

Fire Investigation: Forensic Evidence

FI: FE-Student Manual

3rd Edition, 1st Printing-July 2016



FEMA

FEMA/USFA/NFA

FI: FE-SM

July 2016

3rd Edition, 1st Printing

Fire Investigation: Forensic Evidence



FEMA

Fire Investigation: Forensic Evidence

FI: FE-Student Manual

3rd Edition, 1st Printing-July 2016



FEMA

This Student Manual may contain material that is copyright protected. USFA has been granted a license to use this material only for NFA-sponsored course deliveries as part of the course materials, and it shall not be duplicated without consent of the copyright holder. States wishing to use these materials as part of state-sponsorship and/or third parties wishing to use these materials must obtain permission to use the copyright material(s) from the copyright holder prior to teaching the course.

This page intentionally left blank.

TABLE OF CONTENTS

	PAGE
Table of Contents	iii
Acknowledgments	v
Course Goal	vii
Audience, Scope and Course Purpose	vii
Grading Methodology	vii
Schedule	ix
Firefighter Code of Ethics	xiii
A Student Guide to End-of-course Evaluations.....	xv
UNIT 1: COURSE OVERVIEW	SM 1-1
Appendix: Forensic Evidence Collection Kit — Inventory Sheet 8/2/14 and Student Activity/Skills Assessment	
UNIT 2: COLLECTION AND ANALYSIS OF IGNITABLE LIQUIDS	SM 2-1
UNIT 3: OTHER IGNITABLE LIQUID SAMPLING TOOLS	SM 3-1
UNIT 4: AN OVERVIEW OF THE ANALYSIS OF FIRE DEBRIS FOR IGNITABLE LIQUIDS	SM 4-1
Appendix A: Comparing Gasoline to an Unknown	
Appendix B: Ignitable Liquid Classifications	
UNIT 5: COLLECTING FORENSIC EVIDENCE OTHER THAN IGNITABLE LIQUIDS IN FIRE SCENES.....	SM 5-1
Appendix: Instructions for Use of Gypsum Products	
UNIT 6: POST-MORTEM AND TOXICOLOGY	SM 6-1
UNIT 7: SAMPLE PRESENTATION OF DOWNRANGE EXERCISE.....	SM 7-1
Appendix A: Scenarios 1-4	
Appendix B: Photo Log	
Appendix C: Evidence Transmittal Form	
UNIT 8: EVIDENCE AND THE ISSUES AFFECTING IT IN THE SCENE.....	SM 8-1
UNIT 9: ESSENTIAL COMPONENTS OF A FORENSIC REPORT.....	SM 9-1
 Appendices	
Acronyms	

This page intentionally left blank.

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.

The following people participated in the creation of this course:

Robert A. Neale
Deputy Superintendent for Curriculum and Instruction
U.S. Fire Administration, National Fire Academy
Emmitsburg, Maryland

Lee Vogtman
Instructional Systems Specialist
U.S. Fire Administration, National Fire Academy
Emmitsburg, Maryland

Danielle Jolly
McKinley Group Instructional Designer
Rockville, Maryland

Carl Chasteen
Chief of Forensic Services
Havana, Florida

Thomas Petty
Senior Inspector/Outreach Coordinator/K-9 Handler
Houston, Texas

Jess Dunn
Criminalist
Iowa Division of Criminal Investigation
Ankeny, Iowa

Sharee Bookey Wells, M.S., F-ABC
Lab Director/Senior Forensic Scientist
Forensic and Scientific Testing
Thorsby, Alabama

This page intentionally left blank.

COURSE GOAL

The goal of this course is to provide students with the knowledge and tools used to identify requirements for the “Fire Investigation: Forensic Evidence” (FI: FE) course (R0214). FI: FE is a six-day, intermediate-level course that addresses the critical skills essential to the effective collection, packaging, preservation, processing and testing of evidence from a fire and/or explosion scene. This course uses state-of-the-art techniques, practices, protocols and standards for both the investigator and the laboratory scientist, ensuring legally defensible evidence presentations in a court of law. This course also addresses the interaction and collaboration between fire/arson investigators and laboratory scientists. This partnering encourages collaborative efforts of the entire investigative community involved in all aspects of evidence from fire and explosion incidents.

AUDIENCE, SCOPE AND COURSE PURPOSE

This course is designed to better prepare federal, state and local fire service and law enforcement personnel to apply FI: FE principles and practices to effectively identify, document, collect and submit evidence for laboratory analyses to support their arson cases in court. It will also provide necessary knowledge regarding the use of outside resources and the proper presentation of cases that are based on physical evidence other than ignitable liquid (IL) evidence. Students should have completed “Fire Investigation: Essentials” (FI: E) course (R0206) or an equivalent as approved by the training specialist.

GRADING METHODOLOGY

Final examinations will be administered for the purpose of gauging knowledge gained. Upon completion of the course, credit will be notated in the Federal Emergency Management Agency (FEMA) Knowledge Center.

This page intentionally left blank.

SCHEDULE

TIME	DAY 1	DAY 2
8:00 - 9:00	Introduction, Welcome and Administrative	Unit 3: Other Ignitable Liquid Sampling Tools (cont'd) Unit 4: An Overview of the Analysis of Fire Debris for Ignitable Liquids
9:00 - 9:30	Unit 1: Course Overview	Unit 4: An Overview of the Analysis of Fire Debris for Ignitable Liquids (cont'd) Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes Guest Presenter: ATF Fingerprint Activity 5.1: Using Superglue to Develop Latent Fingerprints Activity 5.2: Latent Prints
9:30 - 10:00	Unit 2: Collection and Analysis of Ignitable Liquids	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd) Activity 5.3: Latent Impression Evidence — Shoe and Tire Treads
10:00 - 10:20	<i>Break</i>	<i>Break</i>
10:20 - 12:00	Unit 2: Collection and Analysis of Ignitable Liquids (cont'd) Activity 2.1: Collecting, Packaging and Sealing Evidence	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd) Activity 5.4: Latent and Impression Evidence — Tool Marks
12:00 - 1:00	<i>Lunch</i>	<i>Lunch</i>
1:00 - 2:15	Unit 3: Other Ignitable Liquid Sampling Tools	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd) Activity 5.5: Latent and Impression Evidence
2:15 - 2:30	<i>Break</i>	<i>Break</i>
2:30 - 5:00	Unit 3: Other Ignitable Liquid Sampling Tools	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd)

FIRE INVESTIGATION: FORENSIC EVIDENCE

TIME	DAY 3	DAY 4
8:00 - 9:00	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd)	Lab Visit
9:00 - 9:30	Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes (cont'd)	Lab Visit (cont'd)
9:30 - 10:00	Guest Presenter: Forensic Photography	Lab Visit (cont'd)
10:00 - 10:20	<i>Break</i>	<i>Break</i>
10:20 - 12:00	Guest Presenter: Forensic Photography	Lab Visit (cont'd)
12:00 - 1:00	<i>Lunch</i>	<i>Lunch</i>
1:00 - 2:15	Unit 6: Post-Mortem and Toxicology	Downrange Activity
2:15 - 2:30	<i>Break</i>	<i>Break</i>
2:30 - 3:30	Unit 6: Post-Mortem and Toxicology (cont'd)	Downrange Activity (cont'd)
3:30 - 5:00	Unit 6: Post-Mortem and Toxicology (cont'd) Unit 7: Sample Presentation of Downrange Exercise	Presentation Preparation

FIRE INVESTIGATION: FORENSIC EVIDENCE

TIME	DAY 5	DAY 6
8:00 - 9:00	Guest Presenter: Computer and Cellphone Forensics	Unit 9: Essential Components of a Forensic Report
9:00 - 9:30	Guest Presenter: Computer and Cellphone Forensics (cont'd)	Final Exam
9:30 - 10:00	Guest Presenter: Computer and Cellphone Forensics (cont'd)	Final Exam (cont'd)
10:00 - 10:20	<i>Break</i>	<i>Break</i>
10:20 - 12:00	Guest Presenter: Computer and Cellphone Forensics (cont'd)	Paper Presentation
12:00 - 1:00	<i>Lunch</i>	<i>Lunch</i>
1:00 - 2:15	Guest Presenter: DNA and Blood Patterns	Paper Presentation (cont'd)
2:15 - 2:30	<i>Break</i>	<i>Break</i>
2:30 - 3:30	Guest Presenter: DNA and Blood Patterns (cont'd)	Course Evaluations
3:30 - 5:00	Unit 8: Evidence and the Issues Affecting it in the Scene Final Exam Preparation	Graduation

This page intentionally left blank.

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.

This page intentionally left blank.

UNIT 1: COURSE OVERVIEW

TERMINAL OBJECTIVE

The students will be able to:

- 1.1 *Review components of the course not presented in the introduction section.*

ENABLING OBJECTIVES

The students will be able to:

- 1.1 *Discuss administrative matters.*
 - 1.2 *Review course outcomes.*
 - 1.3 *Review units of instruction.*
 - 1.4 *Provide an overview of student expectations for the course.*
 - 1.5 *Review Wednesday's practical activity.*
 - 1.6 *Take inventory of forensic evidence collection kits.*
 - 1.7 *Introduce course resources.*
-

This page intentionally left blank.



UNIT 1: COURSE OVERVIEW

Slide 1-1

ENABLING OBJECTIVES

- Discuss administrative matters.
- Review course outcomes.
- Review units of instruction.
- Provide an overview of student expectations for the course.

Slide 1-2

ENABLING OBJECTIVES (cont'd)

- Review Wednesday's practical activity.
- Take inventory of forensic evidence collection kits.
- Introduce course resources.

Slide 1-3

I. ADMINISTRATIVE

ADMINISTRATIVE

- Class roster.
 - Check the information and make any necessary changes.
 - Initial next to your name.
- Class party.
- Class shirts.

Slide 1-4

Overview.

A. Class roster.

1. Check the information and make any necessary changes.
2. Initial next to your name.

B. Class party.

C. Class shirts.

ADMINISTRATIVE (cont'd)

- Dress code.
- Superintendent's lunch.
- Class picture.

Slide 1-5

D. Dress code.

E. Superintendent's lunch.

F. Class picture.

ADMINISTRATIVE (cont'd)

- Absence from class.
 - If you will be absent, tell an instructor.
 - If you feel sick, tell an instructor.
 - If you have to go to your room to lie down after taking medications, tell an instructor.

Slide 1-6

G. Absence from class.

1. If you will be absent, tell an instructor.
2. If you feel sick, tell an instructor.
3. If you have to go to your room to lie down after taking medications, tell an instructor.

II. COURSE OUTCOMES

COURSE OUTCOMES

- At the end of this course, you should be able to:
 - Explain the importance of having a baseline knowledge of ignitable liquids (ILs).
 - Recognize the importance of proper identification, collection and processing of evidence, as well as proper presentation of the evidence.

Slide 1-7

At the end of this course, you should be able to:

- A. Explain the importance of having a baseline knowledge of ignitable liquids (ILs).

- B. Recognize the importance of proper identification, collection and processing of evidence, as well as proper presentation of the evidence.

COURSE OUTCOMES (cont'd)

- Describe the essential components of a forensic fire debris report.
- Conduct downrange exercise.

Slide 1-8

- C. Describe the essential components of a forensic fire debris report.

- D. Conduct downrange exercise.

III. STUDENT REQUIREMENTS

STUDENT REQUIREMENTS

- Attendance to all classes.
- Active participation during all class activities and presentations.
- Downrange exercise group project.
- Student assessment form.

Slide 1-9

- A. Attendance to all classes.
- B. Active participation during all class activities and presentations.
- C. Downrange exercise group project.
- D. Student assessment form.

IV. UNITS OF INSTRUCTION

UNITS OF INSTRUCTION

- Introduction.
- Unit 1: Course Overview.
- Unit 2: Collection and Analysis of Ignitable Liquids.
- Unit 3: Other Ignitable Liquid Sampling Tools.

Slide 1-10

- A. Introduction.
- B. Unit 1: Course Overview.
- C. Unit 2: Collection and Analysis of Ignitable Liquids.
- D. Unit 3: Other Ignitable Liquid Sampling Tools.

UNITS OF INSTRUCTION
(cont'd)

- Unit 4: An Overview of the Analysis of Fire Debris for Ignitable Liquids.
- Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes.
- Unit 6: Post-Mortem and Toxicology.

Slide 1-11

- E. Unit 4: An Overview of the Analysis of Fire Debris for Ignitable Liquids.
- F. Unit 5: Collecting Forensic Evidence Other Than Ignitable Liquids in Fire Scenes.
- G. Unit 6: Post-Mortem and Toxicology.

UNITS OF INSTRUCTION (cont'd)

- Unit 7: Sample Presentation of Downrange Exercise.
- Unit 8: Evidence and the Issues Affecting it in the Scene.
- Unit 9: Essential Components of a Forensic Report.

Slide 1-12

- H. Unit 7: Sample Presentation of Downrange Exercise.
- I. Unit 8: Evidence and the Issues Affecting it in the Scene.
- J. Unit 9: Essential Components of a Forensic Report.

V. STUDENT MANUAL

STUDENT MANUAL

- Objectives.
- Activity worksheets.
- Guest presentations.
- Appendix.

Slide 1-13

- A. Objectives.
- B. Activity worksheets.
- C. Guest presentations.
- D. Appendix.

VI. WEDNESDAY'S PRACTICAL EXERCISE

WEDNESDAY'S PRACTICAL EXERCISE

- Goals of downrange activity.
 - Coordinate with other team members to assess evidence present at the fire scene.
 - Assess the physical evidence at a fire scene, and specify any tests that will aid the investigation.
 - Retrieve, package, and document those items and present findings for evaluation.

Slide 1-14

A. Goals of downrange activity.

1. Coordinate with other team members to assess evidence present at the fire scene.
2. Assess the physical evidence at a fire scene, and specify any tests that will aid the investigation.
3. Retrieve, package, and document those items and present findings for evaluation.

WEDNESDAY'S PRACTICAL EXERCISE (cont'd)

- Activity overview.
 - Activity to take place on Wednesday.
 - Your group will consist of members seated at your table.
 - Each member of the group will speak in front of the class.
 - Go downrange and examine 10 x 10 burn cells.

Slide 1-15

B. Activity overview.

1. Activity to take place on Wednesday.
2. Your group will consist of members seated at your table.

3. Each member of the group will speak in front of the class.
4. Go downrange and examine 10 x 10 burn cells.

WEDNESDAY'S PRACTICAL EXERCISE (cont'd)

- Each group will gather 10 pieces of evidence; three of the 10 pieces of evidence will have to be processed.
- Each group will be prepared to identify evidence, state what type of evidence it can be classified as, and state what tests will be used for the three pieces of evidence.

Slide 1-16

5. Each group will gather 10 pieces of evidence; three of the 10 pieces of evidence will have to be processed.
6. Each group will be prepared to identify evidence, state what type of evidence it can be classified as, and state what tests will be used for the three pieces of evidence.

WEDNESDAY'S PRACTICAL EXERCISE (cont'd)

- Each group will be given class time to prepare.
- Each group will give a 15- to 20-minute presentation on Friday after the exam.

Slide 1-17

7. Each group will be given class time to prepare.
8. Each group will give a 15- to 20-minute presentation on Friday after the exam.

WEDNESDAY'S PRACTICAL EXERCISE (cont'd)

- Directions.
 - Using your scenario:
 - Locate 10 items of evidence within the scene.
 - Document the evidence.
 - Package/Label three items.
 - Prepare a crime scene sketch.
 - Prepare a report.
 - Remember, everything inside the crime scene tape is in play.

Slide 1-18

C. Directions.

1. Using your scenario:
 - a. Locate 10 items of evidence within the scene.
 - b. Document the evidence.
 - c. Package/Label three items.
 - d. Prepare a crime scene sketch.
 - e. Prepare a PowerPoint presentation.
2. Remember, everything inside the crime scene tape is in play.

WEDNESDAY'S PRACTICAL EXERCISE (cont'd)

- Report contents.
 - What was your evidence?
 - What did you submit it for?
 - What were your results?
 - What tests did you use for each piece of evidence?
 - What was your methodology?
 - Did you encounter any challenges?

Slide 1-19

D. Report contents.

1. What was your evidence?
2. What did you submit it for?
3. What were your results?
4. What tests did you use for each piece of evidence?
5. What was your methodology?
6. Did you encounter any challenges?

**WEDNESDAY'S PRACTICAL
EXERCISE (cont'd)**

- Questions.
 - Do you have any questions?
 - Do you have any experience preparing a crime scene report?
 - What do you hope to gain from the activity?

Slide 1-20

E. Questions.

1. Do you have any questions?
2. Do you have any experience preparing a crime scene report?
3. What do you hope to gain from the activity?

VII. EVIDENCE COLLECTION KIT INVENTORY

INVENTORY

- Divide into two-person teams.
- Go to the back table and get one forensic evidence collection kit per two-person team.
- Using the Forensic Evidence Collection Kit — Inventory Sheet 8/2/14, in the appendix of this unit, take inventory of your kit.

Slide 1-21

- A. Divide into two-person teams at your table.
- B. Go to the back table and get one forensic evidence collection kit per two-person team.
- C. Using the Forensic Evidence Collection Kit — Inventory Sheet 8/2/14, in the appendix of this unit, take inventory of your kit. Note: If you borrow from another kit, be sure to put the borrowed item back after class.

INVENTORY (cont'd)

- Once inventory is complete, place your kit under the table to use when instructed.
- Complete a laboratory submission request for all items found.

Slide 1-22

- D. Once inventory is complete, place your kit under the table to use when instructed.
- E. Complete a laboratory submission request for all items found.

VIII. SUMMARY



SUMMARY

- Administrative.
- Course outcomes.
- Student requirements.
- Units of instruction.
- Student manual (SM).
- Wednesday's practical exercise.
- Evidence collection kit inventory.

Slide 1-23

APPENDIX

FORENSIC EVIDENCE COLLECTION KIT — INVENTORY SHEET 8/2/14 AND STUDENT ACTIVITY/SKILLS ASSESSMENT

This page intentionally left blank.

CONTENTS

The Appendix contains the following materials:

1. Forensic Evidence Collection Kit — Inventory Sheet 8/2/14.
2. Fire Investigation: Forensic Evidence Student Activity/Skills Assessment.

This page intentionally left blank.

Forensic Evidence Collection Kit — Inventory Sheet 8/2/14

Top Lid

Tweezers — (1)
Scissors — (1)
Pens — (2-3)
Fine point permanent markers — (1-2)
Eyedropper — (1-2)
Pipettes — (3-4)
Ink-remover towelettes — (6-8)
Glass vials with caps — (2-3)

Tray Section

Cotton-tipped applicators — (6-8)
Tongue depressors — (6-8)
Phillips-head and flathead screwdrivers — (1 each)
Light and dark fingerprint powder brushes — (1 each)
1-inch rolling tape measure — (1)
6- and 12-inch rulers — (1 each)
1- or 2-inch roll of clear fingerprint lifting tape — (1)
4-inch roll of clear fingerprint lifting tape — (1)
Hot Shot canister — (1)
Single and multiple fingerprint lifting packets (white and/or clear) — (6-8 of each)
Utility knife — (1)
Evidence tags — (6-8)

Bottom Section

3 x 5- and 5 x 8-inch white note cards — (8-10 each)
3 x 5-inch black note cards — (6-8)
Brown and White Mikrosil — (1 tube of each color with hardener)
Rubber mallet — (1)
Metal or wooden spoon — (1)
Sifter/Strainer — (1)
Buccal swab kits — (2)
White, black and grey/silver fingerprint powder — (1 jar of each)
Paint brush — (1)
Magnetic wand and magnetic powder — (1 each)/**Powder may be from those listed above**
Magnifying glass — (1)
Hairspray — (1 can)
Evidence tape — (1 roll)
4 x 4-inch gauze pads — (3-4)
“L”, “T”, and 3-foot folding measuring scales — (1 each)
Number tents — (1-15)

This page intentionally left blank.

Fire Investigation: Forensic Evidence Student Activity/Skills Assessment

Activity or Skill	Completed√
Unit 2: Provided with an evidence collection kit and paired with a member, the student will demonstrate the proper procedure to collect, package, seal and mark:	
1. Ignitable liquid (IL) evidence from a liquid medium.	
2. IL evidence from a carpet medium.	
Unit 5: Provided with an evidence collection kit and casting materials, the student will collect and preserve evidence in each of the following activities/skills:	
1. Individually locate and transfer latent fingerprints from a fumed object.	
2. Paired with a team member, cast a foot/tire impression using dental stone.	
3. Individually cast a tool mark using Mikrosil.	
4. Individually dust a textured object and lift mirror printing using Mikrosil.	
Unit 6: At the burn cells, the student will, as a member of a team:	
1. Locate and identify at least six items of evidence. Be prepared to discuss the packaging and testing and the desired laboratory results of each.	
2. Collect, package and properly label three of the six items of evidence previously noted. The three items must represent evidence samplings from three different disciplines listed here: DNA, blood, latent prints, trace evidence, mechanical matching and impressions/castings. Complete any and all submittal documentation required associated with the three items selected.	
Presentation: As a member of a team, the student will:	
1. Review all the evidence and assess its relevance regarding the type of packaging, analysis required, and results anticipated.	
2. With other team members, present a PowerPoint presentation to the entire class and justify the team's thought processes regarding the type of evidence collected and analysis conducted.	

Instructor: _____

Date: _____

Instructor: _____

Date: _____

Course Dates: _____

Student: _____

This page intentionally left blank.

UNIT 2: COLLECTION AND ANALYSIS OF IGNITABLE LIQUIDS

TERMINAL OBJECTIVES

The students will be able to:

- 2.1 *Differentiate the various classes of ignitable liquids (ILs) and properly describe the proper preservation and packaging of fire debris evidence.*
- 2.2 *Describe the importance and distinction of comparison samples as well as those issues that may affect the laboratory's ability to find ILs.*
- 2.3 *Understand the legal and spoliation issues related to fire debris evidence.*

ENABLING OBJECTIVES

The students will be able to:

- 2.1 *Explain the refinery and marketing process for ILs and their common commercial sources.*
 - 2.2 *Describe the proper containment, sealing and shipping methods for ILs.*
 - 2.3 *Describe the source and selection of comparison samples as well as their importance to the investigation.*
 - 2.4 *Cite examples of the various events and problems that may interfere with the laboratory's analysis.*
 - 2.5 *Describe spoliation legal issues.*
-

This page intentionally left blank.



UNIT 2: COLLECTION AND ANALYSIS OF IGNITABLE LIQUIDS

Slide 2-1

ENABLING OBJECTIVES

- Explain the refinery and marketing process for ignitable liquids (ILs) and their common commercial sources.
- Describe the proper containment, sealing and shipping methods for ILs.

Slide 2-2

ENABLING OBJECTIVES (cont'd)

- Describe the source and selection of comparison samples as well as their importance to the investigation.
- Cite examples of the various events and problems that may interfere with the laboratory's analysis.
- Describe spoliation legal issues.

Slide 2-3

I. WHAT ARE IGNITABLE LIQUIDS?

WHAT ARE IGNITABLE LIQUIDS?

- ILs are defined as any liquids that are capable of fueling a fire, including flammable liquids and combustible liquids.
 - Flammable liquid: flash point below 100 F.
 - Combustible liquid: flash point above 100 F.

Slide 2-4

- A. Ignitable liquids (ILs) are defined as any liquids that are capable of fueling a fire, including flammable liquids and combustible liquids.

1. Flammable liquid: flash point below 100 F.
2. Combustible liquid: flash point above 100 F.

FIRE DEBRIS ANALYSIS

Fire debris analysis is the process of identifying and classifying ILs, such as charcoal starters, lighter fluids, gasoline, kerosene and lamp oils.

Slide 2-5

- B. Fire debris analysis is the process of identifying and classifying ILs, such as charcoal starters, lighter fluids, gasoline, kerosene and lamp oils.

CRUDE OIL

- Crude oil is found in many pockets in the earth and was formed from plants, animals (such as dinosaurs), heat, pressure and time.
 - Raw crude oil has no value. To make the crude oil useful (i.e., into petroleum products), it must be refined.
 - Most ILs start off as crude oil.

Slide 2-6

- C. Crude oil is found in many pockets in the earth and was formed from plants, animals (such as dinosaurs), heat, pressure and time.
1. Raw crude oil has no value. To make the crude oil useful (i.e., into petroleum products), it must be refined.
 2. Most ILs start off as crude oil.

CRUDE OIL (cont'd)

- Main objective in refining crude oil:
 - To convert as much crude oil to economically feasible products as possible between the boiling-point range of 30 F (0 C) to 650 F (345 C). Examples include:
 - Gasoline, kerosene, diesel fuel.
 - Lamp oils, charcoal starters.
 - More products produced equals more money.

Slide 2-7

- D. Main objective in refining crude oil:
1. To convert as much crude oil to economically feasible products as possible in the boiling-point range of 30 F (0 C) to 650 F (345 C). Examples include:
 - a. Gasoline, kerosene, diesel fuel.
 - b. Lamp oils, charcoal starters.
 2. More products produced equals more money.

CRUDE OIL (cont'd)

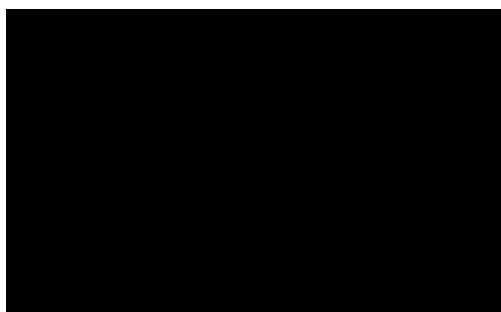
- United States bases:
 - Paraffin base.
 - Naphthene base.
 - Asphalt base.
 - Mixed base.
 - Aromatic base.

Slide 2-8

3. United States bases:

- Paraffins, also referred to as normal and branched alkanes.
- Naphthenes, also referred to as cycloparaffins/cycloalkanes with various sized paraffinic functional groups.
- Asphalt bases composed of large or heavy molecules that need greater degrees of processing at the refinery.
- Mixed bases mixed without any type of material preferred.
- Aromatic bases are the most desirable of the U.S. bases because they can be turned into gasoline.

VIDEO: "THE REFINERY PROCESSES"



Slide 2-9

E. Refining process overview.

THE REFINERY PRODUCTS

- Refineries produce gasoline — but what is gasoline?
 - Gasoline is a blended product.
 - A mixture of hundreds of compounds that boil between 100 F and 400 F.
 - Additives are blended with gasoline to enhance its physical properties.

Slide 2-10

Refineries produce gasoline — but what is gasoline?

1. Gasoline is a blended product.
2. A mixture of hundreds of compounds that boil between 100 F and 400 F.
3. Additives are blended with gasoline to enhance its physical properties.

OCTANE NUMBER/RATING

- Octane number/rating is a critical measure of the gasoline's performance. It indicates how efficiently the gasoline burns.
- Knocking occurs when components of gasoline begin to burn before they are ignited by the spark plug, that is when they are not burning efficiently.
- Isooctane burns without knocking and is therefore considered to have an octane rating of 100.

Slide 2-11

F. Octane number/rating.

1. The octane number/rating is a critical measure of a gasoline's performance. It indicates how efficiently the gasoline burns.
2. Knocking occurs when components of gasoline begin to burn before they are ignited by the spark plug, that is when they are not burning efficiently.
3. Isooctane burns without knocking and is therefore considered to have an octane rating of 100.

CETANE NUMBER

- The cetane number is the measurement of the combustion quality of a diesel fuel.
- Equivalent to the octane rating for gasoline.
- Higher cetane fuels in diesel fuels will typically have shorter ignition delay periods than lower cetane fuels.

Slide 2-12

4. The cetane number is the measurement of the combustion quality of a diesel fuel.
5. Equivalent to the octane rating for gasoline.
6. Higher cetane fuels in diesel fuels will typically have a shorter ignition delay period than lower cetane fuels.

CLASSIFYING GASOLINE: LIMITATIONS

- The laboratory cannot:
 - Distinguish between brands of gasoline.
 - Exxon Mobil Corp. versus Marathon Oil Corp. versus BP.
 - Distinguish between octane ratings:
 - Is it 87, 89, 91 or 93?

Slide 2-13

7. Limitations in the laboratory.

The laboratory cannot:

- a. Distinguish between brands of gasoline.

Exxon Mobil Corp. versus Marathon Oil Corp. versus BP.

- b. Distinguish between octane ratings.

- Is it 87, 89, 91 or 93?

CLASSIFYING GASOLINE: LIMITATIONS (cont'd)

- Distinguish additives (Exxon Mobil, BP).
- Determine how long the gasoline was present in the debris.
- Quantitate the amount of IL found in a fire debris sample:
 - 1 cup versus 1 tablespoon.

Slide 2-14

- c. Distinguish additives (Exxon Mobil, BP).
- d. Determine how long the gasoline was present in the debris.
- e. Quantitate the amount of IL found in a fire debris sample:
 - 1 cup versus 1 tablespoon.

THE REFINERY PRODUCTS

- Three general types of distillate fuels.
 - Jet or turbine fuels — for commercial and military aircraft.
 - Diesel fuels (including kerosene).
 - Heating oils.

