analysis using Gas Chromatography-Mass Spectrometry (GC-MS) (as described in Unit 2: Ignitable Liquid) is the same as fire debris analysis.
- An explosive component analysis should be completed by well-trained personnel.

Slide 13-64: Secondary Device Case Study: North Side Family Clinic



Slide 13-65: Video Presentation



Key Information

The following slides relate to a series of bombings in Atlanta on Jan. 16, 1997. The original explosive device detonates, and emergency personnel arrive to respond. Approximately one hour later, a second device detonates.

For more information, watch "Bombing of Sandy Springs Documentary." (8:24)

Image 1: blast site.

Image 2: blast site, alternate view (1).

Image 3: blast site, alternate view (2).

Slide 13-66: North Side Family Clinic: Relation of Scene #2 to Original Scene

Key Information

Image 1: second blast site, alternate view (1).

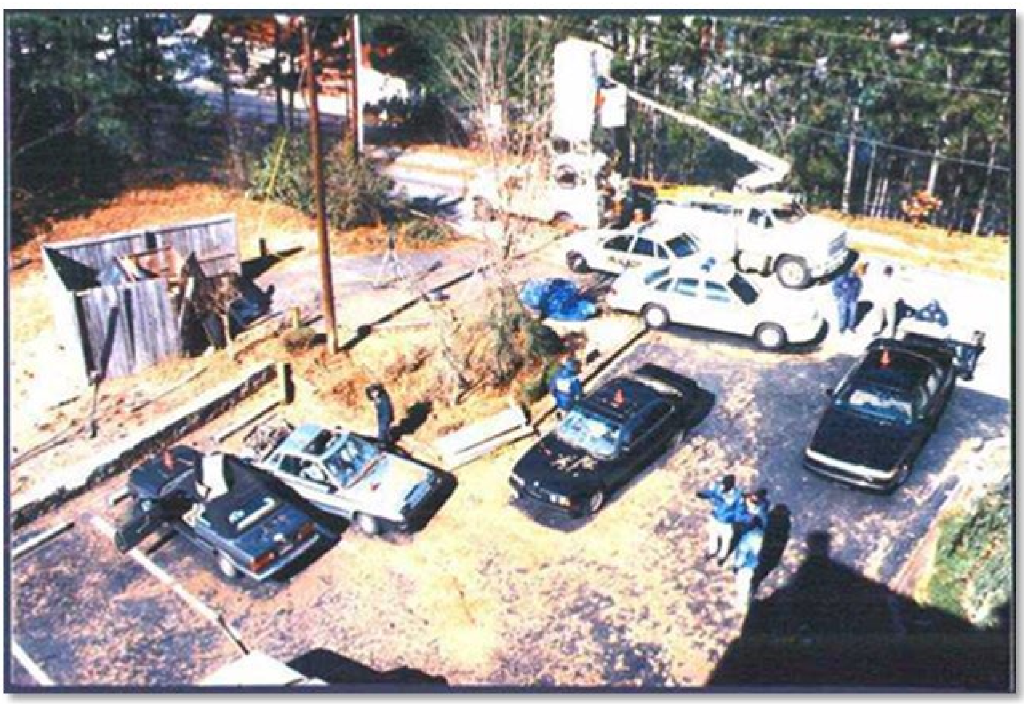
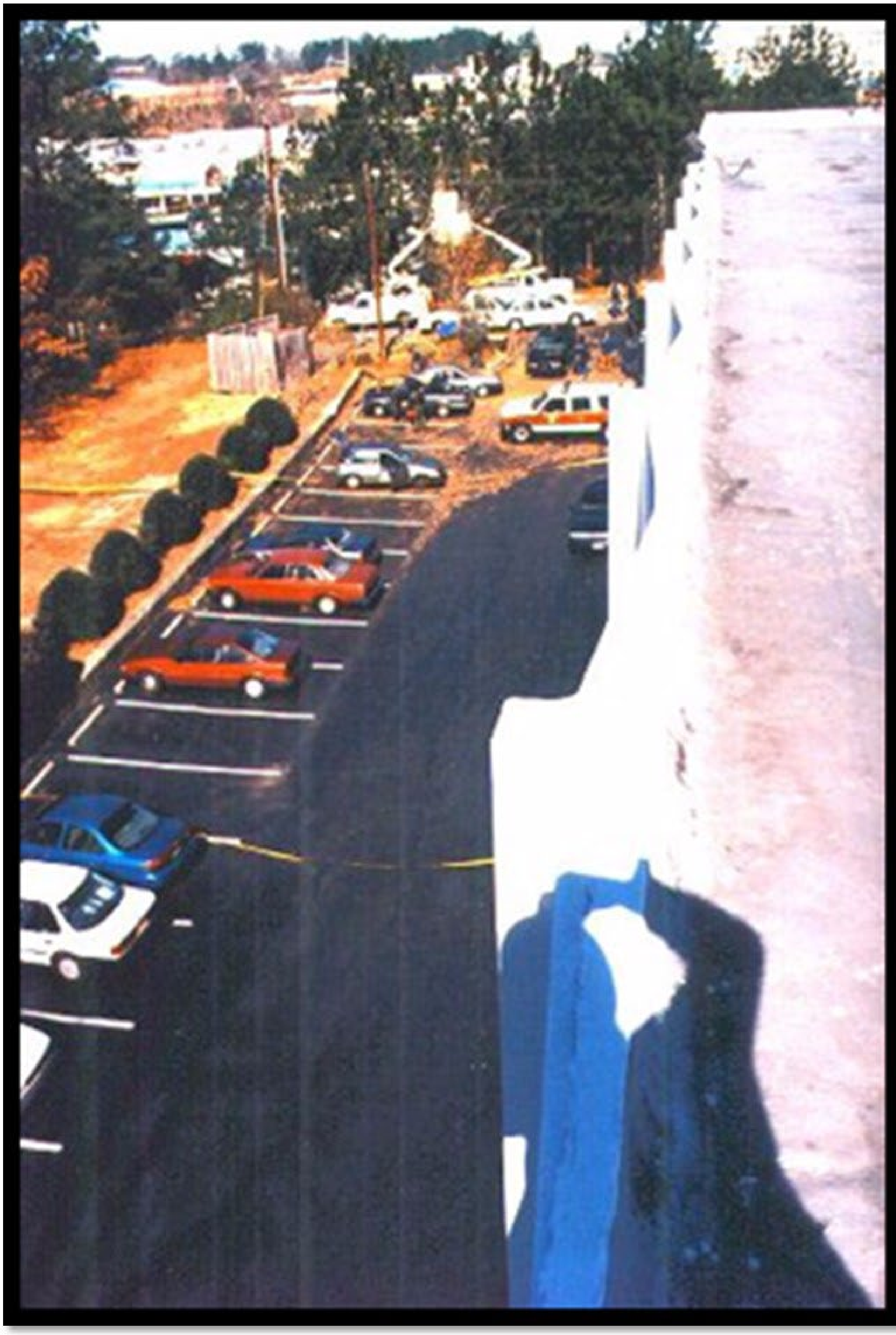
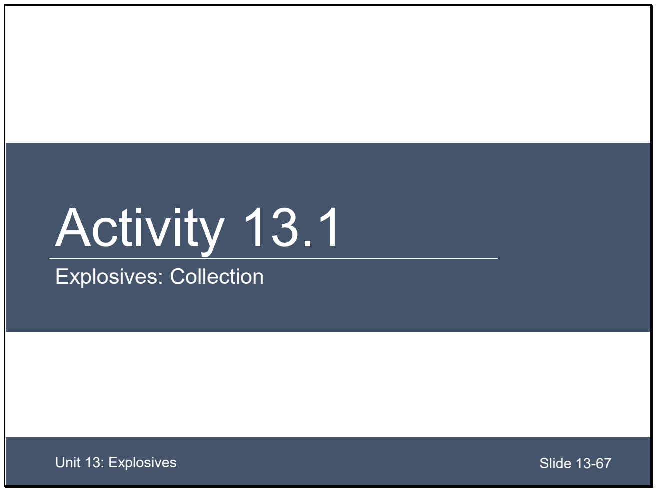


Image 2: second blast site, alternate view (2).