Slide 2-15

- 8. There are three general types of distillate fuels.
 - a. Jet or turbine fuels — for commercial and military aircraft.
 - b. Diesel fuels (including kerosene).
 - c. Heating oils.

MARKETING CONSIDERATIONS

- Economics often determines the flow of products from the refinery. For example, before grills, charcoal starter fluid was not needed.
- Likewise, economics affects the flow of product from the refinery to the shelf of the hardware store to the home.

Slide 2-16

G. The marketing of refinery products as consumer goods.

1. As was stated in the discussion of refineries, economics often determines the flow of products from the refinery. For example, before grills, charcoal starter fluid was not needed.
2. Likewise, economics affects the flow of product from the refinery to the shelf of the hardware store to the home.

MARKETING CONSIDERATIONS (cont'd)

- The refinery products previously listed are not inclusive of all the IL products available for purchase.
- We can purchase gasoline, kerosene and diesel fuel as an end-of-use consumer.
- But what use would we have for some of the intermediate refinery products such as heavy naphtha?

Slide 2-17

3. The refinery products previously listed are not inclusive of all the IL products available for purchase.
4. We can purchase gasoline, kerosene and diesel fuel as an end-of-use consumer.
5. But what use would we have for some of the intermediate refinery products such as heavy naphtha?

MARKETING CONSIDERATIONS (cont'd)

- Before a product comes out for commercial use in the United States, someone in the marketing department of an oil company or a consumer products company is scanning to see what products are desired.

Slide 2-18

H. Confusion between what a label says and what the liquid is.

1. Before a product comes out for commercial use in the United States, someone in the marketing department of an oil company or a consumer products company is scanning to see what products are desired.

MARKETING CONSIDERATIONS (cont'd)

- Separate marketers can take the same refinery product and sell it under two different labels — for example, as a paint thinner or a charcoal starter.

Slide 2-19

2. Separate marketers can take the same refinery product and sell it under two different labels — for example, as a paint thinner or a charcoal starter.

MARKETING CONSIDERATIONS (cont'd)

- A separate but equally problematic situation occurs when a marketer decides to change the refinery product used to make its consumer product but keeps the label of the product the same.
 - Why?
 - Economics.
 - Availability.
 - Changes in consumer expectations.

Slide 2-20

3. A separate but equally problematic situation occurs when a marketer decides to change the refinery product used to make its consumer product but keeps the label of the product the same.

- a. Why?

- Economics.
- Availability.
- Changes in consumer expectations.

ARE THESE THE SAME PRODUCT?

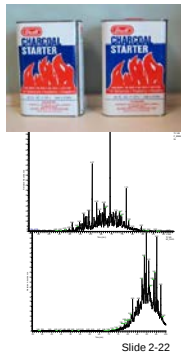


Slide 2-21

- b. Are these the same product?
- c. Product variations.

PRODUCT VARIATIONS

- Although these products appear similar, they are actually chromatographically different.
- One product is a medium petroleum distillate (MPD) and the other product is a naphthenic-paraffinic product.
- To the consumer, though, they are both charcoal starters.



Slide 2-22

4. Although these products appear similar, they are actually chromatographically different.
5. One product is a medium petroleum distillate (MPD) and the other product is a naphthenic-paraffinic product.
6. To the consumer, though, they are both charcoal starters.

MARKETING CONSIDERATIONS (cont'd)

- You can't trust a label.
- You must have a battery of commercial standards.
- Laboratories must have a battery of commercial standards.
 - <http://ilrc.ucf.edu>.

Slide 2-23

7. You can't trust a label.
8. Laboratories must have a battery of commercial standards.

MARKETING CONSIDERATIONS (cont'd)

- Laboratory reference collections must be updated periodically.
- Analysts and investigators must talk to each other to clarify situations like these.

Slide 2-24

9. Laboratory reference collections must be updated periodically.
10. Analysts and investigators must talk to each other to clarify situations like these.

HOUSEHOLD/COMMON SOURCES FOR IGNITABLE LIQUIDS

- Insecticides.
 - MPDs.
 - Isoparaffinic mixtures.
- Furniture finishing and polishing products.
 - MPDs.
 - Light petroleum distillates (LPDs).
 - Heavy petroleum distillates (HPDs).

Slide 2-25

- I. Household/Common sources for ILs.
 1. Insecticides.
 - a. MPDs.
 - b. Isoparaffinic mixtures.
 2. Furniture finishing and polishing products.
 - a. MPDs.
 - b. Light petroleum distillates (LPDs).
 - c. Heavy petroleum distillates (HPDs).

**HOUSEHOLD/COMMON SOURCES
FOR IGNITABLE LIQUIDS (cont'd)**

- Lamp oils.
 - HPDs.
 - Isoparaffinic mixtures.
 - Normal paraffinic mixtures.

Slide 2-26

3. Lamp oils.
 - a. HPDs.
 - b. Isoparaffinic mixtures.
 - c. Normal paraffinic mixtures.

**HOUSEHOLD/COMMON SOURCES
FOR IGNITABLE LIQUIDS (cont'd)**

- Others.
 - No carbon required (NCR) paper — isoparaffinic mixtures.
 - Vehicle fuel additives — MPDs.

Slide 2-27

4. Others.
 - a. No carbon required (NCR) paper — isoparaffinic mixtures.
 - b. Vehicle fuel additives — MPDs.

HOUSEHOLD/COMMON SOURCES FOR IGNITABLE LIQUIDS (cont'd)

- Concrete sealers — various.
- Adhesives — various.
- Shoe polish — HPDs.
- Asphalt/Roof tile — HPDs.
- Air freshener — limonene.

Slide 2-28

- c. Concrete sealers — various.
- d. Adhesives — various.
- e. Shoe polish — HPDs.
- f. Asphalt/Roof tile —HPDs.
- g. Air freshener — limonene.

BIOFUEL'S IMPACT: LABORATORY

- Many times, the laboratory must alter its methods in order to see ethanol-based fuels.
 - Manual headspace analysis.
 - Versus passive adsorption technique for alcohols.

Slide 2-29

- J. Biofuel's impact on the laboratory.
 - 1. Many times, the laboratory must alter its methods in order to see ethanol-based fuels.
 - a. Manual deadspace analysis.
 - b. Versus passive absorption technique for alcohols.

BIOFUEL'S IMPACT: LABORATORY (cont'd)

- Also, additional extraction techniques fatty acid methyl ester (FAME) will be required for:
 - Spontaneous heating/combustion.
 - Dryer fires.
 - Restaurant fires.
 - Construction fires with stain.
 - Please ask your local laboratory if it offers any type of FAME testing, as many will not.

Slide 2-30

2. Also, additional extraction techniques fatty acid methyl ester (FAME) will be required for:

a. Spontaneous heating/combustion.

- Dryer fires.
- Restaurant fires.
- Construction fires with stain.

b. Please ask your local laboratory if it offers any type of FAME testing, as many will not.

SPONTANEOUS IGNITION PARAMETERS

- A physically isolated fire with a collection of oily materials (cotton rags).
- Initial temperature.
- Time of events (four to 24 hours).
- Availability of oxygen.
- Surrounding fuels.
- Humidity.

Slide 2-31

K. Spontaneous ignition parameters.

1. A physically isolated fire with a collection of oily materials (cotton rags).

2. Initial temperature.
3. Time of events (four to 24 hours).
4. Availability of oxygen.
5. Surrounding fuels.
6. Humidity.

II. SAMPLING ISSUES

**IGNITABLE LIQUID
PROPERTIES TO REMEMBER**

- Liquids flow (downgrade) to the lowest level and often form puddles in low areas.
- Almost all ILs (except for alcohol and acetone, which are miscible (water-soluble)) are lighter than water and will float on top of it (rainbowing).

Slide 2-32

A. IL properties to remember.

1. Liquids flow (downgrade) to the lowest level and often form puddles in low areas.
2. Almost all ILs (except for alcohol and acetone, which are miscible (water-soluble)) are lighter than water and will float on top of it (rainbowing).

IGNITABLE LIQUID PROPERTIES TO REMEMBER (cont'd)

- ILs will typically form flammable or explosive vapors at room temperature.
- These vapors are heavier than air and will seek the lowest level and flow downward (into crawlspaces, basements, cellars, sewer drains, cracks, stairs).

Slide 2-33

3. ILs will typically form flammable or explosive vapors at room temperature.
4. These vapors are heavier than air and will seek the lowest level and flow downward (into crawlspaces, basements, cellars, sewer drains, cracks, stairs, etc.).

COMMON SAMPLING ERRORS

- Not enough sample collected.
- Not using an appropriate fire debris container.
- Too few samples collected.
- Too much sample forced into the container.
- Sampling outside of the pour pattern.

Slide 2-34

B. Common sampling errors.

1. Not enough sample collected.
2. Not using an appropriate fire debris container.
3. Too few samples collected.
4. Too much sample forced into the container.
5. Sampling outside of the pour pattern.

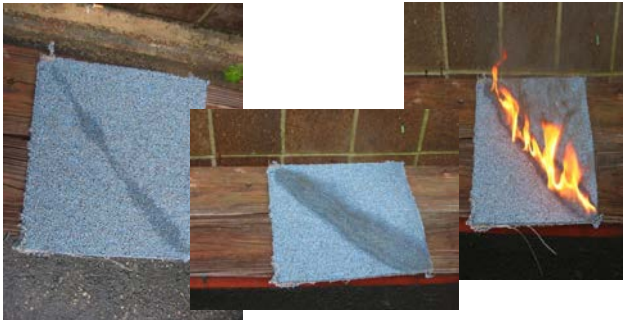
COMMON SAMPLING ERRORS (cont'd)

- Swabbing debris instead of collecting debris.
- Sample not relevant to the scene.
- Failure to maintain a chain of custody.
- Ineffective preservation.

Slide 2-35

6. Swabbing debris instead of collecting debris.
7. Sample not relevant to the scene.
8. Failure to maintain a chain of custody.
9. Ineffective preservation.

PATTERN EXPERIMENT



Slide 2-36

INEFFECTIVE COLLECTION AREAS

- Heavily charred wood.
- Grey to white ash.
- The edge of a hole (burned through a floor).
- Nonporous surfaces.



Slide 2-37

C. Ineffective collection areas for trace ILs.

1. Heavily charred wood.
2. Grey to white ash.
3. The edge of a hole (burned through a floor).
4. Nonporous surfaces.

PACKAGING ACTUAL SAMPLES

- A sample should be placed in the container closest to its natural size.
- A sample should never fill a container more than 50 to 75 percent of the way.

Slide 2-38

D. Packaging actual samples.

1. A sample should be placed in the container closest to its natural size.
2. A sample should never fill a container more than 50 to 75 percent of the way.

PACKAGING ACTUAL SAMPLES (cont'd)

- Use multiple containers if necessary.
 - Do not overfill a can.
 - This eliminates the vapor space necessary to extract ILs.
 - Do not underfill a can.
 - This can also interfere with the efficiency of the extraction.

Slide 2-39

3. Use multiple containers if necessary.
 - a. Do not overfill a can.
 - This eliminates the vapor space necessary to extract ILs.
 - b. Do not underfill a can.
 - This can also interfere with the efficiency of the extraction.

PROPERLY FILLED GALLON CAN



Slide 2-40

PACKAGING ACTUAL SAMPLES (cont'd)

- Containers must be sealed — prior to sealing them, make sure to wipe any debris out of the inner ring (or V channel) of the cans and off the threads of bottles.

Slide 2-41

4. Containers must be sealed — prior to sealing them, make sure to wipe any debris out of the inner ring (or V channel) of the cans and off the threads of bottles.

SAMPLING

- Representative sampling: Take as many samples as you need, but don't shotgun (where an investigator has no idea where to take a sample and starts to randomly take samples). If you are in a situation where there is confusion on where to take samples, use other means to make determinations, such as a canine.

Slide 2-42

5. Representative sampling: Take as many samples as you need, but don't shotgun (where an investigator has no idea where to take a sample and starts to randomly take samples). If you are in a situation where there is confusion on where to take samples, use other means to make determinations, such as a canine.

SAMPLING (cont'd)

- Do not take too few samples.
 - It may be possible to rationalize a small spill of IL in one area, but if it also shows up in more widely separated areas, the excuse of an accidental spill becomes unlikely.
 - If too few samples are taken, it can be difficult to show that the IL was in several separated areas.

Slide 2-43

6. Do not take too few samples.
 - a. It may be possible to rationalize a small spill of IL in one area, but if it also shows up in more widely separated areas, the excuse of an accidental spill becomes unlikely.
 - b. If too few samples are taken, it can be difficult to show that the IL was in several separated areas.

SAMPLING (cont'd)

- Place individual samples in separate cans.
- Highly carbonized debris may not release trapped ILs. Stay away from heavily charred debris.

Slide 2-44

7. Place individual samples in separate cans.
8. Highly carbonized debris may not release trapped ILs. Stay away from heavily charred debris.

SAMPLING (cont'd)

- Increase the debris' surface area by breaking, cutting or tearing.
- Drain off excess water. (Possibly submit it separately if a rainbow is noted.)

Slide 2-45

9. Increase the debris' surface area by breaking, cutting or tearing.
10. Drain off excess water. (Possibly submit it separately if a rainbow is noted.)

DIRT/SAND/VEGETATION

- Collect sample from width of the pattern, digging down about 1 to 1.5 inches in depth.
- Do not overfill the can (two-thirds full max).

Slide 2-46

E. Dirt/Sand/Vegetation.

1. Collect sample from width of the pattern, digging down about 1 to 1.5 inches in depth.
2. Do not overfill the can (two-thirds full max).

DIRT/SAND/VEGETATION (cont'd)

- Dirt samples should be frozen for about 24 hours prior to submitting them to the laboratory.
 - Kills microbes in the soil that eat away potential ILs.
 - Thereafter submit samples to your local laboratory as soon as possible (ASAP).

Slide 2-47

3. Dirt samples should be frozen for about 24 hours prior to submitting them to the laboratory.
 - a. Kills microbes in the soil that eat away potential ILs.
 - b. Thereafter submit samples to your local laboratory as soon as possible (ASAP).

CONTENTS — CLOTHING

- Clothing.
 - Clothing samples may come from either a suspect or a victim.
 - Either type of sample should be treated with care due to potential biohazards.

Slide 2-48

4. Clothing.
 - a. Clothing samples may come from either a suspect or a victim.
 - b. Either type of sample should be treated with care due to potential biohazards.

CONTENTS — CLOTHING (cont'd)

- Biohazards: For the purpose of this course, a biohazard is any material that has a potential to contain human blood or bodily fluids.

Slide 2-49

5. Biohazards: For the purpose of this course, a biohazard is any material that has a potential to contain human blood or body fluids.

CONTENTS — CLOTHING (cont'd)

- Clothing from people, whether living or dead, has this potential.
- Some parts of clothing may have a greater potential for biohazards than others.
- Clothing samples should be labeled as a biohazard.

Slide 2-50

- a. Clothing from people, whether living or dead, has this potential.
- b. Some parts of clothing may have a greater potential for biohazards than others do.
- c. Clothing samples should be labeled as a biohazard.

CONTENTS — CLOTHING (cont'd)

- Selection of clothing:
 - Victim's clothing:
 - Outermost layer of clothing.
 - Coat/Sweatshirt.
 - Pants.

Slide 2-51

6. Selection of clothing:

a. Victim's clothing.

- Outermost layer of clothing.
 - Coat/Sweatshirt.
 - Pants.

CONTENTS — CLOTHING (cont'd)

- Suspect's clothing:
 - Outermost layer of clothing:
 - Coat/Sweatshirt/T-shirt.
 - Pants.
 - Socks/Shoes.
- Do not submit undergarments. Only submit garments that may have been exposed to potential ILs.

Slide 2-52

b. Suspect's clothing.

- Outermost layer of clothing:
 - Coat/Sweatshirt/T-shirt.
 - Pants.

-- Socks/Shoes.

- c. Do not submit undergarments. Only submit garments that may have been exposed to potential ILs.

CONTENTS — CLOTHING (cont'd)

- Whole items of clothing are unlikely to contain spilled, poured or splashed ILs throughout.
- Clothing should be cut so as to select those portions with the highest probability of having traces of incidentally spilled IL.

Slide 2-53

7. Whole items of clothing are unlikely to contain spilled, poured or splashed ILs throughout.
8. Clothing should be cut so as to select those portions with the highest probability of having traces of incidentally spilled IL.

CONTENTS — CLOTHING (cont'd)

- Pant cuffs, shirt and jacket cuffs, pockets, and abdominal areas are the areas most likely to have spilled ILs.
- If the sample cannot be cut, try to place it into the can with the highest probability area nearest the vapor space.

Slide 2-54

9. Pant cuffs, shirt and jacket cuffs, pockets, and abdominal areas are the areas most likely to have spilled ILs.
10. If the sample cannot be cut, try to place it into the can with the highest probability area nearest the vapor space.

WHERE TO CUT CLOTHING



Slide 2-55

WHERE TO CUT CLOTHING (cont'd)



Slide 2-56

WHERE TO CUT SHOES



Slide 2-57

CONTENTS — CLOTHING (cont'd)

- Clothing is often made from blends of both natural and synthetic fibers.
- Dyes and inks are used to add color, logos and patterns to the clothing.

Slide 2-58

11. Clothing is often made from blends of both natural and synthetic fibers.

12. Dyes and inks are used to add color, logos and patterns to the clothing.

CONTENTS — CLOTHING (cont'd)

- These dyes and inks, as well as other variables, may introduce ILs and/or components of ILs onto the clothing.
- An exemplar of the same type of garment is the best way to exclude any inherent interference.

Slide 2-59

13. These dyes and inks, as well as other variables, may introduce ILs and/or components of ILs onto the clothing.

14. An exemplar of the same type of garment is the best way to exclude any inherent interference.

CONTENTS — SHOES

- Shoes are no longer considered the best samples from suspects.
- An indication of an IL on the shoes was often thought to be critical in placing a suspect at a scene.

Slide 2-60

F. Shoes.

1. Shoes are no longer considered the best samples from suspects.
2. An indication of an IL on the shoes was often thought to be critical in placing a suspect at a scene.

CONTENTS — SHOES (cont'd)

- Studies have established that shoes may often contain some IL residues as artifacts of their manufacturing processes.
 - Leather products (shoes, belts, coats) can contain an HPD.

Slide 2-61

3. Studies have established that shoes may often contain some IL residues as artifacts of their manufacturing processes.

Leather products (shoes, belts, coats) can contain an HPD.

CONTENTS — SHOES (cont'd)

- These artifacts are usually present in the plastics, the rubber and the glues used in shoes' construction.
- An exemplar of the same type of shoe is the best way to exclude any inherent interference.
- The concentration of the IL found should also be considered.

Slide 2-62

4. These artifacts are usually present in the plastics, the rubber and the glues used in shoes' construction.
5. An exemplar of the same type of shoe is the best way to exclude any inherent interference.
6. The concentration of the IL found should also be considered.

CONTENTS — SHOES (cont'd)

- When sampled, a size 12 or 13 men's shoe can be squeezed into a gallon can.
- Consider a nylon or polyamide bag for collection instead of a gallon can.

Slide 2-63

7. When sampled, a size 12 or 13 men's shoe can be squeezed into a gallon can.
8. Consider a nylon or polyamide bag for collection instead of a gallon can.

CONTENTS — SHOES (cont'd)

- The best sampling method may be to cut the shoes into pieces.
- While difficult to cut, it may be to your advantage to separate the uppers from the soles and place them in different containers.
- This way a lab can determine if the IL is on the upper or the sole.

Slide 2-64

9. For shoes, the best sampling method may be to cut them into pieces.
10. While difficult to cut, it may be to your advantage to separate the uppers from the soles and place them in different containers.
11. This way a lab can determine if the IL is on the upper or the sole.

CONTENTS — LIQUIDS

- Liquid samples present at fire scenes may be collected from containers, pools or puddles.
- It is important to indicate to the laboratory if it is an aqueous (water-containing) sample.

Slide 2-65

G. Liquids:

1. Liquid samples present at fire scenes may be collected from containers, pools or puddles.
2. It is important to indicate to the laboratory if it is an aqueous (water-containing) sample.

LIQUID SAMPLES

- Per the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) liquid samples should be separated into three equal parts before shipping.
 - Part one is shipped to the lab for analysis.
 - Part two is to be held by the investigator if further or different testing is required.
 - Part three should be held in the event that a defense expert is retained and wishes to test it.

Slide 2-66

3. Per Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), liquid samples should be separated into three equal parts before shipping.
 - a. Part one is shipped to the lab for analysis.
 - b. Part two is to be held by the investigator if further or different testing is required.
 - c. Part three should be held in the event that a defense expert is retained and wishes to test it.

USING ABSORBENTS WITH LIQUID SAMPLES

- The question becomes how best to isolate this sample.
- If the rainbow cannot be suctioned off and sent as directed previously, it may be necessary to use an absorbent material to collect the sample.
- In all cases where an absorbent material is used, a comparison sample of the same absorbent material should also be submitted.

Slide 2-67

4. The question becomes how best to isolate this sample.
5. If the rainbow cannot be suctioned off and sent as directed previously, it may be necessary to use an absorbent material to collect the sample.
6. In all cases where an absorbent material is used, a comparison sample of the same absorbent material should also be submitted.

USING ABSORBENTS WITH LIQUID SAMPLES (cont'd)

- Paper towels, hydrophobic pads, and/or gauze can be floated on a puddle or used to wipe up smaller pools of liquid and then should be placed inside a can.

Slide 2-68

7. Paper towels, hydrophobic pads, and/or gauze can be floated on a puddle or used to wipe up smaller pools of liquid and then should be placed inside a can.

USING ABSORBENTS WITH LIQUID SAMPLES (cont'd)

- Be aware: Some types of gauze pads may contain a heavy petroleum product. Always obtain a comparison sample.
- Warning: Both tampons and maxi pads often show interferences from plastics or glues and should not be used as an absorbent.

Slide 2-69

8. Be aware: Some types of gauze pads may contain a heavy petroleum product. Always obtain a comparison sample.
9. Warning: Both tampons and maxi pads often show interferences from plastics or glues and should not be used as an absorbent.

SHIPPING IGNITABLE LIQUIDS



Slide 2-70

ABSORBENT IS ADDED TO THE LIQUID



Slide 2-71

JAR PACKED IN A PADDED CAN (SECONDARY CONTAINMENT)



Slide 2-72

III. WHAT ARE THE APPROPRIATE CONTAINERS FOR FIRE DEBRIS EVIDENCE?

APPROPRIATE CONTAINERS FOR FIRE DEBRIS

- In general, a proper container for fire debris satisfies the following criteria:
 - It seals the volatile IL.
 - It avoids contamination between samples.
 - It provides a proper chain of custody for the collected material.
- Call the laboratory you use to find out its preferred method.

Slide 2-73

A. General considerations for containers.

1. In general, a proper container for fire debris satisfies the following criteria:
 - a. It seals the volatile IL.
 - b. It avoids contamination between samples.
 - c. It provides a proper chain of custody for the collected material.
2. Call the laboratory you use to find out its preferred method.

METAL CONTAINERS

- Clean, unused paint cans are the most recommended container.
 - They can be sealed airtight.
 - Once sealed, they are not easily punctured and do not break.
 - Their surface is sufficient for recording sample information to provide a clear chain of custody.

Slide 2-74

B. Metal containers.

1. Clean, unused paint cans are the most recommended container.

- a. They can be sealed airtight.
- b. Once sealed, they are not easily punctured and do not break.
- c. Their surface is sufficient for recording sample information to provide a clear chain of custody.

METAL CONTAINERS (cont'd)

- To combat rusting, purchase lined cans.
 - Some cans have linings that will retard rusting. (The linings are typically 1 to 2 microns thick.)

Slide 2-75

2. To combat rusting, purchase lined cans.

- a. Some cans have linings that will retard rusting. (The linings are typically 1 to 2 microns thick.)

METAL CONTAINERS (cont'd)

- Some linings have trace levels of organic compounds, which can interfere with laboratory analyses.
- Fire debris with hard, sharp edges may scratch the lining.

Slide 2-76

- b. Some linings have trace levels of organic compounds, which can interfere with laboratory analysis.
- c. Fire debris with hard, sharp edges may scratch the lining.

METAL CONTAINERS (cont'd)

- For any cans (or any container used):
 - Send an exemplar of the container to the laboratory for testing to determine if the container is contaminated.
 - Include data such as manufacturer, lot number, and type of lining (if used).
 - Store them to avoid accidental contamination of their interiors.

Slide 2-77

3. For any cans (or any container used):
 - a. Send an exemplar of the container to the laboratory for testing to determine if the container is contaminated.
 - b. Include data such as manufacturer, lot number, and type of lining (if used).
 - c. Store them to avoid accidental contamination of their interiors.

GLASS CONTAINERS

- Clean glass containers can be used.
- An advantage is that the sample is visible without opening the container.



Slide 2-78

- C. Glass.
 1. Clean glass containers can be used.
 2. An advantage is that the sample is visible without opening the container.

GLASS CONTAINERS (cont'd)

- The major disadvantage is that glass breaks, and the evidence can then be lost.



Slide 2-79

3. The major disadvantage is that glass breaks, and the evidence can then be lost.

GLASS CONTAINERS (cont'd)

- Lids for glass containers that give an airtight seal are made of plastic with cardboard/plastic liners or rubber rings bonded to a metal top.
 - All three materials are potential sources of contamination and leaks. (ILs can dissolve them.)
 - Lining lids with aluminum foil interferes with airtight seals.
- If glass containers are used, screw-cap lids with Teflon liners are best.

Slide 2-80

4. Lids for glass containers that give an airtight seal are made of plastic with cardboard/plastic liners or rubber rings bonded to a metal top.
 - a. The rubber, cardboard and plastic are potential sources of contamination and leaks. (ILs can dissolve them.)
 - b. Lining a lid with aluminum foil interferes with an airtight seal.
5. If glass containers are used, screw-cap lids with Teflon liners are best.

SPECIALTY ARSON BAGS

- Another container increasing in popularity is the specialty arson bag.
 - These are usually nylon, polyamide or polyester bags.
- They cost less than cans or jars, come in various sizes, and are easily stored in bulk.

Slide 2-81

D. Specialty arson bags.

1. Another container increasing in popularity is the specialty arson bag.

These are usually nylon, polyamide or polyester bags.

2. They often cost less than cans or jars, come in various sizes, and are easily stored in bulk.

SPECIALTY ARSON BAGS (cont'd)

- Their primary disadvantages are:
 - They can be damaged/punctured.
 - Achieving an airtight seal can be difficult.
 - They must be resealed each time they are opened.
 - The more times they have to be opened and resealed, the less the vapor space in the bag.

Slide 2-82

3. Their primary disadvantages are:

- a. They can be damaged/punctured.

- b. Achieving an airtight seal can be difficult.

- They must be resealed each time they are opened.

- The more times they have to be opened and resealed, the less the vapor space in the bag.

SPECIALTY ARSON BAGS (cont'd)

- Anecdotally, there are stories where these bags of this type have been left in car trunks for long periods and have lost the chemicals that keep them flexible, resulting in cracks in the bags.

Slide 2-83

- c. Anecdotally, there are stories where bags of this type have been left in car trunks for long periods and have lost the chemicals that keep them flexible, resulting in cracks in the bags.

RESTRICTED CONTAINERS

- Do not use polyethylene, polypropylene, sandwich, Ziploc or garbage bags.
- The chemicals that compose most ILs will migrate in and out of these bags relatively freely and will therefore be lost or contaminated.

Slide 2-84

E. Restricted containers.

1. Do not use polyethylene, polypropylene, sandwich, Ziploc or garbage bags.
2. The chemicals that compose most ILs will migrate in and out of these bags relatively freely and will therefore be lost or contaminated.

OTHER CONTAINERS

- No other containers are recommended.
- All the other kinds of containers have serious deficiencies and should not be used unless there is absolutely no alternative.

Slide 2-85

F. Other containers.

1. No other containers are recommended.
2. All the other kinds of containers have serious deficiencies and should not be used unless there is absolutely no alternative.

OTHER CONTAINERS (cont'd)

- Investigators should note that if these containers are used, their evidence will be seriously challenged in court, often through the testimony of their own laboratory analysts.

Slide 2-86

3. Investigators should note that if these containers are used, their evidence will be seriously challenged in court, often through the testimony of their own laboratory analysts.

OTHER CONTAINERS (cont'd)

- A short list of these prohibited containers:
 - Paper bags.
 - Coffee cans.
 - Rubber-stopper vials.

Slide 2-87

4. A short list of these prohibited containers:

- a. Paper bags.
- b. Coffee cans.
- c. Rubber-stopper vials.

SEALING THE EVIDENCE

- Evidence containers must be sealed airtight.
- An improperly sealed container may lose any trapped IL residue due to evaporation.
- A poor seal also increases the potential for contamination of the evidence inside.

Slide 2-88

G. Sealing the evidence.

1. Evidence containers must be sealed airtight.
2. An improperly sealed container may lose any trapped IL residue due to evaporation.
3. A poor seal also increases the potential for contamination of the evidence inside.

SEALING THE EVIDENCE (cont'd)

- The potential for contamination is too great to ignore.
- With metal cans, wipe any debris from the V channel prior to securing the lid.