Slide 13-67: Activity 13.1



Activity Estimated Time: 75 minutes

Activity Purpose

Students will examine exploded device components and identify original components. Working in groups, students will use critical thinking to identify components and determine how best to document, collect and preserve evidence.

Activity Directions

1. Student groups will be assigned a container with different exploded component samples. In 30 minutes, students will work with their groups to examine exploded device components, identify original device components as evidence, and complete steps 2 and 3.

2. Document the evidence through photos and measurements.

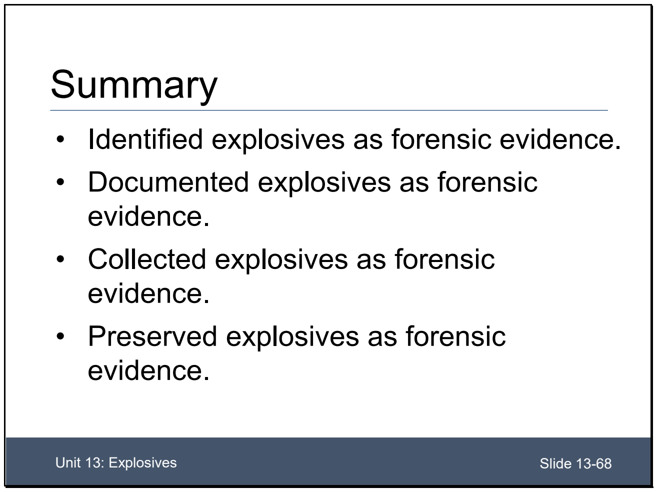
3. Select and execute the appropriate collection method for the given sample.

4. In a five-minute presentation, groups will present their items to the class and explain how they would be preserved for submission to the lab.

Tools

Biohazard materials (i.e., bags, tags, labels); first-aid kit; footwear, safety (e.g., protective shoes/boots); glasses, safety; gloves, heavy and disposable (e.g., surgical, latex); helmets, safety/hard hats; kneepads; outerwear, protective (e.g., disposable suits, weather gear); personnel support items (e.g., food, water, hygiene items, shelter); reflective tape; and respiratory equipment (e.g., particle masks, breathing equipment).

Slide 13-68: Summary



Key Information

Students should now be able to:

- Identify explosives as forensic evidence.
- Document explosives as forensic evidence.
- Collect explosives as forensic evidence.
- Preserve explosives as forensic evidence.

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R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 14: The Forensic Interview

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Evaluate circumstances to prepare for, conduct and document a successful interview.

Unit Enabling Learning Objectives (ELOs)

14.1 Evaluate circumstances to conduct a successful interview.
14.2 Evaluate circumstances to properly document a legally admissible interview.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Evaluate circumstances to prepare for, conduct and document a successful interview.	Practicum Part I: Crime Scene Investigation

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Evaluate circumstances to conduct a successful interview.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation
Evaluate circumstances to properly document a legally admissible interview.	Class dialogue/ facilitated discussion	Practicum Part I: Crime Scene Investigation

Unit Schedule

Topic	Duration
Discussion Questions: Interview Experience	5 min.
Video Presentation	60 min.
Interview Versus Interrogation	60 min.
General Interview Principles	10 min.
Video Presentation	10 min.
Interview and Statement Documentation	15 min.
Summary	5 min.

Audiovisual

Slides 14-1 to 14-17

Videos: "1st Police Interview"
"How to Interview "Almost" Anyone"
"Police Interview"
"Giving the Facts: Bad Cop, False Accusations, and Instagram Trolls"
"Murder Suspect Saad Osman Trashes Police Interview Room"

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Slide 14-1: The Forensic Interview

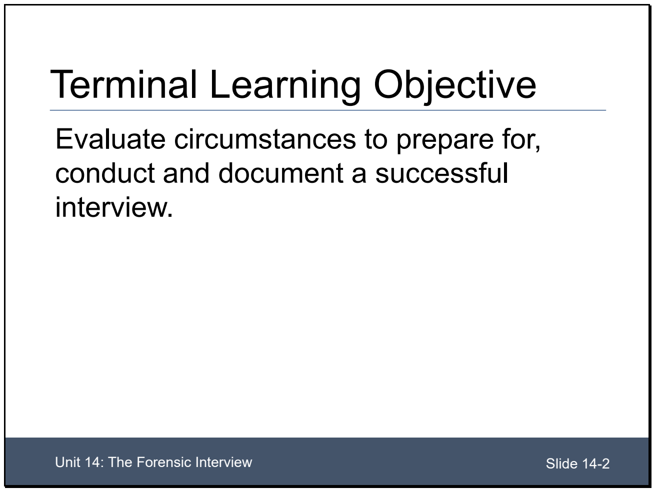
Key Information

Welcome to Unit 14: The Forensic Interview!

Investigating any crime will eventually require the investigator to conduct interviews with victims, witnesses or subjects. Conducting an interview requires knowledge, understanding and patience. A strong understanding of the crime and all available evidence will allow the investigator to conduct a comprehensive interview to determine what occurred at the crime scene.

Interviews fit into the scientific method as a means of collecting data and testing a hypothesis. The investigator should use interviews to assist with determining how the evidence fits into the crime that occurred.

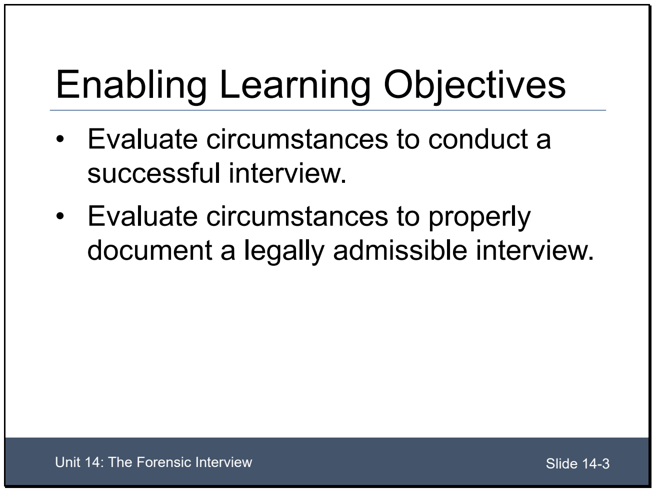
Slide 14-2: Terminal Learning Objective



Key Information

Evaluate circumstances to prepare for, conduct and document a successful interview.

Slide 14-3: Enabling Learning Objectives

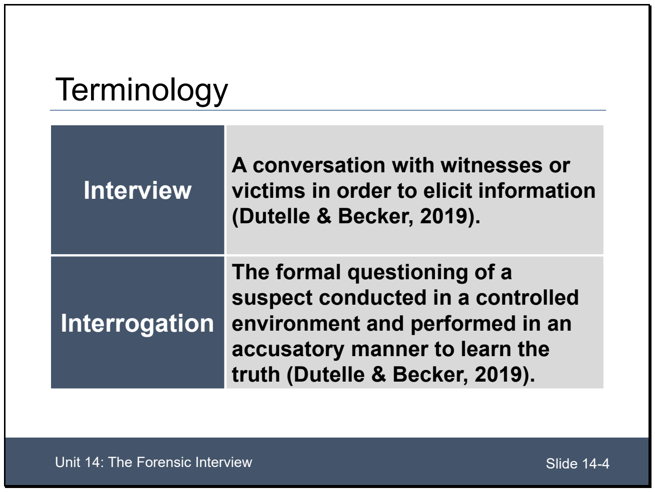


Key Information

After completing this unit, students will be able to:

- Evaluate circumstances to conduct a successful interview.
- Evaluate circumstances to properly document a legally admissible interview.