Slide 2-89

4. The potential for contamination is too great to ignore.
5. With metal cans, wipe any debris from the V channel prior to securing the lid.

THE V CHANNEL OF A CAN



Slide 2-90

SEALING THE EVIDENCE (cont'd)

- Tamper-resistant evidence tape should be used to seal any evidence container sent to the laboratory.
- This ensures that the container has not been opened prior to receipt at the laboratory.

Slide 2-91

6. Tamper-resistant evidence tape should be used to seal any evidence container sent to the laboratory.
7. This ensures that the container has not been opened prior to receipt at the laboratory.

SEALING THE EVIDENCE (cont'd)

- The condition of the tape is one of the physical observations of the evidence recorded by the analyst prior to working on a sample.
- When an analyst finishes working on a case, he or she should reseal the container with the laboratory's evidence tape.

Slide 2-92

8. The condition of the tape is one of the physical observations of the evidence recorded by the analyst prior to working on a sample.
9. When an analyst finishes working on a case, he or she should reseal the container with the laboratory's evidence tape.

SEALING THE EVIDENCE (cont'd)

- While some may minimize its importance, the placement of the evidence tape is a potential issue that can be used to raise questions concerning your evidence.

Slide 2-93

10. While some may minimize its importance, the placement of the evidence tape is a potential issue that can be used to raise questions concerning your evidence.

SEALING THE EVIDENCE (cont'd)

- The purpose of the tape is to provide a method of ensuring that evidence sealed in the field could not have been opened or tampered with before it was received at the lab.

Slide 2-94

11. The purpose of the tape is to provide a method of ensuring that evidence sealed in the field could not have been opened or tampered with before it was received at the lab.

SEALING THE EVIDENCE (cont'd)

- The evidence container should also be labeled with the following, at a minimum:
 - Case number.
 - Evidence item number.
 - Name of investigator.
 - Address of incident location.
 - Incident date.
 - Description of contents.

Slide 2-95

H. Information on the container.

1. The evidence container should also be labeled with the following, at a minimum:
 - a. Case number.
 - b. Evidence item number.
 - c. Name of investigator.
 - d. Address of incident location.
 - e. Incident date.
 - f. Description of contents.

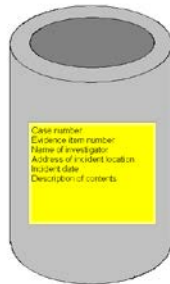
SEALING THE EVIDENCE (cont'd)

- This information must match with the same information on the laboratory submission documents.
- Chain of custody: the written record of who had the evidence from the moment it was collected to the time it was presented in court.

Slide 2-96

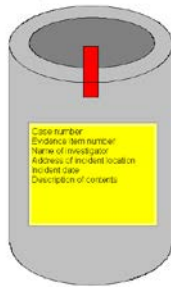
2. This information must match with the same information on the laboratory submission documents.
3. Chain of custody: the written record of who had the evidence from the moment it was collected to the time it was presented in court.

AN UNSEALED CAN



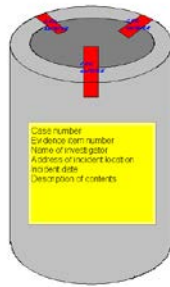
Slide 2-97

ONE PIECE OF TAPE IS NOT A SEAL; IT'S A HINGE



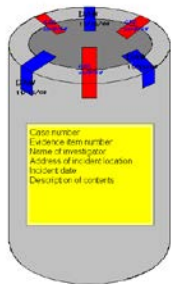
Slide 2-98

THREE PIECES AT 2, 6, AND 10 ENSURE A SEAL



Slide 2-99

RESEAL AFTER PROCESSING THE SAMPLE



Slide 2-100

BIOHAZARD SAMPLES

- Tissue samples should be treated with extreme caution and properly marked.
- Biohazard labels and stickers should be prominently displayed on the container.
- Laboratory submission documents should also clearly state that the sample is a biohazard.

Slide 2-101

I. Biohazards.

1. Tissue samples should be treated with extreme caution and properly marked.
2. Biohazard labels and stickers should be prominently displayed on the container.
3. Laboratory submission documents should also clearly state that the sample is a biohazard.

BIOHAZARD SAMPLES (cont'd)

- In some cases, blood may be contaminating the outside of the evidence container or pooling around the lid seal.
- This must not be allowed, since it creates a hazardous situation for those who transport the sample or handle it prior to analyses.

Slide 2-102

4. In some cases, blood may be contaminating the outside of the evidence container or pooling around the lid seal.
5. This must not be allowed, since it creates a hazardous situation for those who transport the sample or handle it prior to analyses.

IV. SHIPPING EVIDENCE**SHIPPING EVIDENCE**

- Evidence listed as dangerous goods must be shipped with precautions or not shipped at all.
- The classification comes from the Department of Transportation (DOT).

Slide 2-103

- A. Evidence listed as dangerous goods must be shipped with precautions or not shipped at all.
- B. The classification comes from the Department of Transportation (DOT).

SHIPPING EVIDENCE (cont'd)

- If an absorbent is used to take up free liquid, you must send a comparison sample of the absorbent material in a separate container for testing.

Slide 2-104

- C. If an absorbent is used to take up free liquid, you must send a comparison sample of the absorbent material in a separate container for testing.

SHIPPING EVIDENCE (cont'd)

- To help guarantee the integrity of the sample, evidence tape should be used to ensure that the cap is not jarred loose due to handling and/or pressure changes during transport.

Slide 2-105

- D. To help guarantee the integrity of the sample, evidence tape should be used to ensure that the cap is not jarred loose due to handling and/or pressure changes during transport.

SHIPPING EVIDENCE (cont'd)

- Further security measures include placing the bottle inside a metal can that has been lined with an absorbent padding that will secure the bottle.

Slide 2-106

- E. Further security measures include placing the bottle inside a metal can that has been lined with an absorbent padding that will secure the bottle.

SHIPPING EVIDENCE (cont'd)

- This method eliminates the presence of free liquid and provides secondary containment.
- Lastly, shipping these items by ground or hand delivering them is strongly recommended.

Slide 2-107

1. This method eliminates the presence of free liquid and provides secondary containment.
2. Lastly, shipping these items by ground or delivering them by hand is strongly recommended.

OTHER ITEMS

- Other dangerous goods that may potentially need to be shipped are matches and lighters.
- If the matches are classified as any-strike, and if the lighter still has lighter fluid in it, they will be forbidden for air travel in most cases.
- Please call your laboratory for shipping instructions.

Slide 2-108

F. Other items.

1. Other dangerous goods that may potentially need to be shipped are matches and lighters.
2. If the matches are classified as any-strike, and if the lighter still has lighter fluid in it, they will be forbidden for air travel in most cases.
3. Please call your laboratory for shipping instructions.

FINES

- To the best of your ability, avoid shipping dangerous goods.
- Shipping dangerous goods adds a tremendous responsibility to the shipper.
- Fines start at around \$24,000 or more per day.

Slide 2-109

G. Fines.

1. To the best of your ability, avoid shipping dangerous goods.
2. Shipping dangerous goods adds a tremendous responsibility to the shipper.
3. Fines start at around \$24,000 or more per day.

FEDERAL AVIATION ADMINISTRATION

- The Federal Aviation Administration (FAA) requires the shipper to be trained in handling and/or shipping dangerous goods.
- This includes training records and a test to prove completion of the approved DOT course.

Slide 2-110

4. The Federal Aviation Administration (FAA) requires the shipper to be trained in handling and/or shipping dangerous goods.
5. This includes training records and a test to prove completion of the approved DOT course.

This page intentionally left blank.

ACTIVITY 2.1

Collecting, Packaging and Sealing Evidence

Purpose

Give you an opportunity to appropriately collect, pack and seal evidence.

Directions

1. The purpose of this activity is to give you the opportunity to appropriately collect, pack and seal evidence for liquid and carpet.
2. The instructor will provide one square of carpet (minimum 12 to 18 inches), one quart jar with water and IL floating layer, one quart metal can for liquid, and one gallon metal can for carpet.
3. The instructor will also provide one large white cutting board to share to cut the carpet on.
4. From the evidence collection kits, use: nitrile gloves, utility knife, one glass bottle with Teflon liner, one gauze swab, evidence tape, tweezers, pipette, flathead screwdriver, and two evidence labels.
5. When handling evidence, always use nitrile gloves.
6. Upon completion of the activity, exchange both cans with classmates in order to critique each team's work.
7. Before opening the can, examine the label.
8. Open the can with a flathead screwdriver.
9. Critique the collection, packaging and sealing of evidence by team members.

This page intentionally left blank.

V. COMPARISON SAMPLING

A. What is the difference?

COMPARISON SAMPLES

- Comparison samples are:
 - Samples collected at the fire scene.
 - Samples that are unburned, free of soot.
 - Samples for which you do not know the history of that sample — for example, carpeting from a room not in the origin of the fire.

Slide 2-112

1. Comparison samples are:

- a. Samples collected at the fire scene.
- b. Samples that are unburned, free of soot.
- c. Samples for which you do not know the history of that sample — for example, carpeting from a room not in the origin of the fire.

CONTROL SAMPLES

- Control samples.
 - Samples that you go to the store and buy.
 - You know the history of the sample.
 - Lowes: known standard of carpeting, padding.
 - Wal-Mart brand charcoal starter, lamp oil, lighter fluid.

Slide 2-113

2. Control samples.

- a. Samples that you go to the store and buy.
- b. You know the history of the sample.

- Lowes: known standard of carpeting, padding.
- Wal-Mart brand charcoal starter, lamp oil, lighter fluid.

COMPARISON SAMPLES (cont'd)

- The majority of samples collected from a scene will consist of unknown materials (e.g., building materials).
 - Carpet and padding.
 - Vinyl or linoleum flooring.
 - Stained hardwood floors.

Slide 2-114

B. What are they?

1. The majority of samples collected from a scene will consist of unknown materials (e.g., building materials).
 - a. Carpet and padding.
 - b. Vinyl or linoleum flooring.
 - c. Stained hardwood floors.

COMPARISON SAMPLES (cont'd)

- Not every fire scene will have an appropriate comparison sample available.
- Should not be collected from origin location.

Slide 2-115

2. Not every fire scene will have an appropriate comparison sample available.
3. Should not be collected from origin location.

NATIONAL FIRE PROTECTION ASSOCIATION
921, *GUIDE FOR FIRE AND EXPLOSION
INVESTIGATIONS*

- Comparison samples should come from areas that are thought to be free from any ILs.
 - If burned carpet and padding from the point of origin or a trailer are collected, collect an unburned portion of the same carpet and padding from a different room or under a heavy piece of furniture.

Slide 2-116

4. National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations* requirements for comparison samples.
5. Comparison samples should come from areas that are thought to be free from any ILs.
 - a. If burned carpet and padding from the point of origin or a trailer are collected, collect an unburned portion of the same carpet and padding from a different room or under a heavy piece of furniture.

NATIONAL FIRE PROTECTION ASSOCIATION
921, *GUIDE FOR FIRE AND EXPLOSION
INVESTIGATIONS (cont'd)*

- If it is not possible to collect this type of comparison sample, that fact should be clearly documented in your report for future reference.

Slide 2-117

- b. If it is not possible to collect this type of comparison sample, that fact should be clearly documented in your report for future reference.

COMPARISON LIQUID SAMPLES

- Comparison liquid samples should include any ILs common to or used recently in or around the fire scene, such as:
 - Solvents used in a hobby.
 - Solvents used in a business.
 - Insecticides/Pesticides.
 - Spot removers used on upholstery.
 - Stored solvents/cleaners.

Slide 2-118

C. Comparison liquid samples.

1. Comparison liquid samples should include any ILs common to or used recently at the fire scene, such as:
 - a. Solvents used in a hobby.
 - b. Solvents used in a business.
 - c. Insecticides/Pesticides.
 - d. Spot removers used on upholstery.
 - e. Stored solvents/cleaners.

COMPARISON LIQUID SAMPLES (cont'd)

- Look for any areas at the scene where bottles, cans or other containers of possible ILs are stored.
- These will help to establish which ILs were physically identifiable and possibly inherent to the scene.

Slide 2-119

2. Look for any areas at the scene where bottles, cans or other containers of possible ILs are stored.
3. These will help to establish which ILs were physically identifiable and possibly inherent to the scene.

COMPARISON LIQUID (cont'd)

- Establish (as early as possible) which ILs or materials were recently used at the scene by owners, occupants, service personnel or others.
- This may be useful in explaining unexpected lab findings.
- This may also discount later claims by suspects who suddenly recall that they used a particular material the day before the fire.

Slide 2-120

D. Value of comparison samples.

1. Establish (as early as possible) which ILs or materials were recently used at the scene by owners, occupants, service personnel or others.
2. This may be useful in explaining unexpected lab findings.
3. This may also discount later claims by suspects who suddenly recall that they used a particular material the day before the fire.

POSITIVE COMPARISON SAMPLES

- What does it mean when your comparison sample comes back positive for an IL?
 - An IL may be inherent to the sample. (For example, some vinyl flooring contains Isopar H.)
 - Fire was put out before sample had time to ignite.

Slide 2-121

E. Positive comparison samples: What does it mean when your comparison sample comes back positive for an IL?

1. An IL may be inherent to the sample (For example, some vinyl flooring contains Isopar H.)
2. Fire was put out before sample had time to ignite.

POSITIVE COMPARISON SAMPLES (cont'd)

- Water from hose may have scattered IL throughout scene.
- Cross-contamination from not changing gloves between samples or not properly cleaning tools between samples.
- Remember: A true comparison sample is an unburned sample, preferably from a protected area not in room of origin (under couch, desk, chair, rug, etc.).

Slide 2-122

3. Water from hose may have scattered IL throughout scene.
4. Cross-contamination from not changing gloves between samples or not properly cleaning tools between samples.
5. Remember: A true comparison sample is an unburned sample, preferably from a protected area not in room of origin (under a couch, desk, chair, rug, etc.).

VI. CROSS-CONTAMINATION OF SAMPLES

CROSS-CONTAMINATION

- Cross-contamination is the unintentional transfer of a residue from one location to another within an evidence collection site. The most common ways for cross-contamination to occur are:
 - DNA on gloves.
 - ILs.
 - Trace evidence.

Slide 2-123

A. Cross-contamination.

1. Cross-contamination is the unintentional transfer of a residue from one location to another within an evidence collection site. The most common ways for cross-contamination to occur are:

- a. DNA on gloves.
- b. ILs.
- c. Trace evidence.

CROSS-CONTAMINATION (cont'd)

- In the fire scene, some potential sources of cross-contamination are:
 - Failure to clean tools used in the collection of evidence between samples.
 - Failure to wear or change gloves between selections of samples.
 - Contaminated turnout gear or boots worn by arriving personnel.

Slide 2-124

2. In the fire scene, some potential sources of cross-contamination are:

- a. Failure to clean tools used in the collection of evidence between samples.
- b. Failure to wear or change gloves between selections of samples.
- c. Contaminated turnout gear or boots worn by arriving personnel.

CROSS-CONTAMINATION (cont'd)

- More potential sources of contamination include:
 - Personnel walking through areas where ILs were deposited and transferring them to other areas.
 - Pushing or washing ILs from their original place of deposit into other areas.

Slide 2-125

3. More potential sources of contamination include:
 - a. Personnel walking through areas where ILs were deposited and transferring them to other areas.
 - b. Pushing or washing ILs from their original place of deposit into other areas.

CROSS-CONTAMINATION (cont'd)

- Equipment such as positive-pressure ventilation (PPV) fans or saws that are fueled inside the scene during suppression or overhaul.
- Evidence cans or containers that have become contaminated in a trunk or storage area.

Slide 2-126

- c. Equipment such as positive-pressure ventilation (PPV) fans or saws that are fueled inside the scene during suppression or overhaul.
- d. Evidence cans or containers that have become contaminated in a trunk or storage area.

CROSS-CONTAMINATION (cont'd)

- According to Locard's Exchange Principle, cross-contamination can occur when two materials come into contact with one another, resulting in a transfer of each material to the other.

Slide 2-127

- e. According to Locard's Exchange Principle, cross-contamination can occur when two materials come into contact with one another, resulting in a transfer of each material to the other.

CROSS-CONTAMINATION (cont'd)

- Contamination of physical evidence can occur from any improper method of collection, storage or shipment.
 - Like improper preservation of the fire scene, any contamination of physical evidence may reduce the evidentiary value of the physical evidence.
 - Many potential sources of contamination of physical evidence occur during its collection.

Slide 2-128

- B. Contamination of physical evidence can occur from any improper method of collection, storage or shipment.
1. Like improper preservation of the fire scene, any contamination of physical evidence may reduce the evidentiary value of the physical evidence.
 2. Many potential sources of contamination of physical evidence occur during its collection.

CROSS-CONTAMINATION (cont'd)

- Avoiding cross-contamination of any physical evidence becomes critical to the fire investigator. Attention should be paid to:
 - Hand tools.
 - Gloves.
 - Turnout gear and footwear.
 - Power tools.

Slide 2-129

3. Avoiding cross-contamination of any physical evidence becomes critical to the fire investigator. Attention should be paid to:
 - a. Hand tools.
 - b. Gloves.
 - c. Turnout gear and footwear.
 - d. Power tools.

CROSS-CONTAMINATION (cont'd)

- Tools, turnout gear, evidence cans and emergency equipment constitute major potential sources of cross-contamination.
- Tools should be kept separate from other equipment and never coated with petrochemical-based rust preventive.

Slide 2-130

4. Tools, turnout gear, evidence cans and emergency equipment constitute major potential sources of cross-contamination.
5. Tools should be kept separate from other equipment and never coated with petrochemical-based rust preventive.

CROSS-CONTAMINATION (cont'd)

- No matter how pristine the tool, avoid using gasoline-powered tools to collect evidence, especially in the area of origin.
- If gasoline-powered tools were used at the fire scene, check with the Incident Commander (IC) to determine the location where the tools were used as well as where the tools were filled.

Slide 2-131

6. No matter how pristine the tool, avoid using gasoline-powered tools to collect evidence, especially in the area of origin.
7. If gasoline-powered tools were used at the fire scene, check with the Incident Commander (IC) to determine the location where the tools were used as well as where the tools were filled.

CROSS-CONTAMINATION (cont'd)

- The preferred method of cleaning tools is with Dawn or other grease- (oil-) cutting dishwashing detergent, followed by a rinse with clean water prior to storage.

Slide 2-132

8. The preferred method of cleaning tools is with Dawn or another grease- (oil-) cutting dishwashing detergent, followed by a rinse with clean water prior to storage.

CROSS-CONTAMINATION (cont'd)

- From laboratory testing, this procedure has been seen to be effective in dissolving IL residue on steel tools when scrubbed with a brush and properly rinsed.

Slide 2-133

9. From laboratory testing, this procedure has been seen to be effective in dissolving IL residue on steel tools when scrubbed with a brush and properly rinsed.

CROSS-CONTAMINATION (cont'd)

- Another effective method is to wipe the tools with isopropyl alcohol-saturated paper towels followed by a thorough water rinse.

Slide 2-134

10. Another effective method is to wipe the tools with isopropyl alcohol-saturated paper towels followed by a thorough water rinse.

CROSS-CONTAMINATION (cont'd)

- Boots should be cleaned prior to entering the scene.
- Rather than fire gloves, handle IL residue samples with clean latex or nitrile gloves and change them between samples, discarding the old ones. Do not put them into the evidence containers.

Slide 2-135

11. Boots should be cleaned prior to entering the scene.
12. Rather than fire gloves, handle IL residue samples with clean latex or nitrile gloves and change them between samples, discarding the old ones. Do not put them into the evidence containers.

CROSS-CONTAMINATION (cont'd)

- Absorbent materials such as lime, diatomaceous earth, or flour that is not self-rising are excellent media for collecting liquids absorbed into materials that cannot be readily removed from a scene (e.g., concrete flooring).

Slide 2-136

13. Absorbent materials such as lime, diatomaceous earth, or flour that is not self-rising are excellent media for collecting liquids absorbed into materials that cannot be readily removed from a scene (e.g., concrete flooring).

CROSS-CONTAMINATION (cont'd)

- The investigator should be careful to use clean tools and containers during the recovery phase because the absorbent material can be easily contaminated.
- An unused sample of the absorbent should also be submitted as a comparison sample.

Slide 2-137

14. The investigator should be careful to use clean tools and containers during the recovery phase because the absorbent material can be easily contaminated.
15. An unused sample of the absorbent should also be submitted as a comparison sample.

CROSS-CONTAMINATION (cont'd)

- Consider using a hydrocarbon detecting device or an accelerant detection canine to double check tools and equipment prior to and after use.

Slide 2-138

16. Consider using a hydrocarbon detecting device or an accelerant detection canine to double check tools and equipment prior to and after use.

VII. ARMSTRONG et al. ON CONTAMINATION

ARMSTRONG et al. ON CONTAMINATION

"The Evaluation of the Extent of Transporting or 'Tracking' an Identifiable Ignitable Liquid (Gasoline) Throughout Fire Scenes During the Investigative Process," Andrew Armstrong, Ph.D.; Vytenis Babrauskas, Ph.D.; Douglas L. Holmes, M.A.; Cory Martin, B.S.; Ray Powell, B.S.; Steve Riggs, C.F.E.I.; and Lloyd D. Young, P.E., Journal of Forensic Science, July 2004, Vol. 49, No. 4.

Slide 2-139

- A. "The Evaluation of the Extent of Transporting or 'Tracking' an Identifiable Ignitable Liquid (Gasoline) Throughout Fire Scenes During the Investigative Process," Andrew Armstrong, Ph.D.; Vytenis Babrauskas, Ph.D.; Douglas L. Holmes, M.A.; Cory Martin, B.S.; Ray Powell, B.S.; Steve Riggs, C.F.E.I.; and Lloyd D. Young, P.E., Journal of Forensic Science, July 2004, Vol. 49, No. 4.

ARMSTRONG et al. ON CONTAMINATION (cont'd)

Armstrong et al. (2004) state, "The present study, however, has shown that even walking through major quantities of spilled gasoline and onto the fire scene will not cause laboratory analysis to indicate a false positive result when the fire debris are tested. Thus, detected presence of fresh gasoline should be taken to indicate that gasoline may have been poured or spilled in that location, and not tracked in from another area."

Slide 2-140

- B. Armstrong et al. (2004) state, "The present study, however, has shown that even walking through major quantities of spilled gasoline and onto the fire scene will not cause laboratory analysis to indicate a false positive result when the fire debris are tested. Thus, detected presence of fresh gasoline should be taken to indicate that gasoline may have been poured or spilled in that location, and not tracked in from another area."

Test Number	Gasoline Amount	Shoe	Poured On	Laboratory Finding for Step Number (On Carpet)							
				1	2	3	4	5	6	7	8
1	118 ml	fire boots	Cpt & Pad	Y	N	N	N	N			
2	79 ml	work boots	Cpt & Pad	Y	N	N	N	N	N		
3	473 ml	tennis shoes	Concrete	a	a	N	N	N	N	N	N
4	473 ml	tennis shoes	Concrete	b	N	N	N	N	N	N	N
5	473 ml	fire boots	Concrete	c	N						
a = first two steps on concrete; b = first step on concrete; c = 30.5 ft on concrete											
Test Number	Gasoline Amount	Shoe	Poured On	Canine Finding for Step Number (On Carpet)							
				1	2	3	4	5	6	7	8
1	118 ml	fire boots	Cpt & Pad	Y	Y	Y	N	N			
2	79 ml	work boots	Cpt & Pad	Y	Y	N	N	N	N		
3	473 ml	tennis shoes	Concrete	a	a	Y	Y	Y	Y	Y	Y
4	473 ml	tennis shoes	Concrete	b	N	N	N	N	N	N	N
a = first two steps on concrete; b = first step on concrete; c = 30.5 ft on concrete											

Slide 2-141

VIII. SPOILIATION AND LEGAL ISSUES (20 min.)

SPOILIATION AND LEGAL ISSUES

- Spoliation is the loss, destruction or material alteration of an object or document that is evidence or potential evidence by someone who has the responsibility for its preservation.
- The concept of spoliation is a matter of fundamental fairness.

Slide 2-142

A. Definition:

1. Spoliation is the loss, destruction or material alteration of an object or document that is evidence or potential evidence by someone who has the responsibility for its preservation.
2. The concept of spoliation is a matter of fundamental fairness.

SPOILIATION AND LEGAL ISSUES (cont'd)

- Where one party has lost, destroyed or altered physical evidence that prejudices another party, the courts will use the doctrine of spoliation to balance the scales.

Slide 2-143

3. Where one party has lost, destroyed or altered physical evidence that prejudices another party, the courts will use the doctrine of spoliation to balance the scales.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Legal action against the offender is a possibility.
- Most jurisdictions require some element of deliberate intent to be present for sanctions to be imposed.

Slide 2-144

B. Legal actions against individuals.

1. Legal action against the offender is a possibility.
2. Most jurisdictions require some element of deliberate intent to be present for sanctions to be imposed.

SPOLIATION AND LEGAL ISSUES (cont'd)

- In some jurisdictions, however, mere negligence is the threshold for sanctions, even though there was no deliberate intent.
- Due to sovereign immunity, there is limited exposure to claims of spoliation against public investigators.

Slide 2-145

3. In some jurisdictions, however, mere negligence is the threshold for sanctions, even though there was no deliberate intent.
4. Due to sovereign immunity, there is limited exposure to claims of spoliation against public investigators.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Courts can impose sanctions designed to correct prejudice the injured party suffered having been prevented from independently examining and testing the evidence.
- That testing and examination is critical for defense against claims relating to the evidence or to use that same evidence to assert claims against other parties.

Slide 2-146

5. Courts can impose sanctions designed to correct prejudice the injured party suffered having been prevented from independently examining and testing the evidence.
6. That testing and examination is critical for defense against claims relating to the evidence or to use that same evidence to assert claims against other parties.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Sanctions can include preventing the introduction of the spoiled evidence; preventing testimony about that evidence; or entering a judgment in favor of the party victimized by the spoliation.

Slide 2-147

7. Sanctions can include preventing the introduction of the spoliated evidence; preventing testimony about that evidence; or entering a judgment in favor of the party victimized by the spoliation.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Intentional destruction of evidence is likely to be actionable even against a public sector investigator.
- Spoliation of evidence is an inevitable byproduct of any fire scene investigation, as the entire fire scene is critical evidence in a case.

Slide 2-148

8. Intentional destruction of evidence is likely to be actionable even against a public sector investigator.
9. Spoliation of evidence is an inevitable byproduct of any fire scene investigation, as the entire fire scene is critical evidence in a case.

SPOLIATION AND LEGAL ISSUES (cont'd)

- When an investigator has conducted a scene investigation by moving fire debris and other evidence at the scene, the scene itself is altered.
- Moving debris in a layering process can leave the scene devoid of any evidence, exposing only a bare slab.

Slide 2-149

10. When an investigator has conducted a scene investigation by moving fire debris and other evidence at the scene, the scene itself is altered.
11. Moving debris in a layering process can leave the scene devoid of any evidence, exposing only a bare slab.

SPOLIATION AND LEGAL ISSUES (cont'd)

- The mere collection and removal of evidence constitutes even further change.
- The inevitable alteration of evidence as fire debris is examined and moved during a fire scene examination generally does not constitute actionable spoliation, especially if the scene has been properly documented and photographed.

Slide 2-150

12. The mere collection and removal of evidence constitutes even further change.
13. The inevitable alteration of evidence as fire debris is examined and moved during a fire scene examination generally does not constitute actionable spoliation, especially if the scene has been properly documented and photographed.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Documentation and photography are critical and need to be done before, during and after the movement of evidence.
- In this manner, proper fire scene documentation — which should be employed in every investigation — is the first line of defense against claims of spoliation.

Slide 2-151

14. Documentation and photography are critical and need to be done before, during and after the movement of evidence.
15. In this manner, proper fire scene documentation — which should be employed in every investigation — is the first line of defense against claims of spoliation.

SPOLIATION AND LEGAL ISSUES (cont'd)

- Fire investigators should remain current on legal issues regarding spoliation.

Slide 2-152

16. Fire investigators should remain current on legal issues regarding spoliation.

SPOLIATION AND LEGAL ISSUES (cont'd)

- When questions arise, always contact your prosecutor for clarification or advice.
- Remember to document, document and document. It is the best protection against problems resulting from accidental damage, storage or transport.

Slide 2-153

17. When questions arise, always contact your prosecutor for clarification or advice.
18. Remember to document, document and document. It is the best protection against problems resulting from accidental damage, storage or transport.

DVD PRESENTATION

“TAINTED EVIDENCE FORENSICS”



Slide 2-154

IX. SUMMARY




SUMMARY

- What are ILs?
- Sampling issues.
- What are the appropriate containers for fire debris evidence?
- Shipping evidence.

Slide 2-155




SUMMARY (cont'd)

- Comparison sampling.
- Cross-contamination of samples.
- Armstrong et al. on contamination.
- Spoliation and legal issues.