Slide 14-4: Terminology

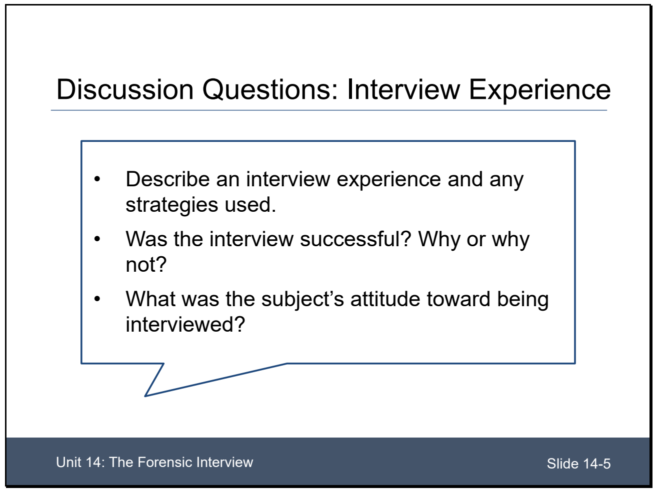


Key Information

An **interview** is a conversation with witnesses or victims in order to elicit information (Dutelle & Becker, 2019).

An **interrogation** is the formal questioning of a suspect conducted in a controlled environment and performed in an accusatory manner to learn the truth (Dutelle & Becker, 2019).

Slide 14-5: Discussion Questions: Interview Experience

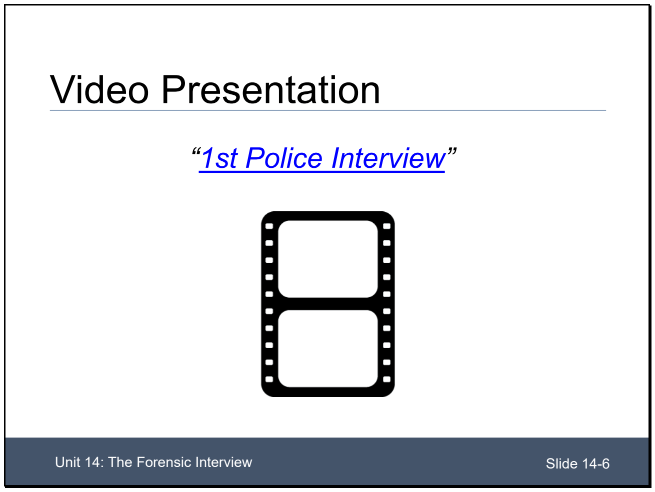


Key Information

Interviews range from casual questioning to formal, scheduled interviews. Share your interview experience, both good and bad, with the class by answering these questions:

- Describe an interview experience and any strategies used.
- Was the interview successful? Why or why not?
- What was the subject's attitude toward being interviewed?

Slide 14-6: Video Presentation

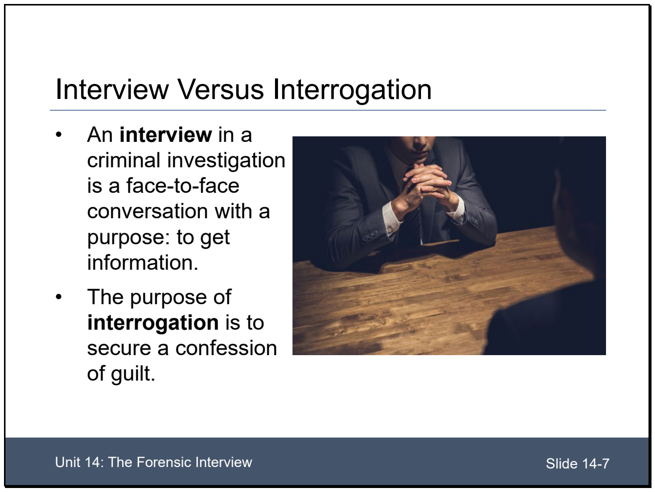


Key Information

This video provides an example of what can go wrong in an interview scenario. Pay close attention and consider how the behaviors and tactics you observe compare with your personal experiences or with your present understanding of how an interview should be conducted.

For more information, watch "1st Police Interview." (14:44)

Slide 14-7: Interview Versus Interrogation



Key Information

Interview

- An interview is a conversation with witnesses or victims in order to elicit information (Dutelle & Becker, 2019).

- Interviewing in criminal investigation is a face-to-face conversation with a purpose: to get information (Lushbaugh & Weston, 2015).

Interviewing people is a large part of any investigator's responsibilities. Investigators should attempt to extract as much information as possible out of witnesses, victims and sometimes suspects on the scene. Not everyone sees, hears, feels or tastes the same thing when an event occurs. Some witnesses may see a portion of an event, while others see something else entirely from a different angle. The investigator needs to understand not only what information can be obtained during an interview but also techniques in how to elicit helpful information.

Interrogation

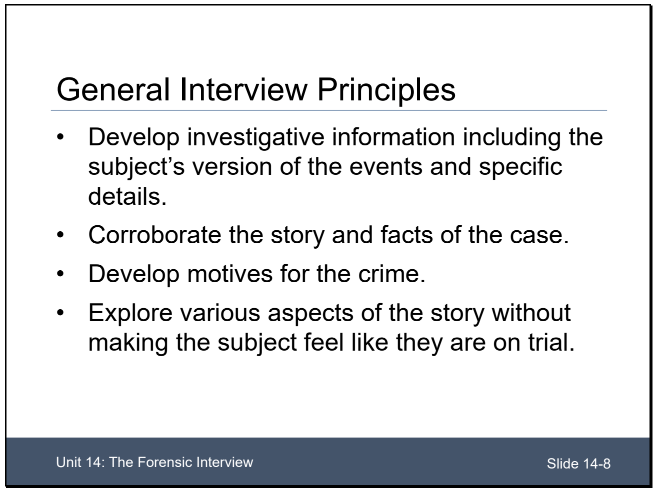
- An interrogation is the formal questioning of a suspect conducted in a controlled environment and performed in an accusatory manner to learn the truth (Dutelle & Becker, 2019).

- The purpose of interrogation is to secure a confession of guilt (Lushbaugh & Weston, 2015).

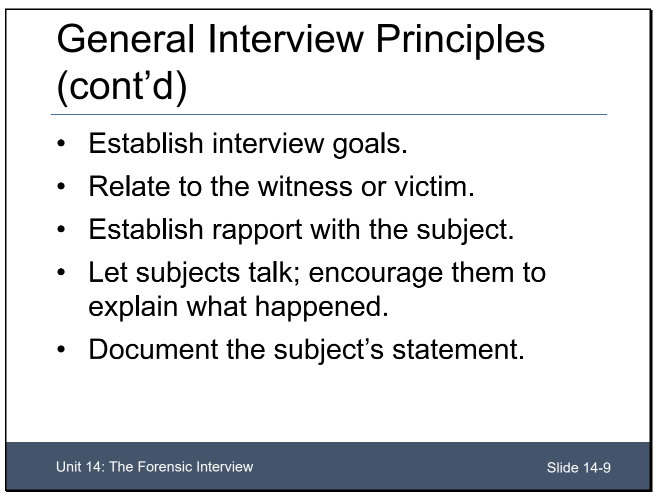
An interrogation is a more in-depth interview and usually involves trying to get someone to confess or admit to something. In the criminal world, an interrogation is usually conducted by a sworn law enforcement officer since the subject's Fourth Amendment protections are involved.

This unit will focus on interviews.

Slide 14-8: General Interview Principles



Slide 14-9: General Interview Principles (cont’d)



Key Information

Interviews are conducted to:

- Develop investigative information including the subject’s version of the events and specific details (by asking “who,” “what,” “when,” “where,” “why” and “how” questions).

- Corroborate the story and facts of the case (e.g., does the scene match what the witness/victim states).

- Develop motives for the crime.
- Explore various aspects of the story without making the subject feel like they are on trial.
- Establish interview goals.
- Relate to the witness or victim.
- Establish rapport with the subject.
- Let subjects talk; encourage them to explain what happened.
- Document the subject’s statement.

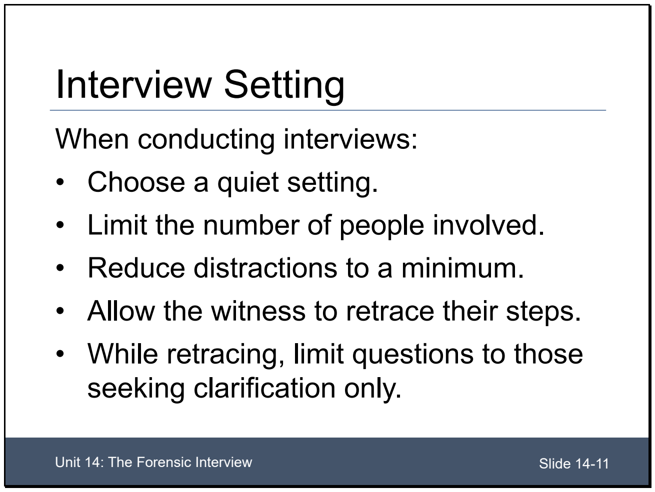
Slide 14-10: Video Presentation

Key Information

In this video, veteran radio host/DJ Mike Dronkers shares his experience with conducting successful, engaging interviews. As you watch the video, consider how the proposed strategies and tactics compare with your personal experiences or with your present understanding of how an interview should be conducted.

For more information, watch "How to Interview 'Almost' Anyone." (11:23)

Slide 14-11: Interview Setting

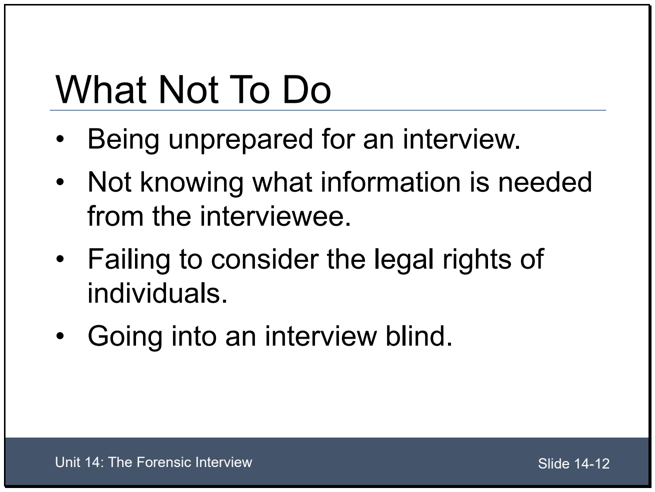


Key Information

To conduct an interview, ideally the location would need to be a quiet setting, away from others, to allow for one-on-one communication. The interviewer should reduce distractions while maintaining an environment with as few people as possible.

The investigator should understand how humans act and think when they observe something. No two people view things the same way. Thus, placing the witness in the location where they witnessed the event is important. Have the witness retrace their steps with you and try to limit questions; ask questions only to clarify.

Slide 14-12: What Not To Do

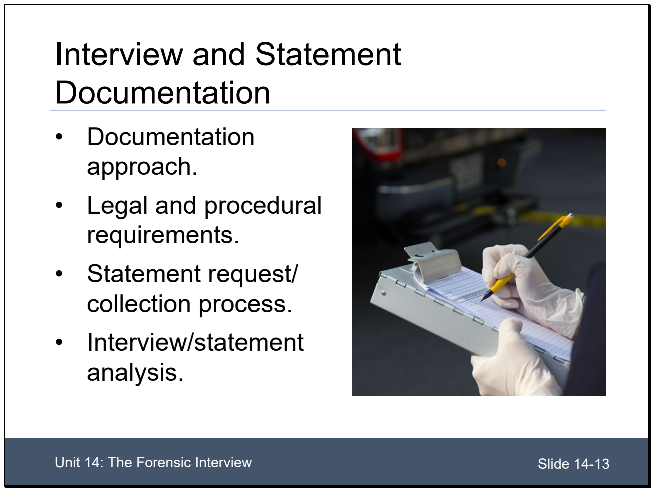


Key Information

Care should be taken when preparing for an interview. There are many "correct" things to do in preparing for and conducting an investigation. However, there are some other things the interviewer should consider prior to conducting an interview.

- Know the status of the person to be interviewed.
  - Are they a victim, witness, person of interest or suspect?
  - If a victim or witness, the interviewer should ensure they have a clear path of what information is needed.
  - If a person of interest or suspect, the interviewer should weigh the information they would like to obtain against the outcome of the case involving the individual.
- The law is specific on an individual's right to remain silent (e.g., Fourth and Fifth amendments to the U.S. Constitution). If there is a need to consider someone's rights before interviewing, then the interviewer should consider seeking legal counsel from the prosecutor having jurisdiction.
- The interviewer should not go into an interview blind. The more information the interviewer has, the better the conversation can be guided.

Slide 14-13: Interview and Statement Documentation



Key Information

Crime scenes provide the results of a criminal act but do not always help to explain why or how the act occurred. Interviews and their resulting statements, therefore, can be extremely valuable investigative tools.

Interview and statement documentation considerations include:

- Documentation approach.
- Legal and procedural requirements.
- Statement request/collection process.
- Interview/statement analysis.

Slide 14-14: Documentation Approach

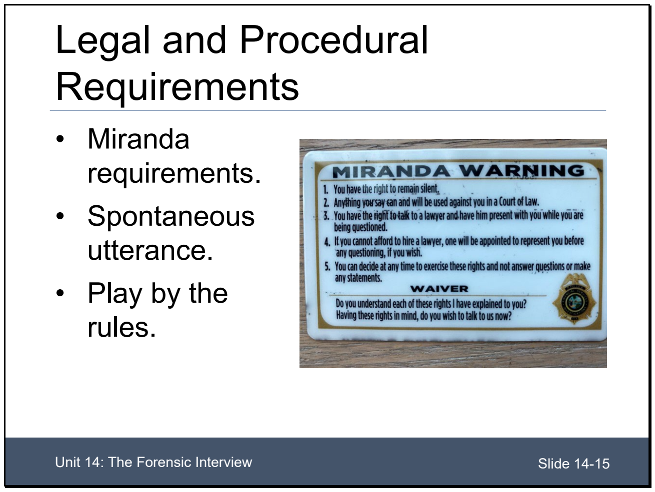
Key Information

Interviews, including field interviews and formal interviews, should be documented using a written or recorded method. This may not always be possible; however, achieving a documented interview from a witness can be valuable for clarification of events. In some circumstances, such as a field interview, formal documentation may not be possible. When this occurs, the investigator should be prepared to take detailed notes.

- A recording (e.g., tape or video) provides the information in the witness's own words.
- Written statements can be used to provide the witness with an opportunity to write their observations in their own words. Diagrams can be used to supplement a statement by allowing the witness to articulate locations, movements and points of reference within a given space.

An interview is an official activity of any investigation and includes the crime scene. The investigator should confer with their local jurisdiction and policy to ensure compliance with the legal requirements.