Slide 2-156

UNIT 3: OTHER IGNITABLE LIQUID SAMPLING TOOLS

TERMINAL OBJECTIVE

The students will be able to:

- 3.1 *Explain the use and application of other ignitable liquid (IL) sampling tools at a fire scene.*

ENABLING OBJECTIVES

The students will be able to:

- 3.1 *Explain various tools and methods to sample ILs, along with the limitations of these tools and methods.*
 - 3.2 *Explain the primary functions of an accelerant detection canine or K-9.*
 - 3.3 *Describe the capabilities, limitations and considerations when deploying an Arson Dog/K-9.*
 - 3.4 *Describe how the Arson Dog/K-9 can assist in obtaining IL evidence from a suspect.*
-

This page intentionally left blank.



UNIT 3: OTHER IGNITABLE LIQUID SAMPLING TOOLS

Slide 3-1

ENABLING OBJECTIVES

- Explain various tools and methods to sample ignitable liquids (ILs), along with the limitations of these tools and methods.
- Explain the primary functions of an accelerant detection canine or K-9.

Slide 3-2

ENABLING OBJECTIVES (cont'd)

- Describe the capabilities, limitations and considerations when deploying an Arson Dog/K-9.
- Describe how the Arson Dog/K-9 can assist in obtaining IL evidence from a suspect.

Slide 3-3

I. IGNITABLE LIQUID OVERVIEW**IGNITABLE LIQUIDS**

- Most ILs are composed of multiple chemical compounds.
- The exceptions are alcohols (methyl, ethyl, isopropyl), ketones (acetone and methyl ethyl ketone (MEK)), toluene, and xylenes.

Slide 3-4

A. Ignitable liquids (ILs).

1. Most ILs are composed of multiple chemical compounds.
2. The exceptions are alcohols (methyl, ethyl, isopropyl), ketones (acetone and methyl ethyl ketone (MEK)), toluene, and xylenes.

COMMERCIAL NAMES FOR ALCOHOL AND KETONES

- These are all sold under various commercial and common names.
 - Heet® — methyl alcohol.
 - Vodka, whiskey, rum, Everclear® — ethyl alcohol.
 - Rubbing or wintergreen alcohol — isopropyl alcohol.
 - Nail polish remover — acetone.
 - Toluol — toluene.
 - Oops® — mixed xylenes.

Slide 3-5

B. These are all sold under various commercial and common names:

1. Heet® — methyl alcohol.
2. Vodka, whiskey, rum, Everclear® — ethyl alcohol.
3. Rubbing or wintergreen alcohol — isopropyl alcohol.
4. Nail polish remover — acetone.

5. Toluol — toluene.
6. Oops[®] — mixed xylenes.

IGNITABLE LIQUIDS (cont'd)

- The vast majority of ILs are complex.
- There are multiple classes of ILs composed of hundreds to thousands of organic compounds. The variety of compounds is significant.

Slide 3-6

7. The vast majority of ILs are complex.
8. There are multiple classes of ILs composed of hundreds to thousands of organic compounds. The variety of compounds is significant.

IGNITABLE LIQUID COMPOUNDS

- Aromatic compounds are prevalent in gasoline.
- Alkane compounds are prevalent in kerosene and diesel fuel.
- Branched and cyclic alkanes are the dominant compounds in many odorless solvents.
- These are only a few of the compounds and classes that can constitute ILs.

Slide 3-7

9. Aromatic compounds are prevalent in gasoline.
10. Alkane compounds are prevalent in kerosene and diesel fuel.
11. Branched and cyclic alkanes are the dominant compounds in many odorless solvents.
12. These are only a few of the compounds and classes that can constitute ILs.

IDENTIFYING IGNITABLE LIQUIDS

- The key complication is that many (if not most) of the chemicals that are found in ILs are also found all around us. In addition, many more of them are created when materials burn.

Slide 3-8

13. The key complication is that many (if not most) of the chemicals that are found in ILs are also found all around us. In addition, many more of them are created when materials burn.

IDENTIFYING IGNITABLE LIQUIDS (cont'd)

- The only conclusive method for identifying ILs requires separating their initial mixtures into individual components, identifying specific compounds, and comparing the ratios of the compounds to each other.
- For this, the forensic laboratory uses a gas chromatograph with mass spectrometer.

Slide 3-9

14. The only conclusive method for identifying ILs requires separating their initial mixtures into individual components, identifying specific compounds, and comparing the ratios of the compounds to each other.
15. For this, the forensic laboratory uses a gas chromatograph with mass spectrometer.

II. SAMPLING TOOL LIMITATIONS

SAMPLING TOOL LIMITATIONS

- Human olfactory capability (i.e., sense of smell).
- Ultraviolet/Black light sources.
- IL accelerant powder/Two-part powder.
- Portable sniffer devices.

Slide 3-10

A. Background.

1. Human olfactory capability (i.e., sense of smell).
2. Ultraviolet/Black light sources.
3. IL accelerant powder/Two-part powder.
4. Portable sniffer devices.

SAMPLING TOOL LIMITATIONS (cont'd)

- The previously named tools and methods all suffer from a similar problem.
- They are all, to varying degrees, nonspecific.
- Most cannot differentiate between kerosene and diesel fuel.

Slide 3-11

B. Limitations.

1. The previously named tools and methods all suffer from a similar problem.
2. They are all, to varying degrees, nonspecific.

3. Most cannot differentiate between kerosene and diesel fuel.

**SAMPLING TOOL
LIMITATIONS — SMELL**

- Some tools cannot differentiate between an IL and certain chemicals produced by:
 - Burned carpet.
 - Burned wood.
 - Burned foam padding.
 - Burned cloth.

Slide 3-12

4. Some tools cannot differentiate between an IL and certain chemicals produced by:

- a. Burned carpet.
- b. Burned wood.
- c. Burned foam padding.
- d. Burned cloth.

**SAMPLING TOOL
LIMITATIONS — SMELL (cont'd)**

- The human nose is quite sensitive. Research has found that the human nose can often differentiate multiple scents; that said, limitations in our sense of smell make it necessary to use other means of detection.

Slide 3-13

5. The human nose is quite sensitive. Research has found that the human nose can often differentiate multiple scents; that said, limitations in our sense of smell make it necessary to use other means of detection.

SAMPLING TOOL LIMITATIONS — SMELL (cont'd)

- For most of us, a mixture of the following would smell like gasoline:
 - Benzene.
 - Toluene.
 - Ethylbenzene.
 - Xylene.
 - Naphthalene.

Slide 3-14

6. For most of us, a mixture of the following would smell like gasoline:
- a. Benzene.
 - b. Toluene.
 - c. Ethylbenzene.
 - d. Xylene.
 - e. Naphthalene.

SAMPLING TOOL LIMITATIONS — LIGHT

- Ultraviolet and black light sources can cause certain chemical compounds to fluoresce (glow in the dark).
- Varying the wavelengths of these variable light sources can be used to reveal different classes of compounds.

Slide 3-15

7. Ultraviolet and black light sources can cause certain chemical compounds to fluoresce (glow in the dark).
8. Varying the wavelengths of these variable light sources can be used to reveal different classes of compounds.

SAMPLING TOOL LIMITATIONS — LIGHT (cont'd)

- This method will also cause pyrolysis products and many chemicals inherent to materials in the room, to glow.
- These tools do not guarantee that the samples selected will contain an IL instead of background interferences.

Slide 3-16

9. This method will also cause pyrolysis products and many chemicals inherent to materials in the room, to glow.
10. These tools do not guarantee that the samples selected will contain an IL instead of background interferences.

SAMPLING TOOL LIMITATIONS — POWDER

- IL accelerant has been formulated so that when in contact with certain classes of organic molecules, the powder alters its color.
- Unfortunately, IL accelerant is still nonspecific.

Slide 3-17

11. IL accelerant has been formulated so that when in contact with certain classes of organic molecules, the powder alters its color.
12. Unfortunately, IL accelerant is still nonspecific.

**SAMPLING TOOL
LIMITATIONS — POWDER (cont'd)**

- The powder has been shown to react with chemicals coming from the pyrolysis of materials in the scene and even from some chemicals inherent to a material's manufacturing/formulation.

Slide 3-18

13. The powder has been shown to react with chemicals coming from the pyrolysis of materials in the scene and even from some chemicals inherent to a material's manufacturing/formulation.

**SAMPLING TOOL
LIMITATIONS — DEVICE**

- Over the years, several chemical sniffers have been developed.
- The first were highly inefficient, as the technology consisted of a simple modified electrical sensor that measured a change in the electrical resistance of a wire as a stream of vapors passed over it.

Slide 3-19

14. Over the years, several chemical sniffers have been developed.
15. The first sniffers were highly inefficient, as the technology consisted of a simple modified electrical sensor that measured a change in the electrical resistance of a wire as a stream of vapors passed over it.

SAMPLING TOOL LIMITATIONS — DEVICE (cont'd)

- Another problem was that many people did not remember that there was a time delay from the time the vapors entered the probe to the time they passed over the detector.

Slide 3-20

16. Another problem with the original sniffers was that many people did not remember that there was a time delay from the time the vapors entered the probe to the time they passed over the detector.

III. K-9

NEUTRAL SITE EXAM



Slide 3-21

OTHER IGNITABLE LIQUID SAMPLING TOOLS

- The canine, or K-9, has become one of the best methods for selecting samples from fire scenes for submission to the laboratory.
- The K-9 combines a highly sensitive sensory mechanism with a brain that can be taught to make subtle discriminations in mixtures of target compounds.

Slide 3-22

A. Overview.

1. The canine, or K-9, has become one of the best methods for selecting samples from fire scenes for submission to the laboratory.
2. The K-9 combines a highly sensitive sensory mechanism with a brain that can be taught to make subtle discriminations in mixtures of target compounds.

OTHER IGNITABLE LIQUID SAMPLING TOOLS (cont'd)

- While not infallible, canines are currently the best alternative for selecting samples for laboratory testing.

Slide 3-23

3. While not infallible, canines are currently the best alternative to human sensory capabilities for selecting samples for laboratory testing.

ACCELERANT DETECTION K-9 BRIEF HISTORY

- Hydrocarbon Detection Dogs — Arson Dogs — prototyped in 1986, Connecticut State Police.
 - Fully developed nationwide by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) in 1989.
 - Expanded by partnership between State Farm Insurance and Maine State Police in 1993.

Slide 3-24

B. Accelerant detection K-9 brief history.

Hydrocarbon Detection Dogs — Arson Dogs — prototyped in 1986, Connecticut State Police.

1. Fully developed nationwide by the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) in 1989.
2. Expanded by partnership between State Farm Insurance and Maine State Police in 1993.

ACCELERANT DETECTION K-9 BRIEF HISTORY (cont'd)

- As of 2014, there are approximately 300 active public service teams in the United States and Canada.

Slide 3-25

3. As of 2014, there are approximately 300 active public service teams in the United States and Canada.

BACKGROUND AND TRAINING

- Several breeds are used, including:
 - Labrador retrievers.
 - Belgian Malinois.
 - German shepherds.
- Imprinting procedure — food/play as reward.

Slide 3-26

C. Background and training.

1. Several breeds are used, including:
 - a. Labrador retrievers.
 - b. Belgian Malinois.
 - c. German shepherds.
2. Imprinting procedure — food/play as reward.

BACKGROUND AND TRAINING (cont'd)

- Four weeks or longer of academy training and scent discrimination, where the canine learns to detect numerous types of ILs, including:
 - Light petroleum distillates (LPDs).
 - Gasoline.
 - Medium petroleum distillates (MPDs).
 - Heavy petroleum distillates (HPDs).

Slide 3-27

3. Four weeks or longer of academy training and scent discrimination, where the canine learns to detect numerous types of ILs on dozens of objects and at fire scenes. ILs learned include light petroleum distillates (LPDs), gasoline, medium petroleum distillates (MPDs) and heavy petroleum distillates (HPDs).

PRIMARY FUNCTION

- The K-9 team assists investigators in determining the origin and cause of the fire:
 - Used as a tool only — canines help locate the best possible location(s) for evidence sampling for ILs.

Slide 3-28

D. Primary function.

The K-9 team assists investigators in determining the origin and cause of the fire:

1. Used as a tool only — canines help locate the best possible location(s) for evidence sampling for ILs.

PRIMARY FUNCTION (cont'd)

- Canines do not call the fire. The fire cause must be determined by the investigator.
- Canines can assist in ruling in as well as ruling out the fire cause as being incendiary.

Slide 3-29

2. Canines do not call the fire. The fire cause must be determined by the investigator.
3. Canines can assist in ruling in as well as ruling out the fire cause as being incendiary.

CANINE VALIDITY/NATIONAL FIRE PROTECTION ASSOCIATION 921

- National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations* (2014 ed.).

Slide 3-30

- E. Canine validity/National Fire Protection Association (NFPA) 921, *Guide for Fire and Explosion Investigations* (2014 ed.).

CANINE VALIDITY/NATIONAL FIRE PROTECTION ASSOCIATION 921 (cont'd)

- 17.5.4.7.4 — “In order for the presence or absence of an ignitable liquid to be scientifically confirmed in a sample, that sample should be analyzed by a laboratory in accordance with 17.5.3. Any canine alert not confirmed by laboratory analysis should not be considered validated.”

Slide 3-31

1. 17.5.4.7.4 — “In order for the presence or absence of an ignitable liquid to be scientifically confirmed in a sample, that sample should be analyzed by a laboratory in accordance with 17.5.3. Any canine alert not confirmed by laboratory analysis should not be considered validated.”

CANINE VALIDITY/NATIONAL FIRE
PROTECTION ASSOCIATION 921 (cont'd)

- 17.5.4.7.3 — “The canine olfactory system is believed capable of detecting gasoline at concentrations below those normally cited for laboratory methods.”

Slide 3-32

2. 17.5.4.7.3 — “The canine olfactory system is believed capable of detecting gasoline at concentrations below those normally cited for laboratory methods.”

CANINE VALIDITY/NATIONAL FIRE
PROTECTION ASSOCIATION 921 (cont'd)

- 17.5.4.7.3 (cont'd) — “Current research does not indicate which individual compounds or classes of chemical compounds are the key ‘triggers’ for canine alerts... Laboratories that use ASTM guidelines have minimum standards that define those chemical compounds that must be present in order to make a positive determination.”

Slide 3-33

3. 17.5.4.7.3 (cont'd) — “Current research does not indicate which individual compounds or classes of chemical compounds are the key ‘triggers’ for canine alerts... Laboratories that use ASTM guidelines have minimum standards that define those chemical compounds that must be present in order to make a positive determination.”

CANINE VALIDITY/NATIONAL FIRE PROTECTION ASSOCIATION 921 (cont'd)

- 17.5.4.7.3 (cont'd) — “The sheer variety of pyrolysis products present at fire scenes suggests the possible reasons for some unconfirmed alerts by canines. The discriminatory capability of the canine to distinguish between pyrolysis products and ignitable liquids is remarkable but not infallible.”

Slide 3-34

4. 17.5.4.7.3 (cont'd) — “The sheer variety of pyrolysis products present at fire scenes suggests the possible reasons for some unconfirmed alerts by canines. The discriminatory capability of the canine to distinguish between pyrolysis products and ignitable liquids is remarkable but not infallible.”

RELIED ON K-9 TO CALL THE FIRE

- “Scientific Protocols for Fire Investigations.” (Chapter 9, 2006 ed., John Lentini, Certified Fire and Explosion Investigator (CFEI), Fellow of the American Board of Criminalistics (F-ABC)).
- Synopsis: State of Georgia v. Carr (1993).
- Suspect charged with arson.
- The canine examined 12 samples — all negative lab results.

Slide 3-35

F. Relied on K-9 to call the fire.

1. “Scientific Protocols for Fire Investigations.” (Chapter 9, 2006 ed., John Lentini, Certified Fire and Explosion Investigator (CFEI), Fellow of the American Board of Criminalistics (F-ABC)).
2. Synopsis: State of Georgia v. Carr (1993).
3. Suspect charged with arson.
4. The canine was given 12 samples that all had negative lab results to examine.

RELIED ON K-9 TO CALL THE FIRE (cont'd)

- Canine confirmation record revealed a confirmation rate of less than 50 percent.
- Due to this error and other grounds for appeal, the Georgia Supreme Court reviewed the case and upheld the dismissal in 2004.

Slide 3-36

5. Canine confirmation record revealed a confirmation rate of less than 50 percent.
6. Due to this error and other grounds for appeal, the Georgia Supreme Court reviewed the case and upheld the dismissal in 2004.

IGNITABLE LIQUID TRAINING FOR CANINES

- ILs (LPDs, MPDs and HPDs).
 - Acetone.
 - Diesel.
 - Lamp oil.
 - Oil/Gas mix.
 - Turpentine.
 - Transmission fluid.
 - Paint thinner.

Slide 3-37

- G. ILs used in training canines.

ILs (LPDs, MPDs and HPDs).

1. Acetone.
2. Diesel.
3. Lamp oil.
4. Oil/Gas mix.

5. Turpentine.
6. Transmission fluid.
7. Paint thinner.

IGNITABLE LIQUID TRAINING FOR CANINES (cont'd)

- Coleman fuel.
- Jet fuel.
- Unleaded gasoline.
- Isopropyl alcohol.
- Charcoal lighter fluid.
- Cigarette lighter fluid.
- K-1 kerosene.

Slide 3-38

8. Coleman fuel.
9. Jet fuel.
10. Unleaded gasoline.
11. Isopropyl alcohol.
12. Charcoal lighter fluid.
13. Cigarette lighter fluid.
14. K-1 kerosene.

IGNITABLE LIQUID TRAINING FOR CANINES (cont'd)

- Brake fluid.
- Denatured alcohol.
- Lacquer thinner.
- Power steering fluid.
- 75 percent evaporated gas.
- 90 percent evaporated gas.
- 50 percent evaporated gas, used as a daily medium.

Slide 3-39

15. Brake fluid.
16. Denatured alcohol.
17. Lacquer thinner.
18. Power steering fluid.
19. 75 percent evaporated gas.
20. 90 percent evaporated gas.
21. 50 percent evaporated gas, used as a daily training medium. (Note: While the gas is evaporated, it is still gas. By evaporating gas, the majority of small molecules are removed, but it is still a good training medium for canines.)

WHEN TO CALL FOR A K-9 UNIT

- Determined by departmental protocol.
- At the minimum, consider:
 - Fatality fires.
 - Serious bodily injury.
 - High profile.
 - Incendiary.
 - Accidental or undetermined.

Slide 3-40

- H. When to call for a K-9 unit.

1. Determined by departmental protocol.
2. At the minimum, consider:
 - a. Fatality fires.
 - b. Serious bodily injury.
 - c. High profile.
 - d. Incendiary.
 - e. Accidental or undetermined.

HOW THE K-9 TEAM WORKS

- Check in with lead investigator and Incident Commander (IC).
- Survey scene prior to deploying the canine.
- Cursory exam and detailed/targeted exam.
- Examine exterior, interior room perimeter, and interior room sections.

Slide 3-41

- I. How the K-9 team works.
 1. Check in with lead investigator and Incident Commander (IC).
 2. Survey scene prior to deploying the canine.
 3. Cursory exam and detailed/targeted exam.
 4. Examine exterior, interior room perimeter, and interior room sections.

HOW THE K-9 TEAM WORKS (cont'd)

- Decontaminate after each entry.
- May need to layer for multiple exams.
- Neutral site — secondary evidence exam.

Slide 3-42

5. Decontaminate after each entry.
6. May need to layer for multiple exams.
7. Neutral site — secondary evidence exam.

K-9 BARRIERS



Slide 3-43

- J. K-9 barriers.

CAPABILITIES AND LIMITATIONS

- The canine must be able to seek and locate the strongest source of the IL scent.
- Fire investigators and the ICs need to be aware of several conditions that could prevent the canine from going to source.

Slide 3-44

1. The canine must be able to seek and locate the strongest source of the IL scent.
2. Fire investigators and ICs need to be aware of several conditions that could prevent the canine from going to source.

CAPABILITIES AND LIMITATIONS (cont'd)

- Contamination due to gasoline-powered tools at the scene or in the area of origin is one situation that can prevent the canine from going to source.

Slide 3-45

3. Contamination due to gasoline-powered tools at the scene or in the area of origin is one situation that can prevent the canine from going to source.

POOR VISIBILITY



Slide 3-46

4. Poor visibility: Barriers that present visibility issues (smoke, debris, fumes, etc.) will prevent the canine from going to source. Add artificial light so that the canine can go to source.

UNSTABLE FLOORING



Slide 3-47

5. Unstable flooring: Poor flooring presents the possibility of falling through the floor and sustaining injury. Shore up the flooring or provide support to allow access for the canine.

ELECTRICITY CONNECTED



Slide 3-48

6. Electricity connected: If the electricity is still connected, there is a shock hazard. Disconnect electricity before going into the scene.

STRUCTURAL COLLAPSE



Slide 3-49

7. Structural collapse: If there is loose or falling debris, remove the debris to allow the canine to proceed into the fire scene.

HAZARDOUS MATERIALS



Slide 3-50

8. Hazardous materials: Within a scene, there may be hazardous materials, whether chemicals used in a manufacturing plant or simply household cleaning supplies. Remove hazardous materials; however, if there is Luminol present, do not send in the canine because Luminol is cancerous.

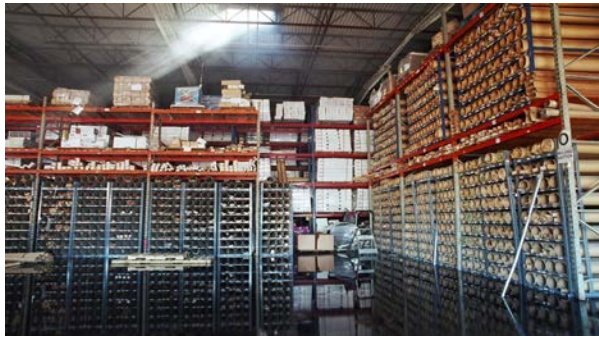
CRACK HOUSE/METH LAB



Slide 3-51

9. Crack house/Meth lab: Under no condition is it permissible to send a canine into a crack house or meth lab.

FOAM/WATER ON THE FLOOR



Slide 3-52

10. Foam/Water on the floor: The picture on Slide 3-52 shows 3 feet of water on the floor in the warehouse. Clear out the water before examining with a canine.

RESTRICTED ACCESS



Slide 3-53

11. Restricted access: An example of restricted access is a hoarder's house. Clear out the obstacles, and then let the canine into the scene.

STILL BURNING



Slide 3-54

12. Still burning: The only people who should be on the scene if the structure is still burning are firefighters. The fire needs to be completely out before anyone goes in, canine included.

OBSTACLES CLEARED — BEST



Slide 3-55

13. Obstacles cleared: The best situation to examine the scene is when all obstacles are cleared.

OTHER APPLICATIONS OF CANINES AT THE SCENE

- Check investigator's tools and equipment prior to and after use for cross-contamination.
- Used for other types of fire scenes:
 - Vehicle fires.
 - Fatality fires.
 - Wildland fires.

Slide 3-56

K. Other applications of canines at the scene.

1. Check investigator's tools and equipment prior to and after use for cross-contamination.
2. Used for other types of fire scenes:
 - a. Vehicle fires.
 - b. Fatality fires.
 - c. Wildland fires.

VEHICLE FIRE — INTERIOR AND EXTERIOR



Slide 3-57

FATALITY FIRE — DEBRIS, BODY AND CLOTHING



3. Slide 3-58 shows unlayered remains still present in a fatality fire.

WILDLAND FIRE



4. Slide 3-59 shows an example of a wildland fire.

ARSON K-9 OLFACTORY SYSTEM

- Thousands of times more sensitive than human olfactory capability.
- Capable of detecting ILs at extremely low levels.

Slide 3-60

L. Arson K-9 olfactory system.

1. Thousands of times more sensitive than human olfactory capability.
2. Capable of detecting ILs at extremely low levels.

ARSON K-9 OLFACTORY SYSTEM (cont'd)

- K-9 actions: alert versus indication.
 - Alert: the involuntary change of posture and respiration when dog recognizes an odor.
 - Indication: a trained behavior that pinpoints source (passive/aggressive).

Slide 3-61

3. K-9 actions: alert versus indication.

- a. Alert: the involuntary change of posture and respiration when dog recognizes an odor.
- b. Indication: a trained behavior that pinpoints source (passive/aggressive).

IV. DOCUMENTATION**PROCESS**

- Photograph marker where K-9 indicated.
- Use numbers or letters.
- Three photos for each sample (NFPA 921):
 - Before sample obtained.
 - Empty can, adjacent location.
 - Can with sample adjacent from where obtained.

Slide 3-62

A. Process.

1. Photograph marker where K-9 indicated.
2. Use numbers or letters.
3. Three photos for each sample (NFPA 921):
 - a. Before sample obtained.
 - b. Empty can, adjacent location.
 - c. Can with sample adjacent from where obtained.

PROCESS (cont'd)

- Record and describe in report.
- Unless directed by your department's standard operating procedures (SOPs), no photos/videos should be taken of the K-9 working the scene. It can distract the handler and provide the defense with an opportunity to make allegations at trial regarding improper practices by the handler.

Slide 3-63

4. Record and describe in report.

5. Unless directed by your department's standard operating procedures (SOPs), no photos/videos should be taken of the K-9 working the scene, as this can distract the handler and provide the defense with an opportunity to make allegations at trial regarding improper practices by the handler.

EXAMINATION OF A SUSPECT'S CLOTHING

- On or off the body — does the suspect pose a threat?
- Lower-half articles of clothing preferred.
- Remove only what's needed.
- Place in appropriate container.

Slide 3-64

B. Examination of a suspect's clothing.

1. On or off the body — does the suspect pose a threat?
2. Lower-half articles of clothing preferred.
3. Remove only what's needed.
4. Place in appropriate container.

EXAMINATION OF A SUSPECT'S SKIN

- The canine alerts and indicates on a specific part(s) of the body.
- Use a transfer medium to capture.
 - Gauze swab with isopropyl alcohol.
 - Powdered latex gloves.
 - Nylon or fire debris plastic bag/activated charcoal strip under controlled conditions.
- Place in appropriate container.

Slide 3-65

C. Examination of a suspect's skin.

1. The canine alerts and indicates on a specific part or parts of the body.

2. Use a transfer medium to capture.
 - a. Gauze swab with isopropyl alcohol.
 - b. Powdered latex gloves.
 - c. Nylon or fire debris plastic bag/activated charcoal strip under controlled conditions.
3. Place in appropriate container.

V. SUMMARY



SUMMARY

- IL overview.
- Sampling tool limitations.
- K-9.
- Documentation.

Slide 3-66

UNIT 4:

AN OVERVIEW OF THE ANALYSIS OF FIRE DEBRIS FOR IGNITABLE LIQUIDS

TERMINAL OBJECTIVES

The students will be able to:

- 4.1 *Define the most common process used by the laboratory in the analysis and interpretation of fire debris.*
- 4.2 *Define the various American Society for Testing and Materials (ASTM) classifications for ignitable liquids (ILs) and the commercial products that may contain them.*

ENABLING OBJECTIVES

The students will be able to:

- 4.1 *Describe the most common process for extracting fire debris.*
 - 4.2 *Describe the ASTM classes of ILs and where they may be most commonly found commercially.*
 - 4.3 *Describe the factors that affect the laboratory's ability to determine the presence and identity of ILs.*
 - 4.4 *Describe how reports can be read or misread.*
-

This page intentionally left blank.



UNIT 4: AN OVERVIEW OF THE ANALYSIS OF FIRE DEBRIS FOR IGNITABLE LIQUIDS

Slide 4-1

ENABLING OBJECTIVES

- Describe the most common process for extracting fire debris.
- Describe the American Society for Testing and Materials (ASTM) classes of ignitable liquids (ILs) and where they may be most commonly found commercially.

Slide 4-2

ENABLING OBJECTIVES (cont'd)

- Describe the factors that affect the laboratory's ability to determine the presence and identity of ILs.
- Describe how reports can be read or misread.

Slide 4-3

I. FIRE DEBRIS ANALYSIS — STEP 1: EXTRACTION**FIRE DEBRIS ANALYSIS —
STEP 1: EXTRACTION**

- Before the sample can be analyzed by gas chromatography with mass spectral (GC/MS) detection, the traces of any ILs trapped in the debris must be pulled out of it (extraction).
- There are several ASTM-approved extraction processes.

Slide 4-4

A. Extraction.

1. Before the sample can be analyzed by gas chromatography with mass spectral (GC/MS) detection, the traces of any ignitable liquids (ILs) trapped in the debris must be pulled out of it (extraction).
2. There are several extraction processes that are approved by the American Society for Testing and Materials (ASTM).

**FIRE DEBRIS ANALYSIS —
STEP 1: EXTRACTION (cont'd)**

- Some of these processes, however, are destructive of the sample, have a low recovery yield, or present issues for archiving samples following analysis.
- The majority of forensic laboratories in the United States (both public and private) use an extraction method that is commonly referred to as the Passive Concentration method.

Slide 4-5

3. Some of these processes, however, are destructive of the sample, have a low recovery yield, or present issues for archiving samples following analysis.
4. The majority of forensic laboratories in the United States (both public and private) use an extraction method that is commonly referred to as the Passive Concentration method.

**FIRE DEBRIS ANALYSIS —
STEP 1: EXTRACTION (cont'd)**

- Another method, commonly referred to as Solvent Wash, will also be discussed, as it has found some limited use in certain situations.

Slide 4-6

5. Another method, commonly referred to as Solvent Wash, will also be discussed, as it has found some limited use in certain situations.

**AMERICAN SOCIETY FOR TESTING
AND MATERIALS E1412**

- ASTM E1412, *Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration With Activated Charcoal.*
- There are potential contamination issues (activated carbon strips, Suspension method, Solvent Wash, crossover from other samples while in the oven, etc.).

Slide 4-7

6. ASTM E1412, *Standard Practice for Separation of Ignitable Liquid Residues from Fire Debris Samples by Passive Headspace Concentration With Activated Charcoal.*
7. There are potential contamination issues (activated carbon strips, Suspension method, Solvent Wash, crossover from other samples while in the oven, etc.).

AMERICAN SOCIETY FOR TESTING AND MATERIALS E1412 (cont'd)

- Heating may be destructive of the sample if not carefully controlled.
- If allowed to cool too quickly after heating, the sample may implode.

Slide 4-8

8. Heating may be destructive of the sample if not carefully controlled.

9. If allowed to cool too quickly after heating, the sample may implode.

ACTIVATED CARBON STRIPS

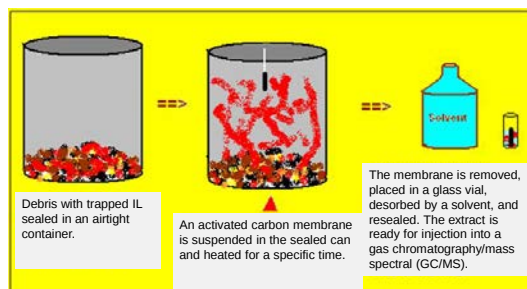
- Activated carbon strips are selective to heavier molecules and may not fully recover lighter components.
- Activated carbon strips require trapped ILs to percolate through the debris into the vapor phase.

Slide 4-9

10. Activated carbon strips are selective to heavier molecules and may not fully recover lighter components.

11. Activated carbon strips require trapped ILs to percolate through the debris into the vapor phase.

EXTRACTION PROCESS



Slide 4-10

ADVANTAGES OF PASSIVE HEADSPACE

- Simple.
- Nondestructive (with precautions).
- Reasonable representative recovery (with appropriate strip size and extraction conditions — that is, time and temperature).



Slide 4-11

B. Advantages of Passive Headspace/Passive Concentration method.

1. Simple.
2. Nondestructive (with precautions).
3. Reasonable representative recovery (with appropriate strip size and extraction conditions — that is, time and temperature).

ADVANTAGES OF PASSIVE HEADSPACE (cont'd)

- Noninvasive of the sample (can be used and followed by other forensic tests — will not affect DNA or latent prints).
- Most common method in the U.S.



Slide 4-12

4. Noninvasive of the sample (can be used and followed by other forensic tests — will not affect DNA or latent prints).
5. Most common method in the U.S.

AMERICAN SOCIETY FOR TESTING AND MATERIALS E1386

- ASTM E1386, *Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction*.
- The technique is labor and glassware intensive, especially when multiple samples are to be extracted.

Slide 4-13

C. Solvent Wash.

1. ASTM E1386, *Standard Practice for Separation and Concentration of Ignitable Liquid Residues from Fire Debris Samples by Solvent Extraction*.
2. The technique is labor and glassware intensive, especially when multiple samples are to be extracted.

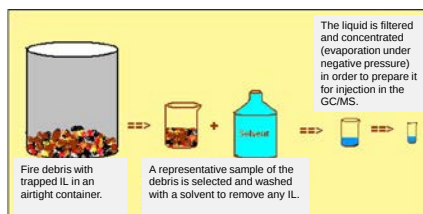
AMERICAN SOCIETY FOR TESTING AND MATERIALS E1386 (cont'd)

- It does not test the entire sample.
- It is destructive of the representative sample used.
- There are multiple sources of potential contamination.

Slide 4-14

3. It does not test the entire sample. If the sample is of limited size, the entire sample may be used.
4. It is destructive of the representative sample used.
5. There are multiple sources of potential contamination.

REPRESENTATIVE SAMPLE



Slide 4-15

MULTIDISCIPLINARY APPROACHES

Some samples may require multiple techniques.

- Screening of samples for low molecular weight compounds (which may elute before or in a solvent peak) may call for the use of Simple Headspace or Solid Phase Microextraction (SPME).

Slide 4-16

D. Multidisciplinary approaches.

Some samples may require multiple techniques.

1. Screening of samples for low molecular weight compounds such as alcohol or acetone (which may elute before or in a solvent peak) may call for the use of Simple Headspace or Solid Phase Microextraction (SPME).

MULTIDISCIPLINARY APPROACHES (cont'd)

- Extremely heavy components not extracted by Passive Headspace may be augmented by Solvent Wash.
- Solvent Wash may be used in place of Passive Headspace for containers found in a scene.

Slide 4-17

2. Extremely heavy components not extracted by Passive Headspace may be augmented by Solvent Wash.
3. Solvent Wash may be used in place of Passive Headspace for containers found in a scene.

II. FIRE DEBRIS ANALYSIS — STEP 2: ANALYSIS

FIRE DEBRIS ANALYSIS — STEP 2: ANALYSIS

Gas chromatography with mass spectral
detection — GC Mass Spec or GC/MS.



Slide 4-18

A. Connecting extraction to analysis: gas chromatography/mass spectroscopy.

1. Gas chromatography with mass spectral detection — GC Mass Spec or GC/MS.

CONNECTING EXTRACTION TO ANALYSIS: GAS CHROMATOGRAPHY/MASS SPECTRAL

- A separation technique whereby a complex mixture of organic chemicals is separated into individual compounds or like groupings of compounds.



Slide 4-19

2. A separation technique whereby a complex mixture of organic chemicals is separated into individual compounds or like groupings of compounds.

CONNECTING EXTRACTION TO ANALYSIS:
GAS CHROMATOGRAPHY/MASS SPECTRAL
(cont'd)

- It is used for ILs, explosives, toxicology, drugs, etc.
- Virtually any substance can be identified using this combination.



Slide 4-20

3. It is used for ILs, explosives, toxicology, drugs, etc.
4. Virtually any substance can be identified using this combination.

CONNECTING EXTRACTION TO ANALYSIS:
GAS CHROMATOGRAPHY/MASS SPECTRAL
(cont'd)

- GC/MS is ideally suited to fire debris, as ILs and the chemicals most often coextracted from the background of the matrix are highly complex mixtures that must be resolved into individual components for a complete determination.



Slide 4-21

5. It is ideally suited to fire debris, as ILs and the chemicals most often coextracted from the background of the matrix are highly complex mixtures that must be resolved into individual components for a complete determination.

GAS CHROMATOGRAPHY/ MASS SPECTRAL

- Known as the gold standard in forensics because it is used to perform a specific test.
- A specific test positively identifies the presence of a particular substance in a given sample.

Slide 4-22

B. GC/MS.

1. Known as the gold standard in forensics because it is used to perform a specific test.
2. A specific test positively identifies the presence of a particular substance in a given sample.

GAS CHROMATOGRAPHY/ MASS SPECTRAL (cont'd)

- A nonspecific test merely indicates that a substance falls into a category of substances. While a nonspecific test could suggest an identity, it could also lead to a false positive.

Slide 4-23

3. A nonspecific test merely indicates that a substance falls into a category of substances. While a nonspecific test could suggest an identity, it could also lead to a false positive.

III. EFFECT OF IGNITABLE LIQUIDS

EFFECT OF IGNITABLE LIQUIDS

ILs acting as solvents:

- If present at a scene, can interact with certain types of evidence to dissolve, wash away, or interfere with chemical components.



Slide 4-24

A. The effect of ILs.

ILs acting as solvents:

1. ILs, if present at a scene, can interact with certain types of evidence to dissolve, wash away, or interfere with chemical components.

EFFECT OF IGNITABLE LIQUIDS (cont'd)

- Direct contact between the IL and evidence is the most detrimental interaction, but exposure to IL vapors (especially in a confined space) can also have a negative effect on evidence.



Slide 4-25

2. Direct contact between the IL and evidence is the most detrimental interaction, but exposure to IL vapors (especially in a confined space) can also have a negative effect on evidence.

IGNITABLE LIQUIDS ACTING AS ACCELERANTS

- ILs used as accelerants act to speed up the progression of a fire but do not necessarily increase the amount of heat produced.
 - This increase in the speed of the progression of a fire will cause many items with evidentiary value to become fuels themselves when they reach their ignition temperatures.



Slide 4-26

B. ILs acting as accelerants.

1. ILs used as accelerants act to speed up the progression of a fire but do not necessarily increase the amount of heat produced.
2. This increase in the speed of the progression of a fire will cause many items with evidentiary value to become fuels themselves.

IV. THE AMERICAN SOCIETY FOR TESTING AND MATERIALS CLASSES

THE AMERICAN SOCIETY FOR TESTING AND MATERIALS CLASSES

- Current version of ASTM E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry* has divided ILs into eight classes, some of which are further subdivided as being either light, medium or heavy.

Slide 4-27

- A. Current version of ASTM E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry* has divided ILs into eight classes, some of which are further subdivided as being either light, medium or heavy.

THE AMERICAN SOCIETY FOR TESTING
AND MATERIALS CLASSES (cont'd)

The classes are:

- Gasoline.
- Aromatic products (light, medium and heavy).
- Petroleum distillates (light, medium and heavy).
- Isoparaffinic products (light, medium and heavy).

Slide 4-28

The classes are:

1. Gasoline.
2. Aromatic products (light, medium and heavy).
3. Petroleum distillates (light, medium and heavy).
4. Isoparaffinic products (light, medium and heavy).

THE AMERICAN SOCIETY FOR TESTING
AND MATERIALS CLASSES (cont'd)

- Normal paraffinic products (light, medium and heavy).
- Naphthenic/Paraffinic products (light, medium and heavy).
- Oxygenated products.
- Miscellaneous (light, medium and heavy).

Slide 4-29

5. Normal paraffinic products (light, medium and heavy).
6. Naphthenic/Paraffinic products (light, medium and heavy).
7. Oxygenated products.
8. Miscellaneous (light, medium and heavy).

USING AMERICAN SOCIETY FOR TESTING
AND MATERIALS CLASSES IN REPORTS

- When you get a report using ASTM classes, what does it mean?
- Use the following tables for cross-reference.
- Recall from Unit 2: Collection and Analysis of Ignitable Liquids how products are marketed — just because two products are paint thinners doesn't mean that they have the same chemical makeup.
- Understand that some laboratories may use different examples of items within the ASTM classification.

Slide 4-30

B. Using ASTM classes in reports.

1. When you get a report using ASTM classes, what does it mean?
2. Use the following tables for cross-reference.
3. Recall from Unit 2: Collection and Analysis of Ignitable Liquids how products are marketed — just because two products are paint thinners doesn't mean that they have the same chemical makeup.
4. Understand that some laboratories may use different examples of items within the ASTM classification.

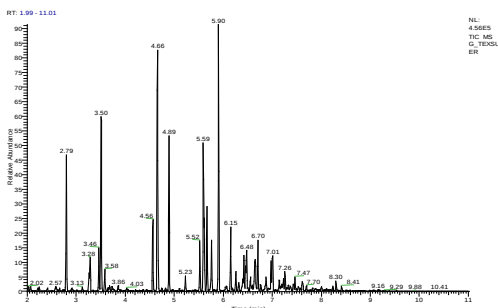
AN OVERVIEW OF THE ANALYSIS OF FIRE DEBRIS FOR IGNITABLE LIQUIDS

Classification Name — Analysts must sometimes choose one classification over another by how the item best fits the ASTM description.	Approximate Peak Spread (n-Alkane Carbon Numbers)	Examples — These examples are not exclusive. Marketing of refinery products often results in a single refinery product being sold under a variety of labels.
Gasoline	C4 to C12	All grades and brands of automobile gasoline and gasohol.
Light petroleum distillate (LPD)	C4 to C11	Cigarette lighter fluid, some camping fuels, various commercial solvents.
Medium petroleum distillate (MPD)	C8 to C12	Mineral spirits, some charcoal lighters, some paint thinners, some insecticide or polish solvents.
Heavy petroleum distillate (HPD)	C9 to C23	Fuel Oil No. 1, Jet “A” aviation fuel, some charcoal starters, some lamp oils, some paint thinners, some insecticide or polish solvents, kerosene heater fuel, Fuel Oil No. 2, diesel fuel, some tar and asphalt removers. Slide 4-31

Classification Name — Analysts must sometimes choose one classification over another by how the item best fits the ASTM description.	Approximate Peak Spread (n-Alkane Carbon Numbers)	Examples — These examples are not exclusive. Marketing of refinery products often results in a single refinery product being sold under a variety of labels.
Oxygenated solvents — The laboratory often reports this finding as the specific chemical identified.	Variable	Alcohols (methyl, ethyl, isopropyl), ketones (acetone, methyl ethyl ketone (MEK)).
Isoparaffinic hydrocarbon mixtures	Variable	Some charcoal lighters, some odorless solvents, some paint thinners, some insecticide or polish solvents, some lamp oils.
Normal paraffinic mixtures	Variable	Specialty products, some liquid candles, some lamp oils, some insecticide or polish solvents.
Aromatic solvents	Variable	Aromatic naphtha solvents in paint and plastics, other specialty solvents.
Naphthenic/Paraffinic solvents	Variable	Specialty solvent and fuel products treated to derivatize the normal alkanes and aromatics. Slide 4-32

GASOLINE

- Aromatic compounds (91, 105, 119, 134 atomic mass unit (amu)) are the most abundant. Indanes (117, 131 amu) and naphthalenes (128, 142, 156 amu) are present.
- Alkanes (57, 71, 85, 99 amu) are present at a lesser amount in a deteriorated gasoline. Cycloalkanes (82, 83 amu) and decahydronaphthalene (138 amu) are not expected.

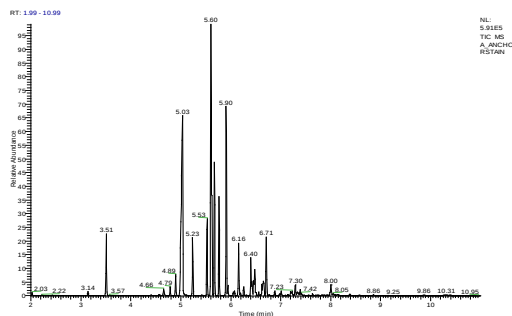


Slide 4-33

5. Gasoline.
 - a. Aromatic compounds (91, 105, 119, 134 atomic mass unit (amu)) are the most abundant. Indanes (117, 131 amu) and naphthalenes (128, 142, 156 amu) are present.
 - b. Alkanes (57, 71, 85, 99 amu) are present at a lesser amount in a deteriorated gasoline. Cycloalkanes (82, 83 amu) and decahydronaphthalene (138 amu) are not expected.

AROMATIC PRODUCTS

- Composed exclusively of aromatic compounds (91, 105, 119, 134 amu).
- May include some naphthalenes (128, 142, 156 amu) in heavy aromatics.

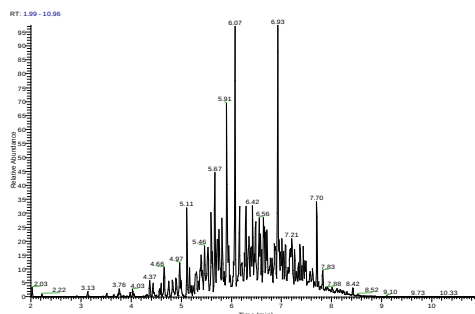


Slide 4-34

6. Aromatic products (light, medium and heavy).
 - a. Composed exclusively of aromatic compounds (91, 105, 119, 134 amu).
 - b. May include some naphthalenes (128, 142, 156 amu) in heavy aromatics.

PETROLEUM DISTILLATES

- Mostly composed of alkanes (57, 71, 85, 99 amu) and cycloalkanes (82, 83 amu), with the normal alkanes more abundant than the branched alkanes.
- Almost always contain decahydronaphthalene (138 amu). May contain aromatics (91, 105, 119, 134 amu), naphthalenes (128, 142, 156 amu), and indanes (117, 131 amu).

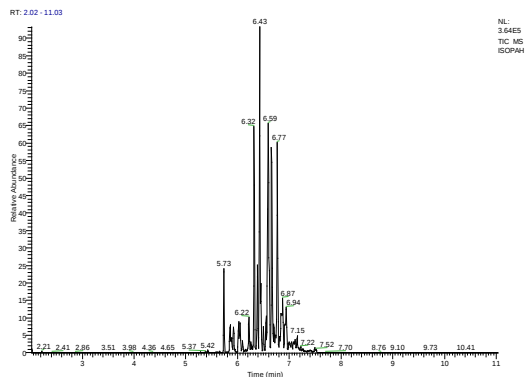


Slide 4-35

7. Petroleum distillates (light, medium and heavy).
 - a. Mostly composed of alkanes (57, 71, 85, 99 amu) and cycloalkanes (82, 83 amu), with the normal alkanes more abundant than the branched alkanes.
 - b. Almost always contain decahydronaphthalene (138 amu). May contain aromatics (91, 105, 119, 134 amu), naphthalenes (128, 142, 156 amu), and indanes (117, 131 amu).

ISOPARAFFINIC PRODUCTS

- Almost exclusively composed of branched alkane compounds (57, 71, 85, 99 amu) with some normal alkanes in the heavy subclass.
- While peaks will be seen in the cycloalkane profile, they are actually simply the branched alkanes because they may contain fragments of 82 or 83 amu. Other compounds are not significant.

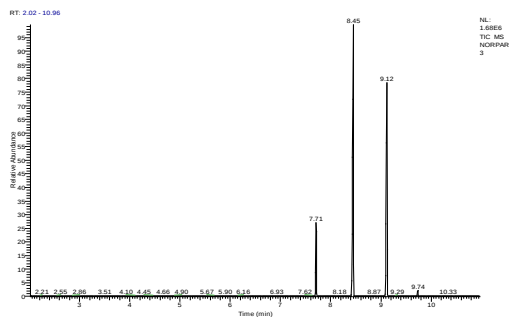


Slide 4-36

8. Isoparaaffinic products (light, medium and heavy).
 - a. Almost exclusively composed of branched alkane compounds (57, 71, 85, 99 amu) with some normal alkanes in the heavy subclass.
 - b. While peaks will be seen in the cycloalkane profile, they are actually simply the branched alkanes because they may contain fragments of 82 or 83 amu. Other compounds are not significant.

NORMAL PARAFFINIC PRODUCTS

Exclusively composed of normal alkanes (57, 71, 85, 99 amu). Other items are not present.



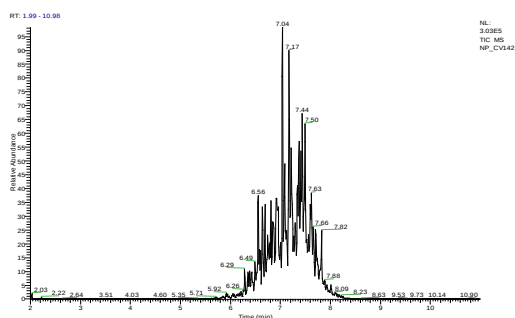
Slide 4-37

-
-
-
-
-
9. Normal paraffinic products (light, medium and heavy).

Exclusively composed of normal alkanes (57, 71, 85, 99 amu). Other items are not present.

NAPHTHENIC/PARAFFINIC PRODUCTS

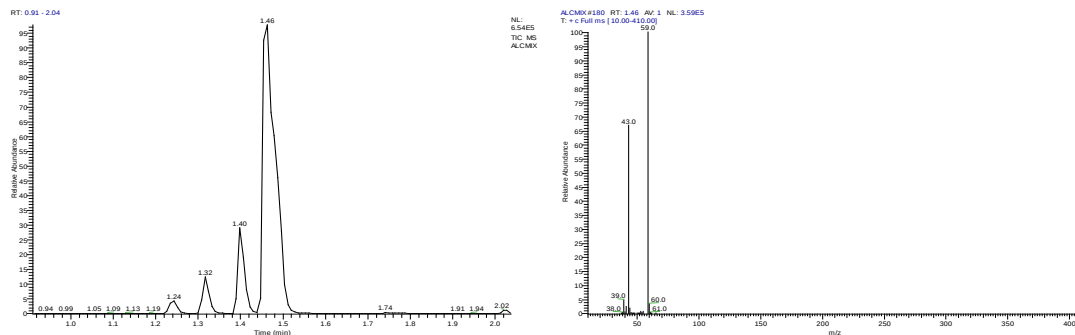
- Composed mostly of branched alkanes (57, 71, 85, 99 amu) like the isoparaffinic products, but also contain a significant amount of cycloalkanes (82, 83 amu).
- Decahydronaphthalene (138 amu) is also usually present. Others are absent or not significant.



Slide 4-38

10. Naphthenic/Paraffinic products (light, medium and heavy).
 - a. Composed mostly of branched alkanes (57, 71, 85, 99 amu) like the isoparaffinic products, but also contain a significant amount of cycloalkanes (82, 83 amu).
 - b. Decahydronaphthalene (138 amu) is also usually present. Others are absent or not significant.

OXYGENATED PRODUCTS



These products are alcohols and acetone, and they are usually seen very early in the chromatogram. While 31, 43 and 59 amu can be used as profiles, these are usually single component liquids. They are identified by a combination of chromatographic retention time and mass spectra.

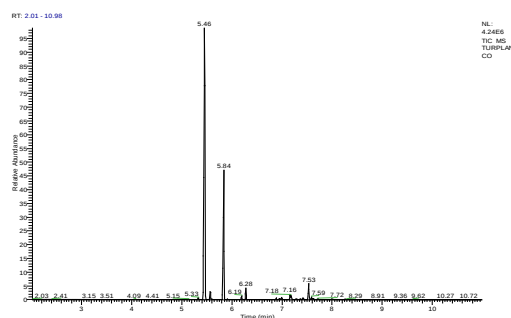
Slide 4-39

11. Oxygenated products.

- a. These products are alcohols and acetone, and they are usually seen very early in the chromatogram.
- b. While 31, 43 and 59 amu can be used as profiles, these are usually single component liquids. They are identified by a combination of chromatographic retention time and mass spectra.

MISCELLANEOUS (LIGHT, MEDIUM AND HEAVY)

This classification includes turpentine; specialty solvents; and some commercial mixtures of single components, specialty chemicals, or the other IL classes.



Slide 4-40

12. Miscellaneous (light, medium and heavy).

This classification includes turpentine; specialty solvents; and some commercial mixtures of single components, specialty chemicals, or the other IL classes.

V. CHANGES TO IGNITABLE LIQUIDS WITHIN THE FIRE SCENE

DETERIORATION

- Heat will affect forensic evidence at the scene.
- ILs will evaporate and some components will combust, thereby removing components of the ILs.

Slide 4-41

A. General effects.

1. Heat will affect forensic evidence at the scene.
2. ILs will evaporate and some components will combust, thereby removing components of the ILs.

DETERIORATION (cont'd)

- This deterioration is also referred to as weathering.
- It will be a relatively linear process.
- Small molecules with low boiling points will evaporate sooner and faster than larger molecules with higher boiling points.

Slide 4-42

3. This deterioration is also referred to as weathering.
4. It will be a relatively linear process.
5. Small molecules with low boiling points will evaporate sooner and faster than larger molecules with higher boiling points.

DETERIORATION (cont'd)

- Evaporation depends on:
 - The boiling points of each of the compounds in the mixture.
 - The temperature at the scene.
 - The amount of time that the IL is exposed to that temperature.

Slide 4-43

6. Evaporation depends on:
 - a. The boiling points of each of the compounds in the mixture.
 - b. The temperature at the scene.
 - c. The amount of time that the IL is exposed to that temperature.

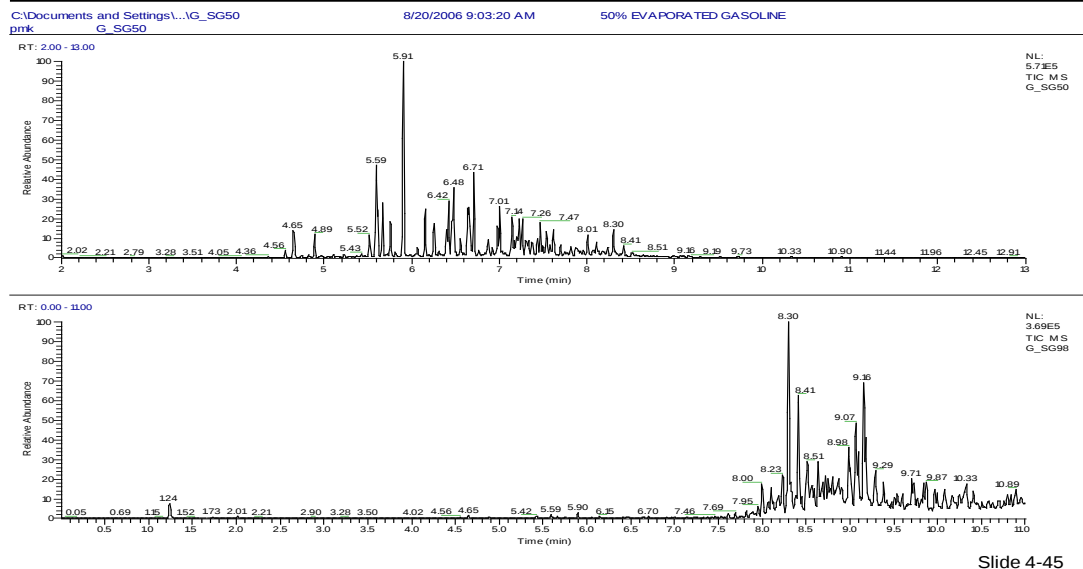
DETERIORATION (cont'd)

- It is possible that an IL could be consumed or have deteriorated so much that it no longer meets the requirements of ASTM for a positive determination.

Slide 4-44

7. It is possible that an IL could be consumed or have deteriorated so much that it no longer meets the requirements of ASTM for a positive determination.

50 PERCENT DETERIORATED GASOLINE (TOP) AND 98 PERCENT DETERIORATED GASOLINE (BOTTOM)



- B. Top graph: 50 percent deteriorated gasoline. Bottom graph: 98 percent deteriorated gasoline.

MICROBES

- In samples that also contain soil, there is another potential problem.
- There are certain common bacteria that consume the chemical compounds that make up ILs.

Slide 4-46

C. Microbes.

1. In samples that also contain soil, there is another potential problem.
2. There are certain common bacteria that consume the chemical compounds that make up ILs.

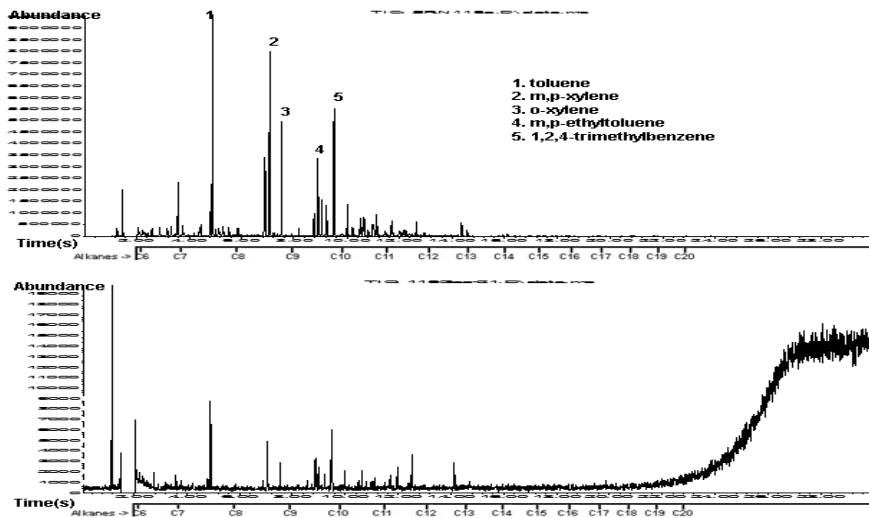
MICROBES (cont'd)

- If the concentration of the bacteria is sufficiently high, the concentration of IL is sufficiently low, and the amount of time for the bacteria to multiply is sufficiently long, the IL may be altered to the extent that the analyst will be unable to make a scientifically supportable conclusion.

Slide 4-47

3. If the concentration of the bacteria is sufficiently high, the concentration of the IL is sufficiently low, and the amount of time for the bacteria to multiply is sufficiently long, the IL may be altered to the extent that the analyst will be unable to make a scientifically supportable conclusion.