Slide 14-15: Legal and Procedural Requirements

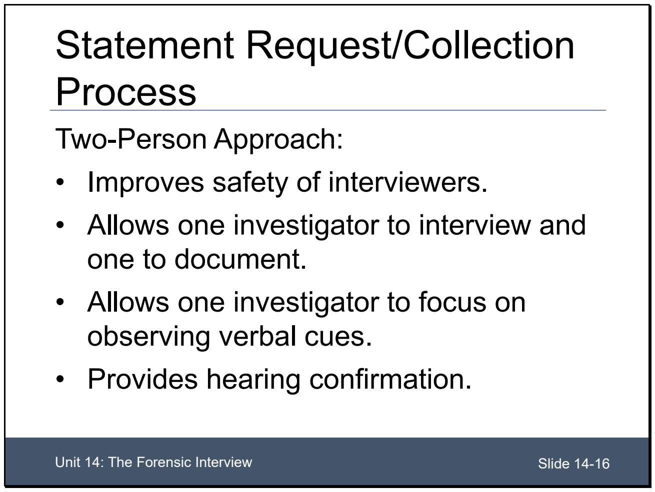


Key Information

The investigator must consider the legalities involved and be knowledgeable of the legal and procedural requirements of conducting an interview or interrogation of a witness, victim or suspect.

- Miranda requirements.
  - Not needed for an interview; subjects are present and participate of their own free will and are free to leave at any time.
  - Required if the subject is in custody (e.g., under arrest or detained and not free to leave).
  - Location of the interrogation (e.g., back of a patrol car, booking facility, interrogation room).
  - Interviewee must decide if they want a lawyer; do not make the decision for them.
  - Waiver of rights, in verbal and written formats (*Miranda v. Arizona*, 1966).
- **Spontaneous utterance:** statements made by the suspect/subject when not prompted by an agent of the government (*Miranda v. Arizona*, 1966).
- Legal requirements (i.e., agent of the government, law enforcement). Do you have the authority to take a statement under oath?

Slide 14-16: Statement Request/Collection Process

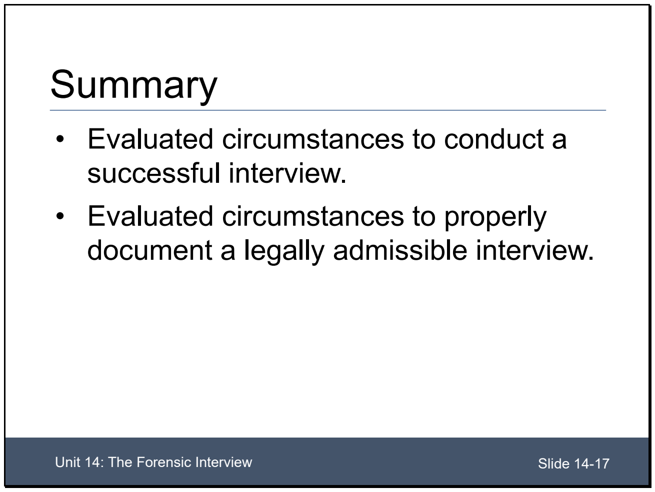


Key Information

An interview can be conducted with one or two people. The safety of the witness and interviewer, as well as the accurate documentation of the interview, are important.

- **One-Person Approach:** involves one person conducting the interview.
  - Maintains direct communication with the person being interviewed.
  - Documentation while maintaining direct communication can be difficult.
  - Should be conducted at a slower pace to ensure accuracy.
- **Two-Person Approach:** involves two people conducting the interview.
  - Improves safety of the interviewers.
  - Allows one investigator to interview and one to document.
  - Allows one investigator to focus on observing verbal cues.
  - Provides confirmation of what was heard during the interview.

Slide 14-17: Summary



Key Information

You should now be able to:

- Evaluate circumstances to conduct a successful interview.
- Evaluate circumstances to properly document a legally admissible interview.

R0780: Fire Investigation: Forensic Evidence and Interviewing

Unit 15: Practicum

Student Manual
September 2024

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Contents

Unit Terminal Learning Objective (TLO)

Develop a plan to conduct, document, analyze and communicate the findings of a crime scene investigation.

Unit Enabling Learning Objectives (ELOs)

15.1 Conduct a safe and systematic crime scene investigation to determine the evidence that can be collected and used.
15.2 Collect crime scene evidence in a manner that will preserve the evidence for laboratory analysis.
15.3 Request the appropriate laboratory testing.
15.4 Analyze laboratory result findings to distinguish pertinent evidence.
15.5 Prepare a presentation that includes all appropriate documentation to complete a crime scene analysis.

Objective/Content Alignment

Terminal Learning Objective (TLO)	Evaluation Method
Develop a plan to conduct, document, analyze and communicate the findings of a crime scene investigation.	Practicum Part I: Crime Scene Investigation Practicum Part III: Final Narrative Practicum Part IV: Prosecutor Presentation

Enabling Learning Objectives (ELOs)	Course Component	Evaluation Method
Conduct a safe and systematic crime scene investigation to determine the evidence that can be collected and used.	Practicum Part I: Crime Scene Investigation Practicum Part II: Submit Lab Requests Practicum Part III: Final Narrative Practicum Part IV: Prosecutor Presentation	Practicum Part I: Crime Scene Investigation Practicum Part III: Final Narrative Practicum Part IV: Prosecutor Presentation
Collect crime scene evidence in a manner that will preserve the evidence for laboratory analysis.	Practicum Part I: Crime Scene Investigation	Practicum Part I: Crime Scene Investigation
Request the appropriate laboratory testing.	Practicum Part II: Submit Lab Requests	Practicum Part III: Final Narrative

Analyze laboratory result findings to distinguish pertinent evidence.	Practicum Part III: Final Narrative	Practicum Part III: Final Narrative
Prepare a presentation that includes all appropriate documentation to complete a crime scene analysis.	Practicum Part IV: Prosecutor Presentation	Practicum Part IV: Prosecutor Presentation

Unit Schedule

Topic	Duration
Practicum Overview	30 min.
Practicum Part I: Crime Scene Investigation	240 min.
Practicum Part II: Submit Lab Requests	120 min.
Practicum Part III: Final Narrative	120 min.
Practicum Part IV: Prosecutor Presentation	240 min.
Final Exam	75 min.
Summary	5 min.

Audiovisual

Slides 15-1 to 15-14

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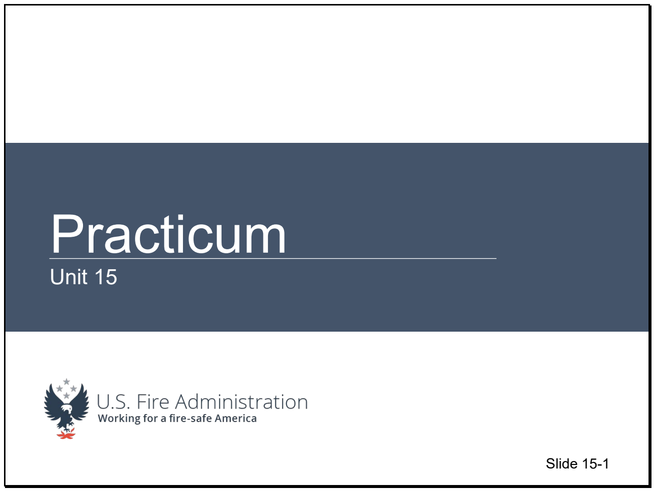
Slide 15-1: Practicum

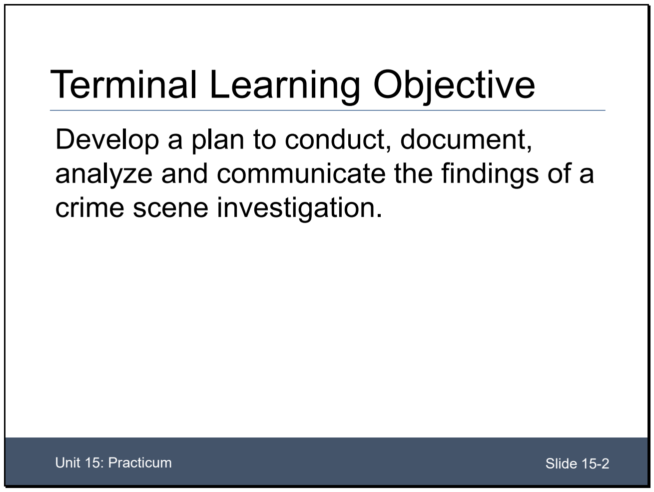


Key Information

Welcome to the final unit, Unit 15: Practicum!