THERMAL DEGRADATION PRODUCTS



Slide 4-48

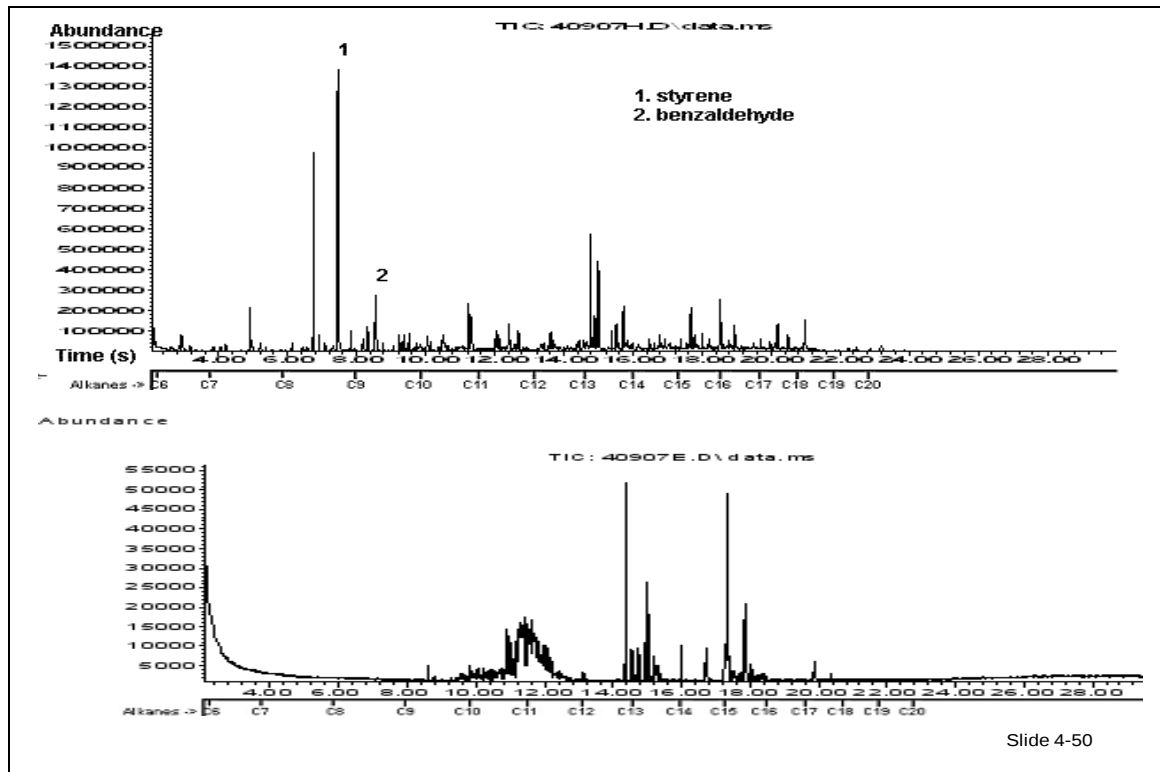
D. Thermal degradation products.

THERMAL DEGRADATION PRODUCTS (cont'd)

- ILs are not the only items in a fire scene that contain chemical compounds.
- The carpet, wood, upholstery, plastics, etc. will burn, and the chemicals in them will break apart and recombine.
- Many of the chemical compounds that we search for in ILs may be produced by the burning objects in the room.

Slide 4-49

1. ILs are not the only items in a fire scene that contain chemical compounds.
2. The carpet, wood, upholstery, plastics, etc. will burn, and the chemicals in them will break apart and recombine.
3. Many of the chemical compounds that we search for in ILs may be produced by the burning of objects in the room.



Slide 4-50

THERMAL DEGRADATION PRODUCTS (cont'd)

- Styrene — often formed from polystyrene, acrylic paints, adhesives (styrene-butadiene), and phenyl polymers.
- Aromatics including alkylbenzenes — may be formed from polystyrene, phenyl polymers, nitrile adhesives, polyvinyl chloride (PVC), polystyrene and adhesives.
- Naphthalene — can be formed from PVC or phenyl ethers.

Slide 4-51

- a. Styrene — often formed from polystyrene, acrylic paints, adhesives (styrene-butadiene), and phenyl polymers.
- b. Aromatics including alkylbenzenes — may be formed from polystyrene, phenyl polymers, nitrile adhesives, polyvinyl chloride (PVC), polystyrene and adhesives.
- c. Naphthalene — can be formed from PVC or phenyl ethers.

THERMAL DEGRADATION PRODUCTS (cont'd)

- Indenes — may be formed from adhesives or phenyl ethers.
- Alkanes, alkenes and cycloalkanes — can be formed from adhesives, PVC, polypropylene or phenyl ethers.
- Acetone — often formed from acrylic paints and polymers.
- Alcohols — formed from paints or adhesives.

Slide 4-52

- d. Indenes — may be formed from adhesives or phenyl ethers.
- e. Alkanes, alkenes and cycloalkanes — can be formed from adhesives, PVC, polypropylene or phenyl ethers.
- f. Acetone — often formed from acrylic paints and polymers.
- g. Alcohols — formed from paints or adhesives.

VI. SUMMING UP THE FACTORS

SUMMING UP THE FACTORS

- All of these issues contribute to make fire debris analysis one of the more difficult of the forensic disciplines.
- You will see more negative findings in fire debris analysis than in many other disciplines.

Slide 4-53

A. Analysis.

1. All of these issues contribute to make fire debris analysis one of the more difficult of the forensic disciplines.
2. You will see more negative findings in fire debris analysis than in many other disciplines.

SUMMING UP THE FACTORS (cont'd)

- The analyst must weigh the complexity of the IL against:
 - Its level of deterioration, possible degradation and concentration.
 - The ILs that present as artifacts of manufacture in many products.
 - The products coming from the burning of items in the room/vehicle.

Slide 4-54

3. The analyst must weigh the complexity of the IL against:
 - a. Its level of deterioration, possible degradation and concentration.
 - b. The ILs that present as artifacts of manufacture in many products.
 - c. The products coming from the burning of items in the room/vehicle.

WHY A POSITIVE RESULT MAY BE MEANINGLESS

- Have all sources of contamination been excluded? Could the IL found have come from contamination by an outside source?
- Have comparison sample and exemplars been analyzed?

Slide 4-55

B. Why a positive result may be meaningless:

1. Have all sources of contamination been excluded? Could the IL found have come from contamination by an outside source?
2. Have comparison sample and exemplars been analyzed?

WHY A POSITIVE RESULT MAY BE MEANINGLESS (cont'd)

- Are the ILs present in the debris inherent to materials in the scene?
- Could the IL be an artifact from an accidental spill or commercial product?
- Is there a logical reason for the IL to be present?

Slide 4-56

3. Are the ILs present in the debris inherent to materials in the scene?
4. Could the IL be an artifact from an accidental spill or commercial product?
5. Is there a logical reason for the IL to be present?

WHY A NEGATIVE RESULT MAY BE MEANINGFUL

- Can you extrapolate the findings for a single sample to the entire scene?
- Is it possible that ILs were consumed?
- Is it possible that ILs were washed away?

Slide 4-57

C. Why a negative result may be meaningful:

1. Can you extrapolate the findings for a single sample to the entire scene?
2. Is it possible that ILs were consumed?
3. Is it possible that ILs were washed away?

WHY A NEGATIVE RESULT MAY BE MEANINGFUL (cont'd)

- Could the investigator have selected the wrong sample?
- Could the residue remaining in the debris be under the threshold of the sensitivity of the instrument?
- Do the compounds found fit the requirements of ASTM E1618?

Slide 4-58

4. Could the investigator have selected the wrong sample?
5. Could the residue remaining in the debris be under the threshold of the sensitivity of the instrument?
6. Do the compounds found fit the requirements of ASTM E1618?

VII. RELEVANCE

RELEVANCE

- The value of a forensic analysis may be eliminated if it can be shown that it is irrelevant to the scene. Examples include:
 - A sample of flooring from a shed next to where a lawn mower is stored that contains gasoline.
 - A sample from newly refinished furniture containing methanol.

Slide 4-59

Forensic evidence.

A. The value of a forensic analysis may be eliminated if it can be shown that it is irrelevant to the scene. Examples include:

1. A sample of flooring from a shed next to where a lawn mower is stored that contains gasoline.
2. A sample from newly refinished furniture containing methanol.

RELEVANCE (cont'd)

- A sample of dirt containing diesel fuel from the road shoulder 10 feet behind a burned tractor-trailer.
- Always consider the relevance of any sample that you submit for analysis.

Slide 4-60

3. A sample of dirt containing diesel fuel from the road shoulder 10 feet behind a burned tractor-trailer.

B. Always consider the relevance of any sample that you submit for analysis.

VIII. SUMMARY



SUMMARY

- Fire debris analysis — Step 1: extraction.
- Fire debris analysis — Step 2: analysis.
- Effect of ILs.
- The ASTM classes.

Slide 4-61



SUMMARY (cont'd)

- Changes to ILs within the fire scene.
- Summing up the factors.
- Relevance.

Slide 4-62

APPENDIX A

COMPARING GASOLINE TO AN UNKNOWN

This page intentionally left blank.

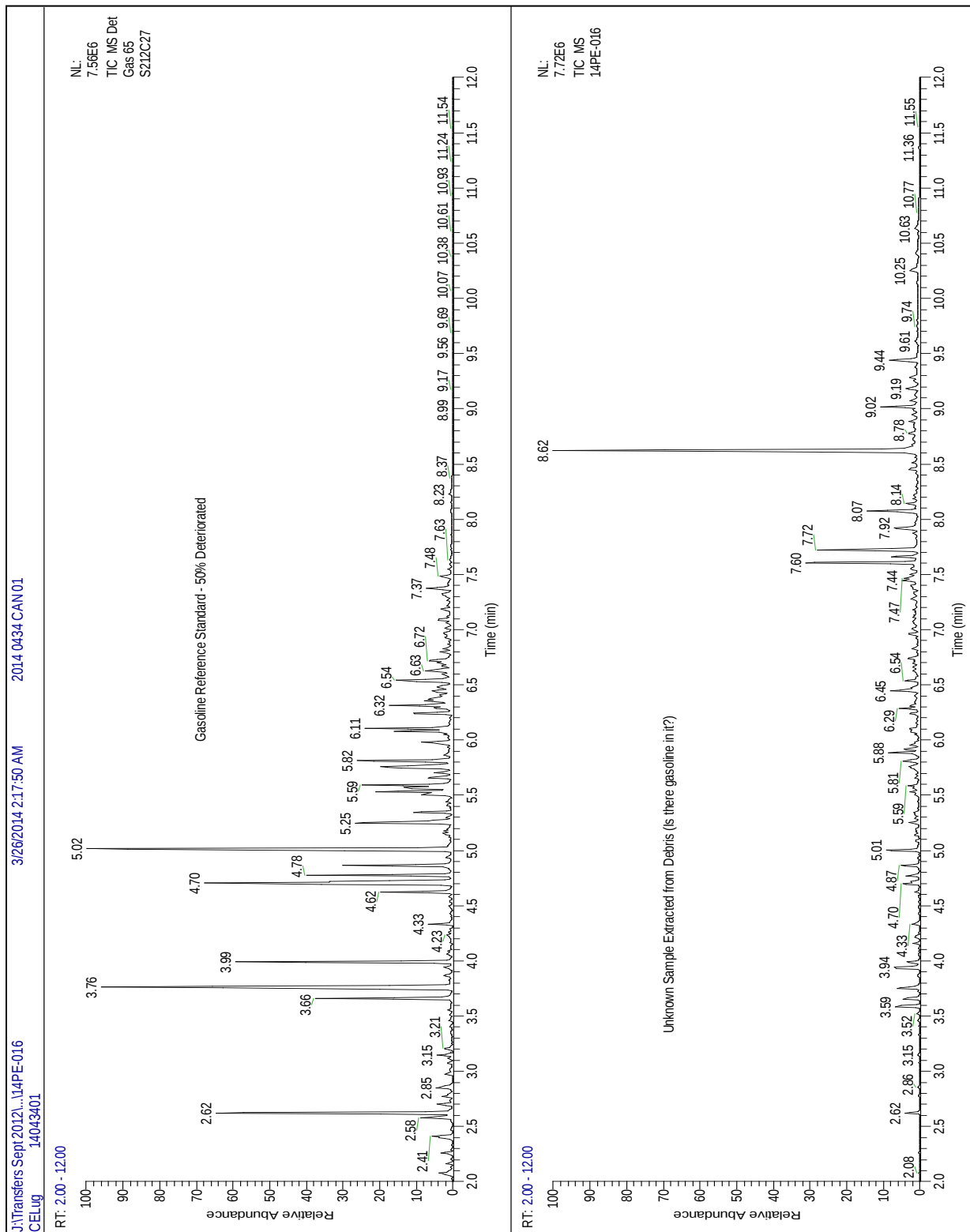
CONTENTS

The Appendix contains the following materials:

1. A comparison chart of a 50 percent deteriorated gasoline with an unknown. The purpose of this diagram is to show if there are patterns in the gasoline which are present in the unknown.
2. An ignitable liquids (ILs) classification chart. This chart shows the accepted American Society for Testing and Materials (ASTM) IL classifications as well as examples of some commercial products that fall into those classifications.

This page intentionally left blank.

Comparing Gasoline to an Unknown



This page intentionally left blank.

APPENDIX B

IGNITABLE LIQUID CLASSIFICATIONS

This page intentionally left blank.

Ignitable Liquid Classifications

Classification Name — Analysts must sometimes choose one classification over another by how the item best fits the American Society for Testing and Materials (ASTM) description.	Approximate Peak Spread (n-Alkane Carbon Numbers)	Examples — These examples are not exclusive. Marketing of refinery products often results in a single refinery product being sold under a variety of labels.
Gasoline	C4 to C12	All grades and brands of automobile gasoline and gasohol (including E85).
Light petroleum distillate (LPD)	C4 to C11	Cigarette lighter fluid, some camping fuels, Stoddard solvent, petroleum ether, Ligroine, and various light commercial solvents.
Medium petroleum distillate (MPD)	C8 to C12	Mineral spirits, some charcoal lighters, some paint thinners, some insecticides (as the vehicle for delivering the pesticide), some polishes.
Heavy petroleum distillate (HPD)	C9 to C23	Fuel Oil No. 1, Jet “A” aviation fuel, some charcoal starters, some lamp oils, some paint thinners, some insecticides (as the vehicle for delivering the pesticide) or polish solvents, kerosene heater fuel, Fuel Oil No. 2, diesel fuel, some lamp oils, some tar and asphalt removers.
Oxygenated solvents — The laboratory reports the specific chemical(s) identified.	Variable	Alcohols (methyl, ethyl, isopropyl), ketones (acetone, methyl ethyl ketone (MEK)).
Isoparaffinic hydrocarbon products	Variable	Some odorless charcoal lighters, some odorless solvents, some odorless paint thinners, some insecticide or polish solvents, some lamp oils.
Normal paraffininc products	Variable	Specialty products, some liquid candles, some lamp oils, some insecticides (as the vehicle for delivering the pesticide), some polishes.
Aromatic solvents/products	Variable	Aromatic naphtha solvents in paint and plastics, other specialty solvents.
Naphthenic/Paraffinic products	Variable	Some insecticides (as the vehicle for delivering the pesticide), some lamp oils, industrial specialty solvents.
Miscellaneous — Other	Variable	Some blended products, some specialty products, turpentine, single compounds.
No ignitable liquid (IL) determined	NA	There were either no ILs noted or the compounds seen could not be attributed to an IL and may have been the product of pyrolysis of material burned in the scene or extracted from the matrix itself.

For an alternate but very useful view of the types of ILs reported as an ASTM classification, please go to www.twgfex.org. Select the “Databases” tab. Select the Ignitable Liquids Reference Collection (ILRC Database). Select “Search Database.” This takes you to a searchable database of over 500 commercial products that have been classified by the ASTM system. In the dropdown for the “Classification” box, select the ASTM Classification on your report and then select “Search.” You will have a list where you can scroll through and see all of the brand names of commercial products that fit that classification on the right. There will be variation in the chromatographic patterns depending on how light or heavy the mixture of compounds is.

This page intentionally left blank.

UNIT 5: COLLECTING FORENSIC EVIDENCE OTHER THAN IGNITABLE LIQUIDS IN FIRE SCENES

TERMINAL OBJECTIVES

The students will be able to:

- 5.1 *Identify the various types of forensic evidence other than fire debris that could be present in the fire scene.*
- 5.2 *Demonstrate a general knowledge of the techniques employed in collecting or preserving common types of impression and trace evidence.*

ENABLING OBJECTIVES

The students will be able to:

- 5.1 *List the various forensic techniques for recovery of impression evidence.*
 - 5.2 *Demonstrate how to determine the potential value and limitations of information from nonfire debris evidence on the scene.*
 - 5.3 *Describe the limitations and abilities of both the scene investigator and the forensic scientist as they relate to forensic evidence from a fire scene.*
-

This page intentionally left blank.



UNIT 5: COLLECTING FORENSIC EVIDENCE OTHER THAN IGNITABLE LIQUIDS IN FIRE SCENES

Slide 5-1

ENABLING OBJECTIVES

- List the various forensic techniques for recovery of impression evidence.
- Demonstrate how to determine the potential value and limitations of information from nonfire debris evidence on the scene.

Slide 5-2

ENABLING OBJECTIVES (cont'd)

- Describe the limitations and abilities of both the scene investigator and the forensic scientist as they relate to forensic evidence from a fire scene.

Slide 5-3

I. OVERVIEW

OVERVIEW

- Discuss common forensic evidence that can be isolated in the field, as well as its preservation and packaging principles.
- Perform hands-on activities in the collection of the evidence.

Slide 5-4

- A. Discuss common forensic evidence that can be isolated in the field, as well as its preservation and packaging principles.
- B. Perform hands-on activities in the collection of the evidence.

II. CERTIFIED FIRE INVESTIGATOR TRAINER

CERTIFIED FIRE
INVESTIGATOR TRAINER

- The Certified Fire Investigator (CFI) trainer from the International Association of Arson Investigators (IAAI) provides an overview of many of the key topics and methods for field collection of forensic evidence.
- http://www.cfitrainer.net/Training_Programs/Physical_Evidence.aspx.

Slide 5-5

- A. The Certified Fire Investigator (CFI) trainer from the International Association of Arson Investigators (IAAI) provides an overview of many of the key topics and methods for field collection of forensic evidence.
- B. http://www.cfitrainer.net/Training_Programs/Physical_Evidence.aspx.

III. OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE

OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE

- Limitations.
 - While there are many potential types of evidence that can be found at different crime scenes, the nature of fire precludes some types of evidence. Others, specifically ignitable liquids (ILs), may be more common to a fire scene.

Slide 5-6

A. Limitations.

1. While there are many potential types of evidence that can be found at different crime scenes, the nature of fire precludes some types of evidence. Others, specifically ignitable liquids (ILs), may be more common to a fire scene.

OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE (cont'd)

- In this unit our discussions will be limited to certain broad types of evidence.
- Be aware that not all laboratories will accept all types of evidence or have the personnel or equipment/instrumentation to perform all of the tests that we discuss. Contact them if you have questions.

Slide 5-7

2. In this unit our discussions will be limited to certain broad types of evidence.
3. Be aware that not all laboratories will accept all types of evidence or have the personnel or equipment/instrumentation to perform all of the tests that we discuss. Contact them if you have questions.

OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE (cont'd)

- Example of laboratory limitations:
 - The laboratory cannot distinguish among various brands of gasoline (e.g., Exxon Mobil Corp. versus Marathon Oil Corp. versus BP).
 - It cannot distinguish among octane ratings (e.g., 87, 89, 91 or 93).
 - It cannot quantify the amount of IL found in a fire debris sample (e.g., 1 cup versus 1 tablespoon).

Slide 5-8

B. Laboratory limitations.

1. Example of laboratory limitations:

- a. The laboratory cannot distinguish among various brands of gasoline (e.g., Exxon Mobil Corp. versus Marathon Oil Corp. versus BP).
- b. It cannot distinguish among octane ratings (e.g., 87, 89, 91 or 93).
- c. It cannot quantify the amount of IL found in a fire debris sample (e.g., 1 cup versus 1 tablespoon).

FORENSIC OVERSIGHT COMMITTEE

- In early 2009, the National Academy of Sciences released a report very critical of many of the forensic comparative techniques (latent prints, hairs, glass, etc.).
- In 2014, the National Science and Technology Council published a report, "Strengthening the Forensic Sciences."

Slide 5-9

C. Forensic oversight committee.

1. In early 2009, the National Academy of Sciences released a report very critical of many of the comparative techniques (latent prints, hairs, glass, etc.).

2. In 2014, the National Science and Technology Council released a report, “Strengthening the Forensic Sciences.”

**FORENSIC OVERSIGHT
COMMITTEE (cont'd)**

- Both of these reports focused on:
 - Laboratory accreditation (Insurance Services Office 17025).
 - Analyst certification.
 - American Board of Criminalistics.
 - Proficiency testing.
 - Continuing Education Units (CEUs).

Slide 5-10

3. Both of these reports focused on:

- a. Laboratory accreditation (Insurance Services Office 17025).
- b. Analyst certification.
 - American Board of Criminalistics.
 - Proficiency Testing.
 - Continuing Education Units (CEUs).

**FORENSIC OVERSIGHT
COMMITTEE (cont'd)**

- Recommendations of methods:
 - In fire debris analysis, these standards include, from the American Society of Testing and Materials (ASTM):
 - ASTM E1618.
 - ASTM E1412.
 - ASTM E2881.

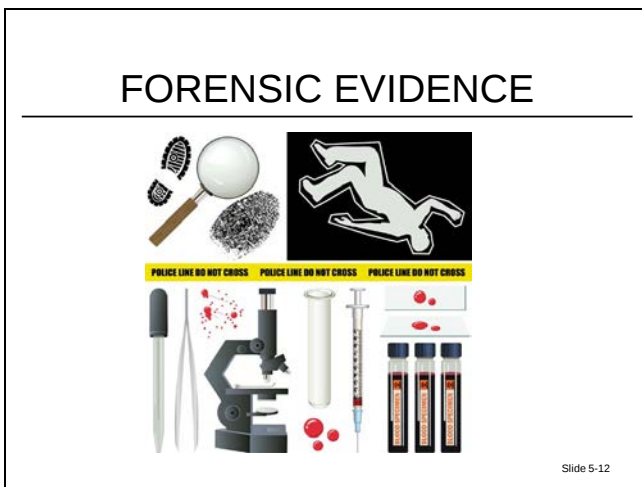
Slide 5-11

4. Recommendation of methods:

In fire debris analysis, these standards include, from the American Society for Testing and Materials (ASTM):

- a. ASTM E1618.
- b. ASTM E1412.
- c. ASTM E2881.

IV. FORENSIC EVIDENCE



A. Locard's Exchange Principle.

LOCARD'S EXCHANGE PRINCIPLE

- Developed by Edmond Locard (1877-1966):
 - When any person comes in contact with another person or object, there will be an exchange of physical materials or a cross-transfer of evidence.
 - The challenge is to recognize what has been transferred and to use the proper tools to find it.

Slide 5-13

Developed by Edmond Locard (1877-1966):

1. When any person comes in contact with another person or object, there will be an exchange of physical materials or a cross-transfer of evidence.
2. The challenge is to recognize what has been transferred and to use the proper tools to find it.

WHAT IS EVIDENCE?

- Evidence is any material or information that can assist the investigation into the origin and cause of an event.

Slide 5-14

B. Overview.

1. Evidence is any material or information that can assist the investigation into the origin and cause of an event.

WHAT IS EVIDENCE? (cont'd)

- Evidence may be collected from a crime scene, a vehicle, the possession of a suspect, a suspect's home or workplace, the possession of a victim, or a victim's home or workplace. This is not an all-inclusive list.

Slide 5-15

2. Evidence may be collected from a crime scene, a vehicle, the possession of a suspect, a suspect's home or workplace, the possession of a victim, or a victim's home or workplace. This is not an all-inclusive list.

WHAT IS EVIDENCE? (cont'd)

- Evidence can be collected anywhere that there is a connection to a crime and that there are items relevant to its investigation.

Slide 5-16

3. Evidence can be collected anywhere that there is a connection to a crime and that there are items relevant to its investigation.

OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE (cont'd)

- In almost every criminal investigation, it is necessary to determine and prove that a particular person or persons may or may not have been present at the scene of a crime.

Slide 5-17

4. In almost every criminal investigation, it is necessary to determine and prove that a particular person or persons may or may not have been present at the scene of a crime.

OVERVIEW OF COMMON TYPES OF FORENSIC EVIDENCE (cont'd)

- For this reason, the collection, preservation and analysis of physical evidence have become more frequent, common and essential in the law enforcement community.

Slide 5-18

5. For this reason, the collection, preservation and analysis of physical evidence have become more frequent, common and essential in the law enforcement community.

V. LATENT AND IMPRESSION EVIDENCE

LATENT AND IMPRESSION EVIDENCE

- Why fingerprint identification?
- Fingerprints offer a nearly infallible means of personal identification.

Slide 5-19

- A. Latent and impression evidence.
 1. Why fingerprint identification?
 2. Fingerprints offer a nearly infallible means of personal identification.

LATENT AND IMPRESSION EVIDENCE (cont'd)

- Fingerprints have served all governments worldwide for the past 100 years to provide accurate identification of criminals.
- No two fingerprints have ever been found to be exactly alike.

Slide 5-20

3. Fingerprints have served all governments worldwide for the past 100 years to provide accurate identification of criminals.
4. No two fingerprints have ever been found to be exactly alike.

LATENT AND IMPRESSION EVIDENCE (cont'd)

- Latent print examinations — the enhancement, recovery and comparison of friction ridge evidence.
- Evidence originally meant looking for plastic impressions in soft material left by the ridges of a finger or palm (impression evidence).

Slide 5-21

5. Latent print examinations — the enhancement, recovery and comparison of friction ridge evidence.
6. Evidence originally meant looking for plastic impressions in soft material left by the ridges of a finger or palm (impression evidence).

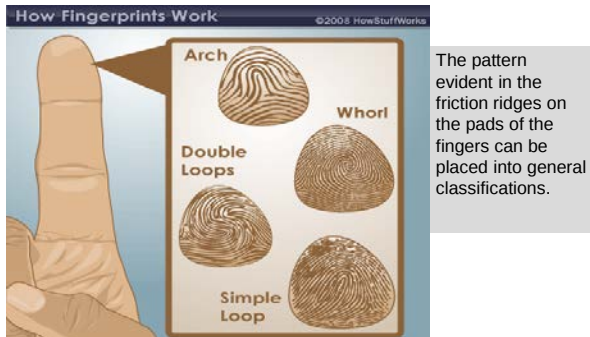
LATENT AND IMPRESSION EVIDENCE (cont'd)

- The earliest reference goes to Roman times, when a print was found in blood and used to identify a murderer.

Slide 5-22

7. The earliest reference goes to Roman times, when a print was found in blood and used to identify a murderer.

HOW FINGERPRINTS WORK



Slide 5-23

- B. Identifying people.

IDENTIFYING PEOPLE

- Before the mid-1800s, law enforcement officers with extraordinary visual memories, so-called camera eyes, identified previously arrested offenders by sight.

Slide 5-24

1. Before the mid-1800s, law enforcement officers with extraordinary visual memories, so-called camera eyes, identified previously arrested offenders by sight.

IDENTIFYING PEOPLE (cont'd)

- Photography lessened the burden on memory but was not the answer to the criminal identification problem. Personal appearance changes.

Slide 5-25

2. Photography lessened the burden on memory but was not the answer to the criminal identification problem. Personal appearance changes.

IDENTIFYING PEOPLE (cont'd)

- Around 1870, a French anthropologist, Alphonse Bertillion, devised a system to measure and record the dimensions of certain parts of the body (Bertillionage).
- While Bertillionage fell out of favor after the advent of the use of fingerprints, some aspects are returning today in computer facial-recognition programs.

Slide 5-26

3. Around 1870, a French anthropologist, Alphonse Bertillion, devised a system to measure and record the dimensions of certain parts of the body (Bertillionage).
4. While Bertillionage fell out of favor after the advent of the use of fingerprints, some aspects are returning today in computer facial-recognition programs.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE

- Automated Fingerprint Information System (AFIS).
 - Department of Homeland Security's (DHS's) U.S. Visit Program, containing the fingerprints of over 74 million people.

Slide 5-27

C. Processing and using latent impression evidence.

1. Automated Fingerprint Information System (AFIS).

- a. Department of Homeland Security's (DHS's) U.S. Visit Program, containing the fingerprints of over 74 million people.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- The FBI's Integrated AFIS (IAFIS) in Clarksburg, West Virginia, has more than 54 million individual computerized fingerprint records for known criminals.

Slide 5-28

- b. The FBI's Integrated AFIS (IAFIS) in Clarksburg, West Virginia, has more than 54 million individual computerized fingerprint records for known criminals.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- As the investigator, you need to decide what items at the scene you want to attempt to enhance, as opposed to having the laboratory process the item.
- Factors such as surface type (porous/nonporous), item size, fragility, etc., need to be considered in that decision.

Slide 5-29

2. As the investigator, you need to decide what items at the scene you want to attempt to enhance, as opposed to having the laboratory process the item.
3. Factors such as surface type (porous/non-porous), item size, fragility, etc., need to be considered in that decision.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- When dealing with latent prints:
 - Wear gloves. Cotton gloves are preferred, but latex/nitrile is better than nothing.
 - Assume that any area your gloves touch, they will destroy identifiable latent prints on nonporous or semiporous surfaces.

Slide 5-30

4. When dealing with latent prints:
 - a. Wear gloves. Cotton gloves are preferred, but latex/nitrile is better than nothing.
 - b. Assume that any area your gloves touch, they will destroy identifiable latent prints on nonporous or semi-porous surfaces.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Field processing of nonporous items.
 - Dusting or superglue fuming.
 - Photograph item as processed.



Slide 5-31

5. Field processing of nonporous items.

a. Dusting or superglue fuming.

b. Photograph item as processed.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Do not place stickers on items.
 - Do not write on items.
- Submit all latent print lifts to lab.



Slide 5-32

c. Do not place stickers on items.

d. Do not write on items.

6. Submit all latent print lifts to lab.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- For impressions deposited on nonporous surfaces, a very fine powder is dusted over the area to make the print visible.
- There are many types and colors of powders.



Slide 5-33

7. For impressions deposited on nonporous surfaces, a very fine powder is dusted over the area to make the print visible.
8. There are many types and colors of powders.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Latent prints are very fragile and need special handling.
- One can easily destroy prints.
- After dusting, the powder is lifted with tape.
- Always photograph before lifting.

Slide 5-34

9. Latent prints are very fragile and need special handling.
10. One can easily destroy prints.
11. After dusting, the powder is lifted with tape.
12. Always photograph before lifting.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Fuming with cyanoacrylate (superglue) is another field method of developing and fixing latent prints on nonporous items.
- The cyanoacrylate ester reacts with chemicals within the latent residue and forms a plastic compound that is more durable than normal latent prints.

Slide 5-35

13. Fuming with cyanoacrylate (superglue) is another field method of developing and fixing latent prints on nonporous items.
14. The cyanoacrylate ester reacts with chemicals within the latent residue and forms a plastic compound that is more durable than normal latent prints.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- When you see investigators in the movies pick up a firearm or drinking glass with their hand covered by a handkerchief, you are seeing an example of a method almost certain to destroy the perpetrator's latent prints on those smooth, nonporous surfaces.

Slide 5-36

15. When you see investigators in the movies pick up a firearm or drinking glass with their hand covered by a handkerchief, you are seeing an example of a method almost certain to destroy the perpetrator's latent print on those smooth, nonporous surfaces.

This page intentionally left blank.

ACTIVITY 5.1

Using Superglue to Develop Latent Fingerprints

Purpose

Give you an opportunity to develop latent fingerprints.

Directions

1. Watch the five-minute video from the Crime Scene Investigator website titled “Developing Latent Fingerprints with Superglue” (<http://www.crime-scene-investigator.net/csi-video.html>).
2. Receive supplies from instructor: one glass aquarium, one glass bottle, one hot shot superglue container, one small cup of water for the aquarium, and one table for aquarium display.
3. Receive one glass bottle with fingerprints.
4. Fume bottles outside and return to the classroom to prepare to lift the latent prints.
5. Note how prints are fixed, and observe how prints are more visible after fuming.

This page intentionally left blank.

V. LATENT AND IMPRESSION EVIDENCE (cont'd)

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- For porous evidence, it is best to submit the item to the laboratory for latent print processing. No field processing of this type of evidence is required or desired.

Slide 5-38

16. For porous evidence, it is best to submit the item to the laboratory for latent print processing. No field processing of this type of evidence is required or desired.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Package porous evidence as conveniently as possible. Wear gloves when handling the evidence. Allow wet or damp evidence to dry before sealing and mailing to the lab.

Slide 5-39

17. Package porous evidence as conveniently as possible. Wear gloves when handling the evidence. Allow wet or damp evidence to dry before sealing and mailing to the lab.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- For porous items, laboratories use chemical enhancement methods. Some examples include:
 - 1,2-indanedione.
 - 1,8-diazafluoren-9-one (DFO).
 - Ninhydrin.

Slide 5-40

18. For porous items, laboratories use chemical enhancement methods. Some examples include:
- a. 1,2-indanedione.
 - b. 1,8-diazafluoren-9-one (DFO).
 - c. Ninhydrin reacts with the amino acids and develops the print with a purple color.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- There are multiple other techniques laboratories can perform using chemicals.
- Be aware that the surface containing the latent print may be so absorbent that the print spreads and detail is lost.

Slide 5-41

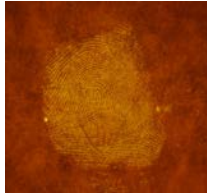
- d. There are multiple other techniques laboratories can perform using chemicals.
- e. Be aware that the surface containing the latent print may be so absorbent that the print spreads and detail is lost.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

Ninhydrin
Development



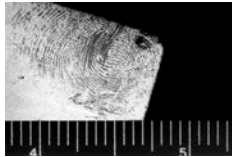
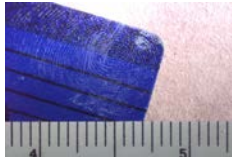
Indanedione
Development



Slide 5-42

DIGITAL IMAGING WITH LATENT PRINTS

Laboratories can manage digital photographs to remove background interference so that latent prints can be seen more readily.



Slide 5-43

19. Laboratories can manage digital photographs to remove background interference so that latent prints can be seen more readily.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Packaging and preservation of objects to be tested for latent prints begins with understanding how fragile they are.
- For nonporous items, place the item inside a container so that it is stable and not touching the sides of the container.

Slide 5-44

20. Packaging and preservation of objects to be tested for latent prints begins with understanding how fragile they are.
21. For nonporous items, place the item inside a container so that it is stable and not touching the sides of the container.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- The goal is to keep the item immobile and minimize rubbing against the evidence container's walls.
- Glassine envelopes are suggested by the FBI.

Slide 5-45

22. The goal is to keep the item immobile and minimize rubbing against the evidence container's walls.
23. Glassine envelopes are suggested by the FBI.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Porous evidence, such as paper items, will not be affected by rubbing, but such items of evidence should be protected by being packaged separately from each other.

Slide 5-46

24. Porous evidence, such as paper items, will not be affected by rubbing, but such items of evidence should be protected by being packaged separately from each other.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- If the item to be tested is tape that has been left on a device or object, do not attempt to pull off the tape and separate it. Leave it as is and package to avoid rubbing.

Slide 5-47

25. If the item to be tested is tape that has been left on a device or object, do not attempt to pull off the tape and separate it. Leave it as is and package to avoid rubbing.

PROCESSING AND USING LATENT IMPRESSION EVIDENCE (cont'd)

- Special precaution.
 - Doors, windows, or other openings with hinged or sliding doors, should not be opened, closed or handled in any manner that might compromise latent fingerprints.
 - These usually are found near the points of entry or exit.



Slide 5-48

26. Special precaution.
- a. Doors, windows, or other openings with hinged or sliding doors, should not be opened, closed or handled in any manner that might compromise latent fingerprints.
 - b. These usually are found near the points of entry or exit.

VI. LATENT PRINTS FROM FIRE SCENES

LATENT PRINTS FROM FIRE SCENES

- The organic chemical components that may remain, such as starches or amino acids, may degrade as the heat rises and will eventually lose all integrity.

Slide 5-49

A. Overview.

1. The organic chemical components that may remain, such as starches or amino acids, may degrade as the heat rises and will eventually lose all integrity.

LATENT PRINTS FROM FIRE SCENES (cont'd)

- Inorganic compounds may survive, but in most cases, the surface upon which the print has been deposited will be destroyed by the fire and leave no possibility for recovery.

Slide 5-50

2. Inorganic compounds may survive, but in most cases, the surface upon which the print has been deposited will be destroyed by the fire and leave no possibility for recovery.

LATENT PRINTS FROM FIRE SCENES (cont'd)

- Because latent prints are essentially deposits of water, chemicals and oils, they can be strongly affected by conditions in a fire scene.
- As heat rises, the moisture and oils deposited will begin to evaporate and will eventually become dry.

Slide 5-51

3. Because latent prints are essentially deposits of water, chemicals and oils, they can be strongly affected by conditions in a fire scene.
4. As heat rises, the moisture and oils deposited will begin to evaporate and will eventually become dry.

LATENT PRINTS FROM FIRE SCENES (cont'd)

- The objects suspected of having latent prints should always be examined, as you never know if you are going to be able to find evidence.
- Sometimes the soot from the fire can actually develop the prints.



Slide 5-52

5. The objects suspected of having latent prints should always be examined, as you never know if you are going to be able to find evidence.
6. Sometimes the soot from the fire can actually develop the prints.

This page intentionally left blank.

ACTIVITY 5.2

Latent Prints

Purpose

Provide you with an opportunity to lift latent fingerprints.

Directions

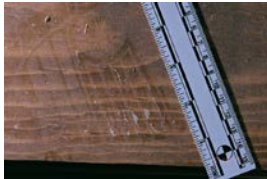
1. Watch the five-minute video from the Crime Scene Investigator website titled “Developing Latent Fingerprints with Black Powder” (<http://www.crime-scene-investigator.net/csi-video.html>).
2. Cover your workspace with brown butcher paper.
3. Receive one glass bottle with fingerprints and one pair of nitrile gloves from the instructor.
4. While working in pairs, remove the following items from the evidence kits: gray, black or white fingerprint powder; corresponding dusting brush; clear lifting tape or hinged card; and a white or black fingerprint card.
5. Use contrasting powder.
6. Lift latent prints, and place on a contrasting-color fingerprint card.

This page intentionally left blank.

VI. LATENT PRINTS FROM FIRE SCENES (cont'd)

SHOES AND TIRE TREADS

- The enhancement, recovery and comparison of impressions left by tires and shoes.
 - The basic tools for accessing this evidence are photography and cast impressions.
 - In some cases, all that can be said is the type of shoe or tire.
 - If anomalies are present, individualization can be attempted.



Slide 5-54

B. Latent and impression evidence: shoes and tire treads.

1. The enhancement, recovery and comparison of impressions left by tires and shoes.
 - a. The basic tools for accessing this evidence are photography and cast impressions.
 - b. In some cases, all that can be said is the type of shoe or tire.
 - c. If anomalies are present, individualization can be attempted.

SHOES AND TIRE TREADS
(cont'd)

- The use of electrostatic screens to recover shoe prints from marginally dusty surfaces has been practiced (but not for wet items).

Slide 5-55

2. The use of electrostatic screens to recover shoe prints from marginally dusty surfaces has been practiced (but not for wet items).

SHOES AND TIRE TREADS (cont'd)

- Electrostatic film can easily be damaged or contaminated by dust and debris attracted to it by a residual electrical charge in the film.
 - Do not place in plastic.
 - Do not place in low-grade paper or cardboard containers.
- Taping the item inside a high-quality paper file folder or photo paper box (no dust and little transfer) can be done.

Slide 5-56

3. Electrostatic film can easily be damaged or contaminated by dust and debris attracted to it by a residual electrical charge in the film.
 - a. Do not place in plastic.
 - b. Do not place in low-grade paper or cardboard containers.
4. Taping the item inside a high-quality paper file folder or photo paper box (no dust and little transfer) can be done.

SHOES AND TIRE TREADS (cont'd)

- For casting, the FBI recommends the use of dental stone with a compressive strength of 8,000 pounds per square inch (psi). (Obtain from dental supply houses.)
- Plaster of Paris, modeling plaster and other modeling materials are not recommended.

Slide 5-57

5. For casting, the FBI recommends the use of dental stone with a compressive strength of 8,000 pounds per square inch (psi). (Obtain from dental supply houses.)
6. Plaster of Paris, modeling plaster, and other modeling materials are not recommended.

SHOES AND TIRE TREADS (cont'd)

- Be certain to allow the cast to harden completely and to air-dry before moving, and package and ship it as a fragile object.

Slide 5-58

7. Be certain to allow the cast to harden completely and to air-dry before moving, and package and ship it as a fragile object.

SHOES AND TIRE TREADS (cont'd)

- Why are footwear impressions overlooked?
 - The lack of training and education in the proper searching, collection and preservation of the evidence.
 - The evidence is undervalued or not understood.

Slide 5-59

8. Why are footwear impressions overlooked?
- a. The lack of training and education in the proper searching, collection and preservation of the evidence.
 - b. The evidence is undervalued or not understood.

SHOES AND TIRE TREADS (cont'd)

- It may only be sufficient to provide investigative leads.
- Incomplete searches of the crime scene.
- Weather conditions.
- The impression has been intentionally destroyed.
- Protection of the scene.

Slide 5-60

- c. It may only be sufficient to provide investigative leads.
- d. Incomplete searches of the crime scene.
- e. Weather conditions.
- f. The impression has been intentionally destroyed.
- g. Protection of the scene.

SHOES AND TIRE TREADS (cont'd)

- The first officer at the crime scene should assess and attempt to determine the entire area of the crime scene, including paths of entry and exit and any areas that may include evidence that a suspect was present.

Slide 5-61

- 9. The first officer at the crime scene should assess and attempt to determine the entire area of the crime scene, including paths of entry and exit and any areas that may include evidence that a suspect was present.

SHOES AND TIRE TREADS (cont'd)

- Never blind search a crime scene.
- Footwear evidence should first be photographed and, if three-dimensional (3-D), cast.

Slide 5-62

10. Never blind search a crime scene.
11. Footwear evidence should first be photographed and, if three-dimensional (3-D), cast.

SHOES AND TIRE TREADS (cont'd)

- Each impression should be documented as to its position and surrounding areas.
- Measure and record position of the evidence.
- Remember, position can tell you direction of travel.



Slide 5-63

12. Each impression should be documented as to its position and surrounding areas.
13. Measure and record position of the evidence.
14. Remember, position can tell you direction of travel.

SHOES AND TIRE TREADS (cont'd)



Slide 5-64

SHOES AND TIRE TREADS (cont'd)

- Visible prints occur when the footwear steps into a foreign substance and is contaminated by it, and then comes in contact with a clean surface, and is pressed onto that surface and can be seen.

Slide 5-65

15. Visible prints occur when the footwear steps into a foreign substance and is contaminated by it, and then comes in contact with a clean surface, and is pressed onto that surface and can be seen.

SHOES AND TIRE TREADS (cont'd)

- Plastic prints are impressions that occur when the footwear steps into a soft surface, such as deep mud, snow, wet sand or dirt, creating a 3-D impression.

Slide 5-66

16. Plastic prints are impressions that occur when the footwear steps into a soft surface, such as deep mud, snow, wet sand or dirt, creating a 3-D impression.

SHOES AND TIRE TREADS (cont'd)

- Latent prints are the most overlooked prints; they are generally found on smooth surfaces and require more extensive development.

Slide 5-67

17. Latent prints are the most overlooked prints; they are generally found on smooth surfaces and require more extensive development.

SHOES AND TIRE TREADS (cont'd)

Why cast?

- The cast gives lifelike and actual-size molding of the original impression, including uneven surfaces and depths.
- The cast reproduces microscopic characteristics.

Slide 5-68

C. Why cast?

1. The cast gives lifelike and actual-size molding of the original impression, including uneven surfaces and depths.
2. The cast reproduces microscopic characteristics.

SHOES AND TIRE TREADS (cont'd)

- In deep impressions, the cast reproduces characteristics of the side of outsoles and midsoles of the shoe that are usually not reproduced in photographs.

Slide 5-69

3. In deep impressions, the cast reproduces characteristics of the side of outsoles and midsoles of the shoe that are usually not reproduced in photographs.

ACTIVITY 5.3

Latent Impression Evidence — Shoe and Tire Treads

Purpose

Provide you with an opportunity to recognize latent impression evidence from shoe and tire treads.

Directions

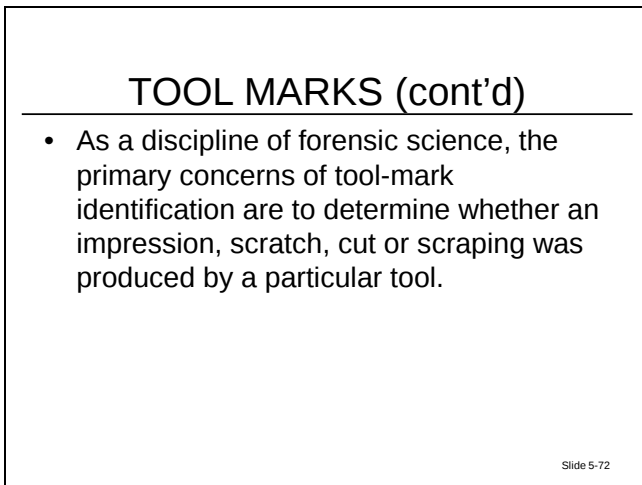
1. Watch the six-minute video from the Crime Scene Investigator website titled “Casting Footwear Impressions” (<http://www.crime-scene-investigator.net/csi-video.html>).
2. Work in pairs. Each pair will receive a box of sample shoe and tire sections for casting, dental stone with measuring cups, two to three gallon jugs of water with measuring cups, and a pair of nitrile gloves.
3. Each pair will also receive play sand in a Rubbermaid-type container with lid and Ziploc gallon bags for mixing dental stone.
4. Retrieve the following items from the evidence kit: metal or wooden spoons, paintbrush, Sharpie marker and a magnifying glass.
5. In pairs, cast a tire or shoe impression in sand.
6. Upon completion, examine casting for accuracy and detail and repeat activity, correcting and improving application techniques.
7. Notice whether your casting picked up evidence on how you poured in the dental stone. Were there waves and overlap in your impression?
8. Use precautions throughout the activity. Do not get dental stone on your clothes
9. Allow sand to air-dry overnight, then use the sifter to remove clumps. Place lid on the sandbox prior to storing. Not following these precautions will cause mold to grow in the sandbox.

This page intentionally left blank.

VII. OVERVIEW OF COMMON TYPES OF EVIDENCE



A. Latent and impression evidence: tool marks.



1. As a discipline of forensic science, the primary concerns of tool-mark identification are to determine whether an impression, scratch, cut or scraping was produced by a particular tool.

TOOL MARKS (cont'd)

- There are basically two types of tool marks:
 - Impressed (or compression) marks originate when the pressure of a tool against an object is sufficient to leave an impression in the object.
 - Striated tool marks originate when a tool is scraped against an object softer than itself and leaves an impression. (This is also seen in firearms identification.)

Slide 5-73

2. There are basically two types of tool marks:
 - a. Impressed (or compression marks) originate when the pressure of a tool against an object is sufficient to leave an impression in the object.
 - b. Striated tool marks originate when a tool is scraped against an object softer than itself and leaves an impression. (This is also seen in firearms identification.)

TOOL MARKS (cont'd)

- Some tool marks exhibit a combination of both features.
- Photograph the impression before cutting it out or attempting to lift an impression. Use direct and oblique lighting.

Slide 5-74

3. Some tool marks exhibit a combination of both features.
4. Photograph the impression before cutting it out or attempting to lift an impression. Use direct and oblique lighting.

TOOL MARKS (cont'd)

- Acrylic-surface replica casting is suggested by the FBI. Other casting media may be used.
- Comparison microscopes are used to place these items side by side in order to see if there is a match in the patterns.

Slide 5-75

5. Acrylic-surface replica casting is suggested by the FBI. Other casting media may be used.
6. Comparison microscopes are used to place these items side by side in order to see if there is a match in the patterns.

TOOL MARKS (cont'd)

- Suspected sources of the marks should be packaged to avoid changing the surface characteristics of the edge that may have made the mark (submit the tool itself and not a test cut made in the field).

Slide 5-76

7. Suspected sources of the marks should be packaged to avoid changing the surface characteristics of the edge that may have made the mark. (Submit the tool itself and not a test cut made in the field.)

TOOL MARKS (cont'd)

- If the tool or items to be tested is or are made of iron or steel and is or are slightly wet, allow them to air-dry completely before packaging in order to avoid rusting.

Slide 5-77

8. If the tool or items to be tested is or are made of iron or steel and is or are slightly wet, allow them to air-dry completely before packaging in order to avoid rusting.

TOOL MARKS (cont'd)

- Two types of photographs are necessary for courtroom presentation, as well as for investigative purposes:
 - Overall photos depicting the entire scene and the object that bears the tool mark.
 - Close-up photos showing the detail of the tool mark. These photos should contain a scale and are used for identification and orientation only.

Slide 5-78

9. Two types of photographs are necessary for courtroom presentation, as well as for investigative purposes:
- a. Overall photos depicting the entire scene and the object that bears the tool mark.
 - b. Close-up photos showing the detail of the tool mark. These photos should contain a scale and are used for identification and orientation only.

TOOL MARKS (cont'd)

- Special precautions note:
 - A tool should never be fitted into an impression to see if it could have made the mark. This could render laboratory analysis useless.

Slide 5-79

10. Special precautions note:

A tool should never be fitted into an impression to see if it could have made the mark. This could render laboratory analysis useless.

TOOL MARKS (cont'd)

- Recording tool-mark evidence.
 - Tool marks should be completely documented prior to removal or casting. Notes, sketches and photographs must accurately reflect the position of all tool marks to a fixed reference point and should depict the height from the floor or ground.

Slide 5-80

11. Recording tool-mark evidence.

Tool marks should be completely documented prior to removal or casting. Notes, sketches and photographs must accurately reflect the position of all tool marks to a fixed reference point and should depict the height from the floor or ground.

TOOL MARKS (cont'd)

- Any items removed as evidence should be clearly marked with the case number, initials of recovering officer and date/time of removal.
- Many objects bearing tool marks that are detached during a forced entry may be submitted directly as they are found.

Slide 5-81

12. Any items removed as evidence should be clearly marked with the case number, initials of recovering officer and date/time of removal.
13. Many objects bearing tool marks that are detached during a forced entry may be submitted directly as they are found.

ACTIVITY 5.4

Latent and Impression Evidence — Tool Marks

Purpose

Give you an opportunity to develop latent and impression evidence from tool marks.

Directions

1. Following the lecture and just prior to casting, the instructor will show a three-minute video from the Crime Scene Investigator website titled “Casting Tool Mark Impressions with Mikrosil” (<http://www.crime-scene-investigator.net/csi-video.html>).
2. Receive nitrile gloves, and cut wood sections with tool-mark impressions.
3. Gather the following from your evidence kit: Brown Mikrosil with Hardener (shared in pairs), tongue depressor for mixing, 5 x 7 note cards, and a shared magnifying glass.
4. Acting in pairs, cast at least two tool-mark impressions in wood sections provided.
5. Upon completion, examine casting for accuracy and detail.

This page intentionally left blank.

ACTIVITY 5.5

Latent and Impression Evidence

Purpose

Give you an opportunity to lift latent prints from irregular surfaces.

Directions

1. Watch a three-minute video from the Crime Scene Investigator website titled “Using Mikrosil to Lift Fingerprints from Irregular Surfaces” (<http://www.crime-scene-investigator.net/csi-video.html>).
2. Receive a pair of nitrile gloves and an empty mason jar.
3. Work individually and gather White Mikrosil with Hardener to share, tongue depressor for mixing, 5 x 7 note cards, a shared magnifying glass, gray or white magnetic fingerprint powder, and a shared magnetic wand from the evidence kit.
4. Take mason jars and place fingerprint impression on textured surface of glass. Area will be dusted with black/gray magnetic fingerprint powder, and then White Mikrosil will be applied. After Mikrosil dries, application is peeled back to reveal a “mirror” print.
5. Place dried application faceup on 3 x 5 notecard, and attach with cut piece of lifting tape.

This page intentionally left blank.

VIII. LATENT AND IMPRESSION EVIDENCE — FIREARMS

FIREARMS

- Firearms examinations.
 - Determination of the condition of a firearm, its mechanical functionality, whether it has been discharged, or comparison of a discharged bullet with a particular weapon.

Slide 5-84

A. Firearms examinations.

1. Determination of the condition of a firearm, its mechanical functionality, whether it has been discharged, or comparison of a discharged bullet with a particular weapon.

FIREARMS (cont'd)

- The tools for comparison of marks left on an unknown bullet or casing with those created from a test firing of a weapon are the same as with tool marks.

Slide 5-85

2. The tools for comparison of marks left on an unknown bullet or casing with those created from a test firing of a weapon are the same as with tool marks.

FIREARMS (cont'd)

- To determine the type of weapon by examination of lands and grooves requires a significant database of standard firings from many different weapons.
- There are many databases available for information on weapons and for comparing ballistics data.

Slide 5-86

3. To determine the type of weapon by examination of lands and grooves requires a significant database of standard firings from many different weapons.
4. There are many databases available for information on weapons and for comparing ballistics data.

FIREARMS (cont'd)

- National Integrated Ballistic Information Network (NIBIN).
 - Administered by federal Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).
 - Cartridge casing information is also stored in NIBIN.

Slide 5-87

5. National Integrated Ballistic Information Network (NIBIN).
 - a. Administered by federal Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF).
 - b. Cartridge casing information is also stored in NIBIN.

FIREARMS — GUNSHOT RESIDUE ANALYSIS

- Some laboratories will offer gunshot residue (GSR) analysis to determine whether there is gunshot residue remaining on a suspect's skin or clothing or on a victim.
- Contact your laboratory if you need this analysis.

Slide 5-88

B. Firearms — Gunshot Residue (GSR) analysis.

1. Some laboratories will offer GSR analysis to determine whether there is GSR remaining on a suspect's skin or clothing or on a victim.
2. Contact your laboratory if you need this analysis.

FIREARMS — SERIAL NUMBER RESTORATION

- Restoration of obliterated numbers from objects with tracking of the number to a reference source.
 - Also can compare the impressed number with the die suspected of making the impression.
- If a comparison is needed, the same procedures used for other impression evidence are used for making a cast.

Slide 5-89

C. Firearms — serial number restoration.

1. Restoration of obliterated numbers from objects with tracking of the number to a reference source.

Also can compare the impressed number with the die suspected of making the impression.
2. If a comparison is needed, the same procedures used for other impression evidence are used for making a cast.

FIREARMS — SERIAL NUMBER RESTORATION (cont'd)

- Comparison to the correct database may allow association of the item to a particular individual.
- Preserve the items to keep them from further damage during shipment.
- Be aware of rusting issues.

Slide 5-90

3. Comparison to the correct database may allow association of the item to a particular individual.
4. Preserve the items to keep them from further damage during shipment.
5. Be aware of rusting issues, as some materials made from iron are subject to rust if placed in a moist or caustic environment. Rust will change the surface characteristics, making comparison impossible.

FIREARMS — SUBMISSIONS

- Rule 1 — Unload the firearm, or render it safe.
- Document how the firearm was loaded.



Slide 5-91

D. Firearms — submissions.

1. Rule 1 — Unload the firearm, or render it safe.
2. Document how the firearm was loaded.

FIREARMS — SUBMISSIONS (cont'd)

- Use a tag to mark a firearm. Do not write or scribe onto the firearm itself. Secure in a box made for firearms submissions.
- If there are biologicals present on the firearm, mark it as a biohazard.



Slide 5-92

3. Use a tag to mark a firearm. Do not write or scribe onto the firearm itself. Secure in a box made for firearms submissions.
4. If there are biologicals present on the firearm, mark it as a biohazard.

FIREARMS — SERIAL NUMBER RESTORATION (cont'd)

- The use of a chemical reagent, or sometimes an x-ray technique, to reveal the compaction of the molecular structure under the surface after a serial number is worn or scratched.
- It requires photography to record the restored number.

Slide 5-93

5. The use of a chemical reagent, or sometimes an x-ray technique, to reveal the compaction of the molecular structure under the surface after a serial number is worn or scratched.
6. It requires photography to record the restored number.

FIREARMS — SUBMISSIONS (cont'd)

- For cartridge casings or bullets/fragments, use a small cardboard box for each. Write on the container and not on the item.



Slide 5-94

7. For cartridge casings or bullets/fragments, use a small cardboard box for each. Write on the container and not on the item.

FIREARMS — SUBMISSIONS (cont'd)

- Any cloth, clothing or upholstery that is to be tested for GSR must be air-dried and wrapped in paper. Biohazard labeling is usually required.



Slide 5-95

8. Any cloth, clothing or upholstery that is to be tested for GSR must be air-dried and wrapped in paper. Biohazard labeling is usually required.

IX. TRACE EXAMINATIONS

TRACE EXAMINATIONS —
FIBERS

- The identification and comparison of fibers (type, composition, construction, etc.) and comparison between sources.
 - Examples: Molotov wicks, clothing, rags.



Slide 5-96

A. Fibers.

1. The identification and comparison of fibers (type, composition, construction, etc.) and comparison between sources.

Examples: Molotov wicks, clothing, rags.

TRACE EXAMINATIONS —
FIBERS (cont'd)

- For fibers, submit the entire garment or textile to which the found fibers are to be compared.
- Loose fibers should be submitted in clean paper envelopes or folded paper with sealed corners.

Slide 5-97

2. For fibers, submit the entire garment or textile to which the found fibers are to be compared.
3. Loose fibers should be submitted in clean paper envelopes or folded paper with sealed corners.

TRACE EXAMINATIONS — ROPE AND CORDAGE

- Rope and cordage examinations — determination and comparison of the color, composition, physical properties (diameter, length, twist, etc.), and construction of rope or cord.
- Gross physical observation, microscopy and spectroscopic techniques are the primary tools.

Slide 5-98

B. Rope and cordage.

1. Rope and cordage examinations — determination and comparison of the color, composition, physical properties (diameter, length, twist, etc.), and construction of rope or cord.
2. Gross physical observation, microscopy and spectroscopic techniques are the primary tools.