Throughout this unit, students will work in groups to conduct a staged crime scene investigation to demonstrate the skills and techniques learned throughout the course. The practicum will include the initial crime scene investigation, submission of lab requests, preparation of a final narrative and a prosecutor presentation.

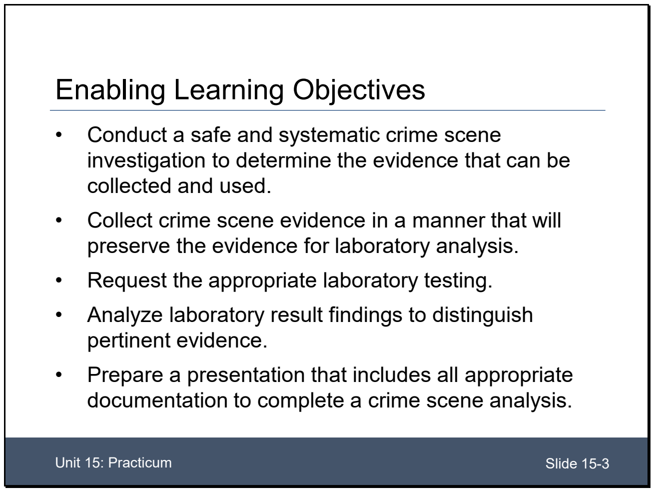
Slide 15-2: Terminal Learning Objective



Key Information

Develop a plan to conduct, document, analyze and communicate the findings of a crime scene investigation.

Slide 15-3: Enabling Learning Objectives

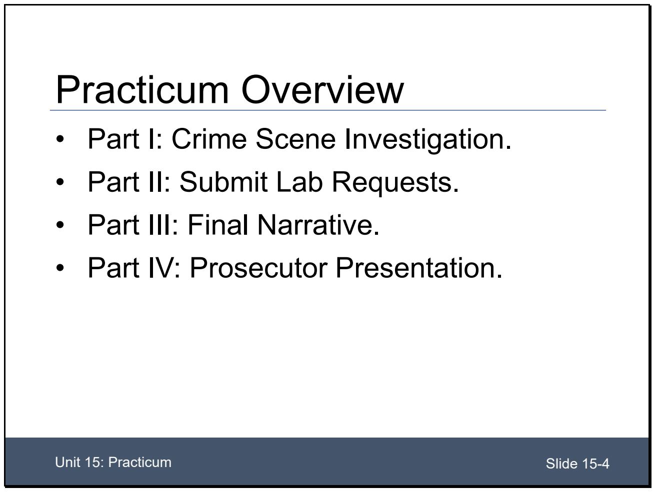


Key Information

After completing this unit, students will be able to:

- Conduct a safe and systematic crime scene investigation to determine the evidence that can be collected and used.
- Collect crime scene evidence in a manner that will preserve the evidence for laboratory analysis.
- Request the appropriate laboratory testing.
- Analyze laboratory result findings to distinguish pertinent evidence.
- Prepare a presentation that includes all appropriate documentation to complete a crime scene analysis.

Slide 15-4: Practicum Overview

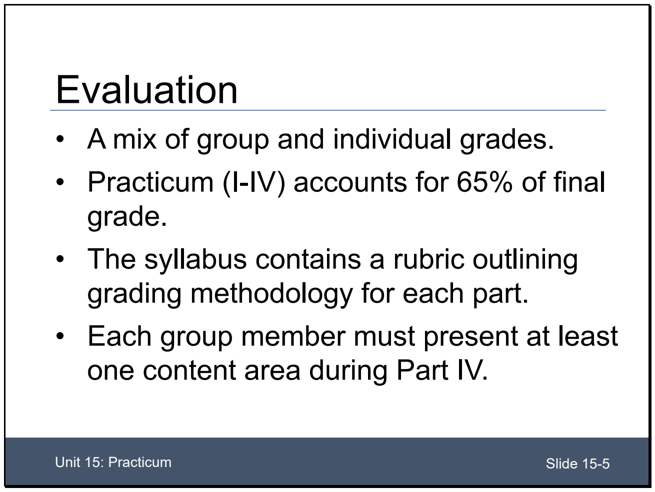


Key Information

Unit 15 activities include:

- Practicum Part I: Crime Scene Investigation.
- Practicum Part II: Submit Lab Requests.
- Practicum Part III: Final Narrative.
- Practicum Part IV: Prosecutor Presentation.

Slide 15-5: Evaluation

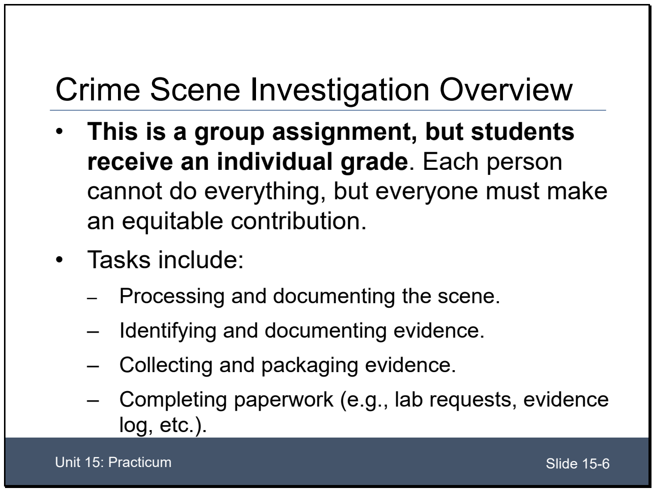


Key Information

Course evaluation considerations:

- The activities in this unit will be a mix of group and individual assignments as follows:
  - **Practicum Part I:** group assignment with individual grades for everyone.
  - **Practicum Part II:** group assignment with a single grade for the group.
  - **Practicum Part III:** individual assignment with individual grades.
  - **Practicum Part IV:** group assignment with a single grade for the group.
- The Practicum (Parts I-IV) accounts for 65% of the final grade.
- The syllabus contains a rubric outlining the grading methodology for each part.
- Each group member must present at least one content area during Practicum Part IV.
- Please refer to the individual assignment directions and the course syllabus for detailed instructions, grading information and rubrics.

Slide 15-6: Crime Scene Investigation Overview

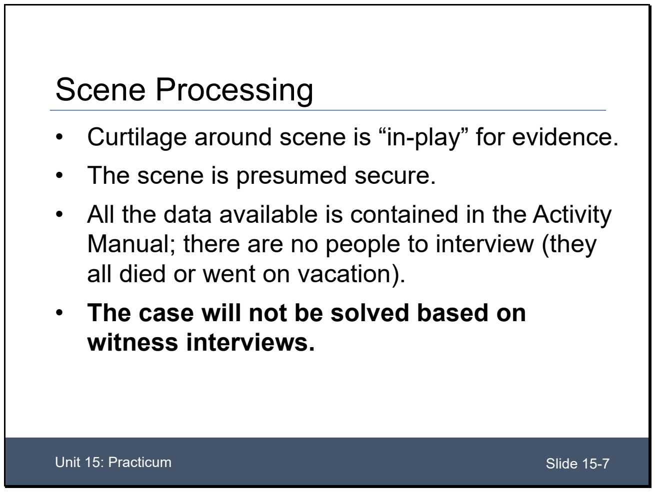


Key Information

Crime scene investigation overview:

- **This is a group assignment; however, students will be graded individually.**
- Tasks include:
  - Processing and documenting the scene.
  - Identifying and documenting evidence.
  - Collecting and packaging evidence.
  - Completing paperwork (e.g., lab requests, evidence log, etc.).

Slide 15-7: Scene Processing

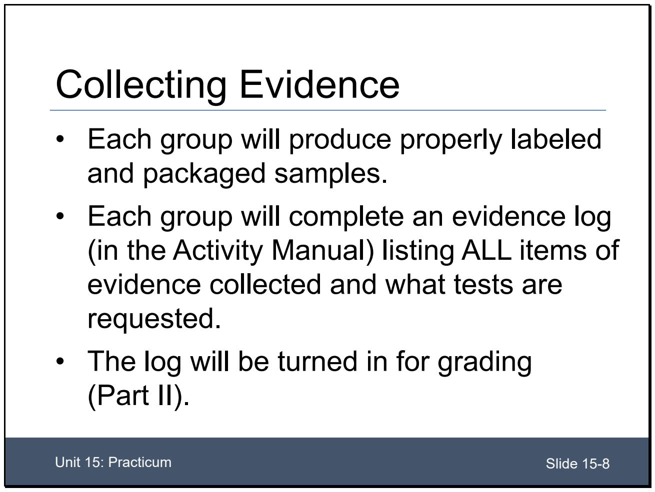


Key Information

Scene processing considerations:

- Any curtilage around the scenarios is “in-play” for evidence.
- The scene is presumed secure.
- All the data available is contained in the Activity Manual; there are no people to interview (as they all died or went on vacation).
- **The case will not be solved based on witness interviews.**

Slide 15-8: Collecting Evidence



Key Information

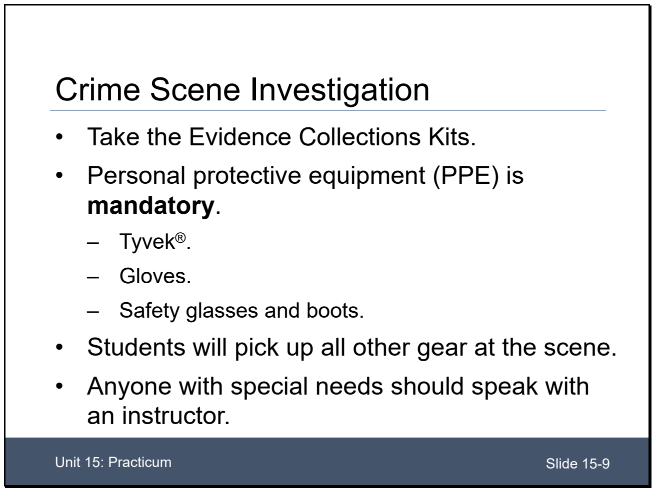
Evidence collection considerations:

- Each group will produce properly labeled and packaged samples.

- Each group will complete an evidence log (in the Activity Manual) listing **all** items of evidence collected and what tests are requested.

- The log will be turned in for grading (Practicum Part II).

Slide 15-9: Crime Scene Investigation



Key Information

Crime scene investigation considerations:

- Take the Evidence Collections Kits.
- Personal protective equipment (PPE) is mandatory.
  - Tyvek®.
  - Gloves.
  - Safety glasses and boots.
- For any special needs, please consult the instructor.

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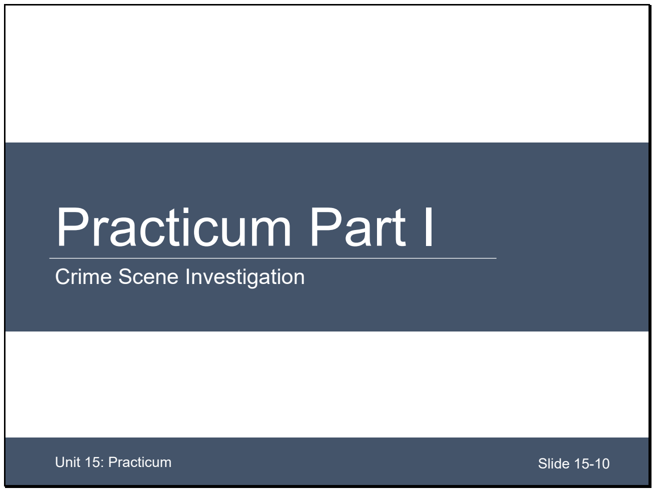
Slide 15-10: Practicum Part I: Crime Scene Investigation



Activity Estimated Time: 240 minutes

Activity Purpose

This practical exercise provides students with an opportunity to conduct a crime scene investigation in which they identify, document, collect and package evidence for testing.

Activity Directions

1. Working as a group, students will identify, document, collect and package evidence at an assigned crime scene.

2. Use the evidence log to document all evidence, including a description of the evidence, the location where the evidence was found, when the evidence was found, and who found the evidence**. Consult the Practicum Part I rubric for guidance.**

3. Groups will submit their completed evidence log and documentation (photos, notes, sketches, etc.) along with all packaged evidence to the instructors for grading.

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Evidence Log

Group No.: ____________________ Name: ____________________

Date: ____________________ Address: ____________________

Exhibit No.	Description	Location	Found By/Time

Signature (Evidence Technician) ____________________

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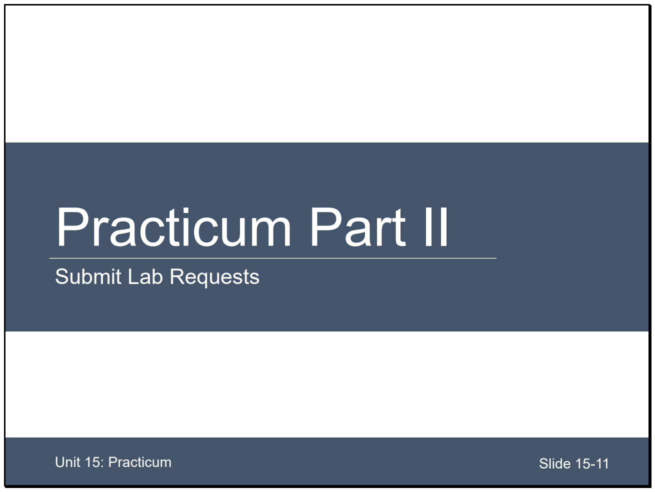
Slide 15-11: Practicum Part II: Submit Lab Requests



Activity Estimated Time: 120 minutes

Activity Purpose

This assignment requires students to detail, prioritize and submit their evidence for laboratory testing.

Activity Directions

1. Working as a group, students will complete the National Fire Academy (NFA) Lab Submittal Form for all evidence collected at the crime scene, including the item number, description of evidence, origin and type of exam requested.

2. Consider the effects testing may have on evidence and prioritize requests accordingly.

3. Groups will submit their completed NFA Lab Submittal Form to the instructors for review.

4. Students will receive lab results for use in Practicum Part III.

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NFA LAB SUBMITTAL FORM

Lab Case #
For Laboratory Use Only

Group Number ______________________________

Offense ___________________________________

Date of Offense ____________________________

County of Offense __________________________

Submitting Official: Send report to:

Name ________________________ Agency ____________________________

Signature _____________________ Contact Name _______________________

Description of Evidence Submitted

	Item #	Description of Evidence	Origin	Exam Requested
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Was a SFMO K-9 used to identify any exhibits? ☐Yes ☐ No Which K-9? _________ Which exhibits? __________

Include any pertinent information:

Laboratory Submission Form
SF008 Rev. 09/19

Page ______ of ______

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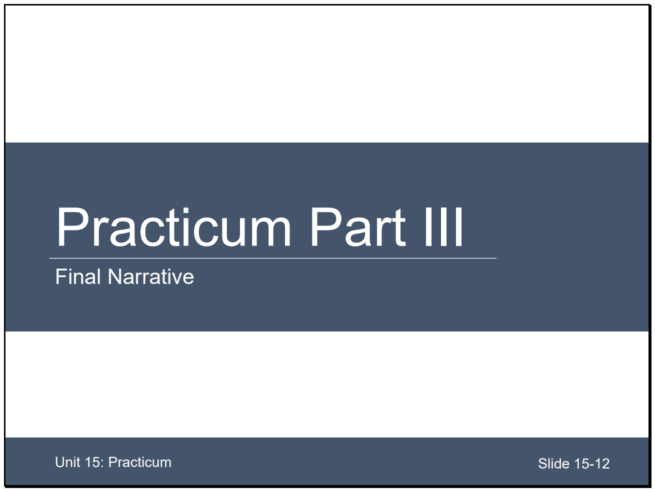
Slide 15-12: Practicum Part III: Final Narrative



Activity Estimated Time: 120 minutes

Activity Purpose

This assignment requires students to work individually to develop their final narrative detailing their crime scene investigation, findings and conclusions.

Activity Directions

1. Working individually, students will develop a final **narrative** detailing their crime scene findings (a partially completed report containing the incident details will be provided to students). For this assignment, **students will focus on writing the narrative section of the report only.** Include the following information:

    a. Summarize the case scenario, including the initial observations and initial identification, collection and packaging planning actions anticipated.

    b. For each item collected:

        – Identify the item.

        – Briefly discuss how the item was identified, any unique challenges in identification or recognition of the item, and why the item was deemed important.

        – Write three to four sentences per item.

c. Choose four items that were collected.

   – Provide a written synopsis of the collection method used by the student.

   – Compare and contrast the chosen method with another method that was not used and articulate the justification for the chosen method.

   – Write one paragraph for each item (three to five sentences).

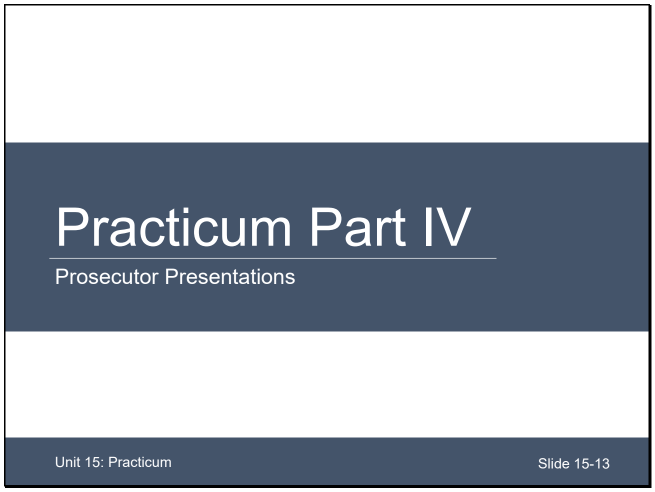
d. Choose four items, then list each item and the expected laboratory examination outcome.

e. Choose two items where the collection or packaging did not go as expected, and discuss the mistakes identified, lessons learned and actions that may avoid that mistake in the future.

2. Develop the narrative according to the American Psychological Association's (APA's) Seventh Edition Guidelines (i.e., APA Style). **Consult the Practicum Part III rubric for additional guidance.**

3. Submit the assignment for grading.

Slide 15-13: Practicum Part IV: Prosecutor Presentations



Activity Estimated Time: 240 minutes

Activity Purpose

This assignment requires students to create and deliver a prosecution presentation based on the narrative developed during Practicum Part III. During the presentation, students will present their evidence and conclusions to their classmates and instructors who will be playing the role of the prosecution.

Activity Directions

1. Working as a group, students will develop a PowerPoint presentation based on the narrative developed in Practicum Part III. Groups will have 30 minutes to deliver their presentation, including questions from instructors.

2. Ensure the presentation covers: 1) a brief overview of the scenario, 2) a review of the items collected (with photographs and scene diagrams), 3) a thorough explanation of the nexus between the items collected and the crime scene, 4) conclusions and expected outcomes of the laboratory examination, and 5) any investigative leads developed by the evidence (i.e., next steps). In addition to addressing items 1 through 5, the presentation must include these elements to receive full credit:

   a. Photographic documentation of the scene.
   b. A completed scene diagram.
   c. Identification of all evidence.

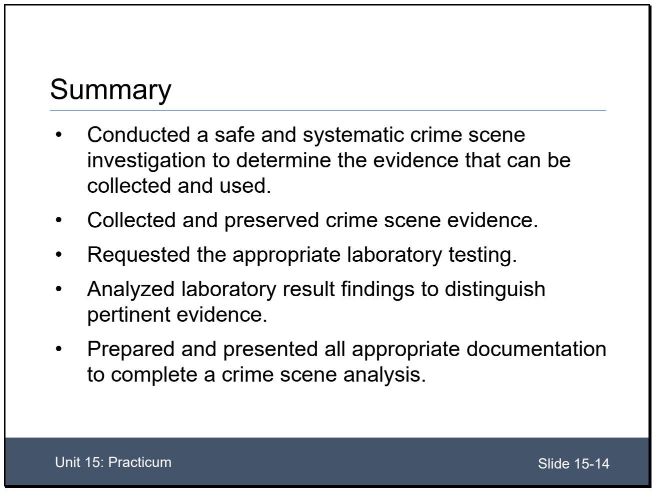
   d. Thorough explanation of the nexus between the items collected and the crime scene.
   e. A comprehensive narrative that connects the elements of the case and is worthy of presentation to a prosecuting attorney.

3. Students will deliver the presentation to classmates and instructors. Ensure all group members present a portion of the presentation.

4. At the end of the presentation, classmates and instructors will ask questions. Each group must be prepared to answer any questions based on their findings.

5. Groups must submit their presentation to the instructors. The presentation will be graded for content, grammar, spelling and timing. Consult the Practicum Part IV rubric for guidance on this or any other requirement.

Slide 15-14: Summary



Key Information

Students should now be able to:

- Conduct a safe and systematic crime scene investigation to determine the evidence that can be collected and used.
- Collect and preserve crime scene evidence.
- Request the appropriate laboratory testing.
- Analyze laboratory result findings to distinguish pertinent evidence.
- Prepare and present all appropriate documentation to complete a crime scene analysis.

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Resources and References

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Resources and References

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Acronyms

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Acronyms

ACS	activated charcoal strip
AFTE	Association of Firearm and Toolmark Examiners
AHJ	authority having jurisdiction
ANSI	American National Standards Institute
APA	American Psychological Association
ASB	Academy Standards Board
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
BFS	Bureau of Forensic Services
BLEVE	Boiling Liquid Expanding Vapor Explosion
BPA	bloodstain pattern analysis
CCTV	closed-circuit television
CODIS	Combined DNA Index System
CPU	central processing unit
CSI	Crime Scene Investigation
DOJ	Department of Justice
DOT	Department of Transportation
DSLR	digital single-lens reflex
ECT	Evidence Collection Technician
ELO	Enabling Learning Objective
EMS	emergency medical services
FBI	Federal Bureau of Investigation
FDLE	Florida Department of Law Enforcement

FDS	Fire Dynamics Simulator
FI: E	“Fire Investigation: Essentials”
FI: FEI	“Fire Investigation: Forensic Evidence and Interviewing”
GC-MS	Gas Chromatography-Mass Spectrometry
HPD	heavy petroleum distillate
IAAI	International Association of Arson Investigators
ILDC	ignitable liquid detection canine
IP	internet protocol
IR	infrared
IT	information technology
JPR	job performance requirement
LMS	learning management system
LPD	light petroleum distillate
MPD	medium petroleum distillate
MSP	Maryland State Police
NACDL	National Association of Criminal Defense Lawyers
NFA	National Fire Academy
NDIS	National DNA Index System
NFPA	National Fire Protection Association
NFSTC	National Forensic Science Technology Center
NIBIN	National Integrated Ballistic Information Network
NIJ	National Institute of Justice
NIST	National Institute of Standards and Technology

OEM	original equipment manufacturer
OSAC	Organization of Scientific Area Committees
PPE	personal protective equipment
ppi	pixels per inch
PVC	polyvinyl chloride
SM	Student Manual
SME	subject matter expert
SMV	Smokeview
TLO	Terminal Learning Objective
TTI	transmit terminal identifier
UPS	uninterruptible power supply
USFA	U.S. Fire Administration