TRACE EXAMINATIONS — ROPE AND CORDAGE (cont'd)

- Submit the entire length of rope or cord. The ends may also be useful for fracture matching. If the rope or cord must be cut, be certain to indicate which end is the cut end.
- Differentiate between the known and unknown samples on their labels.

Slide 5-99

3. Submit the entire length of rope or cord. The ends may also be useful for fracture matching. If the rope or cord must be cut, be certain to indicate which end is the cut end.
4. Differentiate between the known and unknown samples on their labels.

TRACE EXAMINATIONS — ROPE AND CORDAGE (cont'd)

- Plastic evidence bags (either tape- or heat-sealed) are appropriate.
- Be aware that there may be other trace evidence in the fibers that will need to be extracted and tested separately.

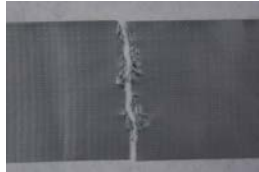
Slide 5-100

5. Plastic evidence bags (either tape- or heat-sealed) are appropriate.
6. Be aware that there may be other trace evidence in the fibers that will need to be extracted and tested separately.

X. TRACE EVIDENCE

PHYSICAL MATCHES AND TRACE EVIDENCE

- Physical matches — in some scenes, a material will be found which was broken or torn from a source.
 - Provided the item has not been negatively affected by fire or suppression, it may be possible to match the characteristics from the item at the scene to another associated with the suspect or victim.



Slide 5-101

A. Physical matches and trace evidence.

1. Physical matches — in some scenes, a material will be found which was broken or torn from a source.

Provided the item has not been negatively affected by fire or suppression, it may be possible to match the characteristics from the item in the scene to another associated with the suspect or victim.

PHYSICAL MATCHES AND TRACE EVIDENCE (cont'd)

- Other trace evidence — the nature of a fire scene typically precludes the survival of trace evidence other than ILs. Whatever survives the fire will likely succumb to destruction by suppression and overhaul efforts.

Slide 5-102

2. Other trace evidence — the nature of a fire scene typically precludes the survival of trace evidence other than ILs. Whatever survives the fire will likely succumb to destruction by suppression and overhaul efforts.

TRACE EXAMINATIONS — GLASS

- Comparison of the fractures in a piece of glass to a suspected source.
- Determination and comparison of glass composition between two sources.



Slide 5-103

B. Trace examinations — glass.

1. Comparison of the fractures in a piece of glass to a suspected source.
2. Determination and comparison of glass composition between two sources.

TRACE EXAMINATIONS — GLASS (cont'd)

- Some laboratories will even do direction and type of breaking.
- Avoid using glass or paper for submission of glass samples. Instead, use leak-proof plastic containers. Metal containers may also be used.

Slide 5-104

3. Some laboratories will even do direction and type of breaking.
4. Avoid using glass or paper for submission of glass samples. Instead, use leak-proof plastic containers. Metal containers may also be used.

TRACE EXAMINATIONS — GLASS (cont'd)

- Package glass from different suspected sources separately.
- For laminated glass, it is necessary to label which side of the lamination the glass came from (inside versus outside) and to keep samples in separate containers.

Slide 5-105

5. Package glass from different suspected sources separately.
6. For laminated glass, it is necessary to label which side of the lamination the glass came from (inside versus outside) and to keep samples in separate containers.

TRACE EXAMINATIONS — GLASS (cont'd)

- Comb through the hair, look over the skin, and inspect the wounds of a suspect or victim for glass particles.

Slide 5-106

7. Comb through the hair, look over the skin, and inspect the wounds of a suspect or victim for glass particles.

TRACE EXAMINATIONS — GLASS (cont'd)

- If glass particles are suspected to be on clothing, such as from a hit-and-run or breaking and entering, submit the whole item of clothing after it has been air-dried.
- Avoid contamination between suspected items and suspected sources.

Slide 5-107

8. If glass particles are suspected to be on clothing, such as from a hit-and-run or breaking-and-entering, submit the whole item of clothing after it has been air-dried.
9. Avoid contamination between suspected items and suspected sources.

TRACE EXAMINATIONS — SOIL

- Determine whether soils share a common source.
- Soil samples should come from the immediate crime scene area or the logical and likely means of ingress and egress.

Slide 5-108

C. Trace examinations — soil.

1. Determine whether soils share a common source.
2. Soil samples should come from the immediate crime scene area or the logical and likely means of ingress and egress.

TRACE EXAMINATIONS — SOIL (cont'd)

- Document and map the locations where the samples are taken.
- Leave soil adhering to clothing, tools or shoes on the items. Do not remove the soil; allow the samples to air-dry, and package separately.

Slide 5-109

3. Document and map the locations where the samples are taken.
4. Leave soil adhering to clothing, tools or shoes on the items. Do not remove the soil; allow the samples to air-dry, and package separately.

TRACE EXAMINATIONS — TAPE

- Tape examinations — examine composition, construction and color of potential source of evidence.
- Sometimes there may be a plastic impression of a latent print or epithelial cells that can be separately evaluated.

Slide 5-110

D. Trace examinations — tape.

1. Tape examinations — examine composition, construction and color of potential source of evidence.
2. Sometimes there may be a plastic impression of a latent print or epithelial cells that can be separately evaluated.

TRACE EXAMINATIONS — TAPE (cont'd)

- Fracture matches of the end pieces of tape can associate an unknown with a source.
- Leave the tape on the item, and submit both together.

Slide 5-111

3. Fracture matches of the end pieces of tape can associate an unknown with a source.
4. Leave the tape on the item, and submit both together.

THE EFFECT OF TEMPERATURE ON WOOD

- A rise in temperature may cause softwoods to off-gas organic terpene compounds.
- Be aware that drying may distort gross physical characteristics and impair fracture matching, but placing a wet item in a container may permit mold growth and microbial decay.

Slide 5-112

E. The effect of temperature on wood.

1. A rise in temperature may cause softwoods to off-gas organic terpene compounds.
2. Be aware that drying may distort gross physical characteristics and impair fracture matching, but placing a wet item in a container may permit mold growth and microbial decay.

TRACE EXAMINATION — PAINT

- Examine the layer structure of paint samples to determine whether the unknown sample matches a known source.
- Search for paint fragments on surfaces (cloth, skin, other hard surfaces, etc.) where they may have been transferred.

Slide 5-113

F. Trace examination — paint.

1. Examine the layer structure of paint samples to determine whether the unknown sample matches a known source.
2. Search for paint fragments on surfaces (cloth, skin, other hard surfaces, etc.) where they may have been transferred.

TRACE EXAMINATION — PAINT (cont'd)

- Use leak-proof pill boxes or glass vials to store and ship paint chips, avoiding paper and plastic since static electricity will prevent the analyst from pulling the paint chips out of the can.
- Clearly label the known and questioned samples.

Slide 5-114

3. Use leak-proof pill boxes or glass vials to store and ship paint chips, avoiding paper and plastic since static electricity will prevent the analyst from pulling the paint chips out of the can.
4. Clearly label the known and questioned samples.

XI. EXPLOSIVES AND EXPLOSIVE RESIDUES

EXPLOSIVES AND EXPLOSIVE RESIDUES

- If nonreactive or intact explosives are found, collect and submit. Depending on the type, you may need to call in explosives experts or bomb technicians.

Slide 5-115

A. Overview.

1. If nonreactive or intact explosives are found, collect and submit. Depending on the type, you may need to call in explosives experts or bomb technicians.

EXPLOSIVES AND EXPLOSIVE RESIDUES (cont'd)

- Explosives that have partially or completely reacted may require the analysis of scrapings, swabs or chemical extracts.
- Contact your laboratory to determine what they will accept.

Slide 5-116

2. Explosives that have partially or completely reacted may require the analysis of scrapings, swabs or chemical extracts.
3. Contact your laboratory to determine what they will accept.

EXPLOSIVES AND EXPLOSIVE RESIDUES (cont'd)

- Analysis often requires the use of multiple forensic techniques in order to determine and identify post-explosion artifacts and device components (e.g., switches, batteries, fuses, wires, etc.).

Slide 5-117

4. Analysis often requires the use of multiple forensic techniques in order to determine and identify post-explosion artifacts and device components (e.g., switches, batteries, fuses, wires, etc.).

EXPLOSIVES AND EXPLOSIVE RESIDUES (cont'd)

- For explosives, water-soluble residues should be protected from exposure to water; this may not be possible in a fire scene.
- Some residues are highly volatile and must be collected and stored in airtight containers (metal cans, glass jars, and nylon or Mylar bags which have been heat-sealed).

Slide 5-118

5. For explosives, water-soluble residues should be protected from exposure to water; this may not be possible in a fire scene.
6. Some residues are highly volatile and must be collected and stored in airtight containers (metal cans, glass jars, and nylon or Mylar bags which have been heat-sealed).

EXPLOSIVES AND EXPLOSIVE RESIDUES (cont'd)

- Never overfill containers, and package the containers to eliminate the potential for breakage.
- Control and comparison samples are essential to establish that residues found were not inherent to the scene.

Slide 5-119

7. Never overfill containers, and package the containers to eliminate the potential for breakage.
8. Control and comparison samples are essential to establish that residues found were not inherent to the scene.

EXPLOSIVES AND EXPLOSIVE RESIDUES (cont'd)

- Keep residues separate from intact explosives.
- Submit residues from explosion scenes separately from samples collected in workshops or other potential bomb-construction areas.

Slide 5-120

9. Keep residues separate from intact explosives.
10. Submit residues from explosion scenes separately from samples collected in workshops or other potential bomb-construction areas.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES

- Low explosives (including pyrotechnics and flash powders) are typically composed of mixtures of inorganic compounds.
- These mixtures include a fuel (such as sulfur, charcoal or powdered aluminum) and an oxidizer (such as ammonium nitrate, potassium perchlorate or strontium nitrate).

Slide 5-121

- B. The effect of temperature on explosives.
1. Low explosives (including pyrotechnics and flash powders) are typically composed of mixtures of inorganic compounds.
 2. These mixtures include a fuel (such as sulfur, charcoal or powdered aluminum) and an oxidizer (such as ammonium nitrate, potassium perchlorate or strontium nitrate).

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- Most readily available are black powder and smokeless gun powder. One of the simplest mixtures is sugar combined with potassium chlorate.

Slide 5-122

3. Most readily available are black powder and smokeless gun powder. One of the simplest mixtures is sugar combined with potassium chlorate.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- Primary explosives.
 - Primary explosives, often found in blasting caps, are used to initiate secondary explosives and are by nature quite sensitive to shock and changes in temperature.

Slide 5-123

4. Primary explosives.

Primary explosives, often found in blasting caps, are used to initiate secondary explosives and are by nature quite sensitive to shock and changes in temperature.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- As they dry, they will often become more sensitive and can potentially detonate as temperatures rise above certain thresholds.

Slide 5-124

5. As they dry, they will often become more sensitive and can potentially detonate as temperatures rise above certain thresholds.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- Secondary high explosives are composed primarily of organic compounds.
- They typically contain the fuel and oxidizer within the same molecule.



Slide 5-125

6. Secondary high explosives are composed primarily of organic compounds.

7. They typically contain the fuel and oxidizer within the same molecule.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- Heat may cause organic compounds to volatilize or decompose.
- In many cases the energy is not sufficient to cause a detonation, but will rather cause the material to burn — and its physical integrity is lost.



Slide 5-126

8. Heat may cause organic compounds to volatilize or decompose.
9. In many cases the energy is not sufficient to cause a detonation, but will rather cause the material to burn — and its physical integrity is lost.

THE EFFECT OF TEMPERATURE ON EXPLOSIVES (cont'd)

- Common residues of post-blast explosives may be from a source other than the explosive.
- However, with some materials, such as the remains of railway flares, a solid post-reaction residue will be found, and components within it may be sufficiently distinct to be able to characterize the material.

Slide 5-127

10. Common residues of post-blast explosives may be from a source other than the explosive.
11. However, with some materials, such as the remains of railway flares, a solid post-reaction residue will be found, and components within it may be sufficiently distinct to be able to characterize the material.

XII. PAPER AND DOCUMENTS

PAPER AND DOCUMENTS

- Paper is almost entirely composed of organic materials, and there are multiple situations where it may be of value as evidence.
- It may simply provide the surface on which other evidence is deposited, including latent prints, impressions, ink, writing, etc.
- Not all paper is composed of the same mixtures of fibers, nor is it the same weight or thickness.

Slide 5-128

A. Overview.

1. Paper is almost entirely composed of organic materials, and there are multiple situations where it may be of value as evidence.
2. It may simply provide the surface on which other evidence is deposited, including latent prints, impressions, ink, writing, etc.
3. Not all paper is composed of the same mixtures of fibers, nor is it the same weight or thickness.

PAPER AND DOCUMENTS (cont'd)

- Burned documents found in a fire scene may have a direct connection to the fire in that the object of the fire was to cause their destruction.
 - Financial records.
 - Diaries of activities.
 - Medical notes.
 - Lists of accomplices or victims.
 - Images.

Slide 5-129

4. Burned documents found in a fire scene may have a direct connection to the fire in that the object of the fire was to cause their destruction.
 - a. Financial records.

- b. Diaries of activities.
- c. Medical notes.
- d. Lists of accomplices or victims.
- e. Images.

PAPER AND DOCUMENTS (cont'd)

- The ignition of paper is dependent on temperature, orientation and its composition.
- In some cases, the edges of the paper can show fracture matches that will allow the sourcing of one piece to another.

Slide 5-130

- 5. The ignition of paper is dependent on temperature, orientation and its composition.
- 6. In some cases, the edges of the paper can show fracture matches that will allow the sourcing of one piece to another.

THE EFFECT OF TEMPERATURE ON PAPER AND DOCUMENTS

- The ink may retain some integrity, though the paper on which it has been placed is burned.
- The issue is not just temperature, but the fragility of the support (the ashed paper) as the fire is suppressed and overhauled.

Slide 5-131

- B. The effect of temperature on paper and documents.
 - 1. The ink may retain some integrity, though the paper on which it has been placed is burned.

2. The issue is not just temperature, but the fragility of the support (the ashed paper) as the fire is suppressed and overhauled.

QUESTIONED DOCUMENT EXAMINATIONS
FOR PAPERS SURVIVING A FIRE

- Examination of documents to determine source, authorship, alterations, obliterations or age.
- Restoration of damaged, burned or charred documents to make writing more visible.

Slide 5-132

C. Questioned document examinations for papers surviving a fire.

1. Examination of documents to determine source, authorship, alterations, obliterations or age.
2. Restoration of damaged, burned or charred documents to make writing more visible.

QUESTIONED DOCUMENT EXAMINATIONS
FOR PAPERS SURVIVING A FIRE (cont'd)

- Various tools and techniques are used, including wet chemical, spectroscopic, microscopic, and light wavelength and polarizing filters.
- Various types of exemplars may be required. Review the FBI's handbook for how to obtain these different types.

Slide 5-133

3. Various tools and techniques are used, including wet chemical, spectroscopic, microscopic, and light wavelength and polarizing filters.
4. Various types of exemplars may be required. Review the FBI's handbook for how to obtain these different types.

QUESTIONED DOCUMENT EXAMINATIONS
FOR PAPERS SURVIVING A FIRE (cont'd)

- If possible, always submit an original document.
- Photocopies should not be stored in plastic.
- Preserve originals in the condition in which they were found. Do not fold, cut, tear, mark, stamp or write on the document.

Slide 5-134

5. If possible, always submit an original document.
6. Photocopies should not be stored in plastic.
7. Preserve originals in the condition in which they were found. Do not fold, cut, tear, mark, stamp or write on the document.

QUESTIONED DOCUMENT EXAMINATIONS
FOR PAPERS SURVIVING A FIRE (cont'd)

- Protect it from indented writing. (Don't put it in an envelope, then set a paper on the envelope and write a note.)
- If you must mark on the document, use a pencil and make it unobtrusive.

Slide 5-135

8. Protect it from indented writing. (Don't put it in an envelope, then set a paper on the envelope and write a note.)
9. If you must mark on the document, use a pencil and make it unobtrusive.

INK EXAMINATIONS

- Often a component of document examinations.
- Determination of ink compositions and formulations.

Slide 5-136

D. Ink examinations.

1. Often a component of document examinations.
2. Determination of ink compositions and formulations.

INK EXAMINATIONS (cont'd)

- The techniques may include various types of fluorescence spectroscopy and examination under different wavelengths of light, as well as chemical and instrumental analysis.

Slide 5-137

3. The techniques may include various types of fluorescence spectroscopy and examination under different wavelengths of light, as well as chemical and instrumental analysis.

INK EXAMINATIONS (cont'd)

- Be certain to package documents that are to be examined separately from other documents or items with ink marks.

Slide 5-138

4. Be certain to package documents that are to be examined separately from other documents or items with ink marks.

GENERAL UNKNOWNNS

- Powders, liquids and stains that cannot be readily classified but may have relevance to a crime, suspect or victim.
- Always attempt to obtain comparison samples of any items of any suspected source.

Slide 5-139

E. General unknowns.

1. Powders, liquids and stains that cannot be readily classified but may have relevance to a crime, suspect or victim.
2. Always attempt to obtain comparison samples of any items of any suspected source.

GENERAL UNKNOWNNS (cont'd)

- Leak-proof containers are required for loose powders and liquids.
- For stains on large areas, cut a small sample and preserve in a heat-sealed plastic bag.

Slide 5-140

3. Leak-proof containers are required for loose powders and liquids.
4. For stains on large areas, cut a small sample and preserve in a heat-sealed plastic bag.

GENERAL UNKNOWNNS (cont'd)

- Collect an unstained area, and package separately for comparison.
- If the sample cannot be cut, rubbing with a cotton swab may be possible.
(Photograph the items before and after.)

Slide 5-141

5. Collect an unstained area, and package separately for comparison.
6. If the sample cannot be cut, rubbing with a cotton swab may be possible.
(Photograph the items before and after.)

XIII. VIDEO AND DIGITAL IMAGING**VIDEO AND DIGITAL IMAGING**

- Video examinations — the examination and enhancement of video media to determine authenticity, format, special effects, stability and screen captures.
- On occasion, it may be necessary to repair damaged media.

Slide 5-142

A. General.

1. Video examinations — the examination and enhancement of video media to determine authenticity, format, special effects, stability and screen captures.
2. On occasion, it may be necessary to repair damaged media.

**VIDEO AND DIGITAL IMAGING
(cont'd)**

- To extract information from both analog and digital media, various input devices will be needed (video home system (VHS), DVD, flash memory, digital memory, digital video recorder (DVR), etc.).
- Software that can decode the video input, as well as stabilize, sort cameras and capture stills, will be necessary.

Slide 5-143

3. To extract information from both analog and digital media, various input devices will be needed (video home system (VHS), DVD, flash memory, digital memory, digital video recorder (DVR), etc.).
4. Software that can decode the video input, as well as stabilize, sort cameras and capture stills, will be necessary.

VIDEO AND DIGITAL IMAGING (cont'd)

- The quality of many video recordings is compromised by poor cameras, old tapes being reused, video compression, or poor resolution selected for the recording.
- Older tape-type evidence is fragile and can be corrupted by static electricity, electrical fields and magnetic fields. Mark this on the shipping container.

Slide 5-144

5. The quality of many video recordings is compromised by poor cameras, old tapes being reused, video compression, or poor resolution selected for the recording.
6. Older tape-type evidence is fragile and can be corrupted by static electricity, electrical fields and magnetic fields. Mark this on the shipping container.

VIDEO AND DIGITAL IMAGING (cont'd)

- Copy the original, and view the copy.
- Always submit the originals to the laboratory.
- Not all crime laboratories have digital imaging capabilities.

Slide 5-145

7. Copy the original, and view the copy.
8. Always submit the originals to the laboratory.
9. Not all crime laboratories have digital imaging capabilities.

DIGITAL IMAGING AND VIDEO PROCESSING

- Many of these videos are complex multiple-camera views that need to be separated from each other and time-base-corrected, stabilized or enhanced.
- Digital imaging and video are used in almost all crimes where the scene, a victim, or suspect are captured on film or digitally.

Slide 5-146

10. Many of these videos are complex, multiple-camera views that need to be separated from each other and time-base-corrected, stabilized or enhanced.
11. Digital imaging and video are used in almost all crimes where the scene, a victim, or suspect are captured on film or digitally.

IMAGE ANALYSIS EXAMINATIONS

- The examination of images, whether from a conventional or digital camera (including photographic prints, digital captures from video sources, video recordings, etc.), may be requested in order to create photographic enhancements and comparisons of images.



Slide 5-147

B. Image analysis examinations.

1. The examination of images, whether from a conventional or digital camera (including photographic prints, digital captures from video sources, video recordings, etc.), may be requested in order to create photographic enhancements and comparisons of images using special software.

IMAGE ANALYSIS EXAMINATIONS (cont'd)

- For static digital images, light can be averaged to improve the illumination and visibility of an object.



Slide 5-148

2. For static digital images, light can be averaged to improve the illumination and visibility of an object.

DIGITAL IMAGING

- The techniques of facial comparisons — using the spacing of features such as ears, eyes, nose, mouth, chin, hairline, etc. — may be requested.
- Photogrammetry may be used to calculate measurements of items within the image, such as the height of a person or the distance between objects.

Slide 5-149

C. Digital imaging.

1. The techniques of facial comparisons — using the spacing of features such as ears, eyes, nose, mouth, chin, hairline, etc. — may be requested.
2. Photogrammetry may be used to calculate measurements of items within the image, such as the height of a person or the distance between objects.

DIGITAL IMAGING (cont'd)

- The examination of images often includes investigation of child pornography.
- Always write-protect the original media. Work and view only copies. Submit originals to the lab.

Slide 5-150

3. The examination of images often includes investigation of child pornography.
4. Always write-protect the original media. Work and view only copies. Submit originals to the lab.

DIGITAL IMAGING (cont'd)

- Collect comparison photos and images of people, rooms, objects, vehicles or other markings to be submitted with the unknown.
- Include a diagram for the various camera angles to be examined.

Slide 5-151

5. Collect comparison photos and images of people, rooms, objects, vehicles or other markings to be submitted with the unknown.
6. Include a diagram for the various camera angles to be examined.

DIGITAL IMAGING (cont'd)

- Physical items to be submitted for comparison to images should be left whole and not cut.

Slide 5-152

7. Physical items to be submitted for comparison to images should be left whole and not cut.

FORENSIC ENGINEERING

- Forensic engineering is a very broad category of forensic testing that requires specialized education and experience.
- Most familiar engineering analyses for fire investigators — determining the electrical status of wiring, appliances or devices.

Slide 5-153

D. Forensic engineering.

1. Forensic engineering is a very broad category of forensic testing that requires specialized education and experience.
2. Most familiar engineering analyses for fire investigators — determining the electrical status of wiring, appliances or devices.

FORENSIC ENGINEERING (cont'd)

- Appliances and devices often found in a fire scene may not appear to be significantly burned or melted — yet questions as to their status of operation at the time of fire may arise.

Slide 5-154

3. Appliances and devices often found in a fire scene may not appear to be significantly burned or melted — yet questions as to their status of operation at the time of fire may arise.

FORENSIC ENGINEERING (cont'd)

- Wiring and appliances are often found in the fire scene and are typically composed of inorganic compounds but may contain significant amounts of organic compounds as well.

Slide 5-155

4. Wiring and appliances are often found in the fire scene and are typically composed of inorganic compounds but may contain significant amounts of organic compounds as well.

FORENSIC ENGINEERING (cont'd)

- Often these items will be subjected to electrical or other engineering tests to determine if they were damaged by the fire or contributed to or caused a fire.

Slide 5-156

5. Often these items will be subjected to electrical or other engineering tests to determine if they were damaged by the fire or contributed to or caused a fire.

WHAT DOES THE INVESTIGATOR WANT TO KNOW, AND WHICH TESTS SHOULD BE USED?

- Other branches of the engineering sciences may also be employed in forensic analysis.



Slide 5-157

- E. What does an investigator want to know, and which test should be used?

1. Other branches of the engineering sciences may also be employed in forensic analysis.

WHAT DOES THE INVESTIGATOR WANT TO KNOW, AND WHICH TESTS SHOULD BE USED? (cont'd)

- In some fire scenes, the question is not whether an electrical component or system was related to a fire, but whether and how a mechanical, hydraulic or other engineered structure failed.



Slide 5-158

2. In some fire scenes, the question is not whether an electrical component or system was related to a fire, but whether and how a mechanical, hydraulic or other engineered structure failed.

XIV. SUMMARY



SUMMARY



- Overview.
- CFI trainer.
- Overview of forensic evidence.
- Forensic evidence.
- Latent and impression evidence.
- Latent prints from fire scenes.

Slide 5-159



SUMMARY (cont'd)



- Latent impression evidence: tool marks.
- Latent and impression evidence: firearms.
- Trace examinations.
- Trace evidence.
- Explosives and explosive residues.
- Paper and documents.
- Video and digital imaging.

Slide 5-160

This page intentionally left blank.

APPENDIX

INSTRUCTIONS FOR USE OF GYPSUM PRODUCTS

This page intentionally left blank.

Instructions for Use of Gypsum Products

Model stone / Die Stone / Orthodontic Stone / Orthodontic Plaster / Model Plaster

All Gypsums meet the specifications of the American dental association

Choose water to powder ratio from table below for the product you purchased.

Measure room temperature water (distilled water is always the best to use.) into mixing bowl in the correct proportions as shown in the chart. Always add powder to liquid.

Hand Mixing: Mix vigorously for 60 seconds at a rate of 120 revolutions per minute until a smooth and uniform mix is achieved.

Mechanical Mixing: Mix for 15 to 30 seconds at 450 rpm. Mechanical mixing is highly recommended for die stone models for crown and bridge work. It provides much stronger and uniform models.

Note on Setting Time: All set times are shown for mechanical Mixing at 450 rpm's for 30 Seconds.

Some color streaking is normal. The color will rapidly become uniform under active spatulation. After pouring, be sure to clean the mixing bowl thoroughly. Any dried out particles of gypsum may cause undue acceleration of future mixes.

Storage and Handling: Store in a cool and dry place. High temperature and humidity affect the gypsum materials adversely. Use colder water to increase working and setting time. To decrease setting time to make the stone set faster, use warmer water (80 to 85 degrees F).

Products <i>1 Part H₂O 3 Parts Stone</i>	Water to Powder Ratio <i>1 to 3 Ratio</i>	Initial Set, Minutes, <i>See Note</i>	% Setting Expansion	Dry Strength psi
Superstone Die Stone, Type IV	23 - 25 / 100	15 Max.	0.095	13,500
Superstone Die Stone, Type V	23 - 25 / 100	15 Max.	0.200 max.	13,500
Lab. Model Stone	30 - 32 / 100	15 Max	0.15	6,000
Lab. Model Stone - HARD	26 - 27 / 100	15 Max	0.15	10,000
Orthodontic Die Stone	23 - 25 / 100	15 Max	0.095	13,500
Orthodontic Model Stone	30 - 32 / 100	15 Max	0.15	6,000
Orthodontic Model Stone - HARD	26 - 28 / 100	15 Max	0.12	8,000
Orthodontic Plaster	45 - 47 / 100	6 - 8	0.20	3,500
Lab. Plaster - FAST SET	45 - 47 / 100	4 - 6	0.20	3,500
Lab. Plaster - REGULAR SET	45 - 47 / 100	6 - 8	0.20	3,500
Lab. Plaster - SLOW SET	45 - 47 / 100	10 - 12	0.20	3,500

Manufactured and distributed world wide by:

EMDIN INTERNATIONAL CORPORATION

15841 Business Center Drive, Irwindale, California 91706, USA

Tel: 626-813-3740

FAX: 626-445-5233

Web Site: www.Emdin.com

Email: info2004@Emdin.com

emdinusa@yahoo.com

This page intentionally left blank.

UNIT 6: POST-MORTEM AND TOXICOLOGY

TERMINAL OBJECTIVES

The students will be able to:

- 6.1 *Describe the changes that occur to the human body during a fire and the effect of trauma on how a body will burn.*
- 6.2 *Describe the role of toxicology in fire investigation and identify key toxicants.*

ENABLING OBJECTIVES

The students will be able to:

- 6.1 *Describe the effects of heat and fire on bodies.*
 - 6.2 *Describe the effects of fire on premortem injuries.*
 - 6.3 *Describe the various types of information derived from a toxicology report.*
 - 6.4 *Describe the source and effect of various toxic gases produced during a fire.*
-

This page intentionally left blank.



UNIT 6: POST-MORTEM AND TOXICOLOGY

Slide 6-1

ENABLING OBJECTIVES

- Describe the effects of heat and fire on bodies.
- Describe the effects of fire on premortem injuries.
- Describe the various types of information derived from a toxicology report.
- Describe the source and effect of various toxic gases produced during a fire.

Slide 6-2

I. ANTHROPOLOGICAL EXAMINATIONS

ANTHROPOLOGICAL EXAMINATIONS

- Bodies found within the fire scene may have various levels of decay or destruction.
 - Some will be completely unburned and will have suffered little heat damage.
 - Others will be heavily burned with loss of the extremities and the calcination of exposed bone.

Slide 6-3

- A. Bodies found within the fire scene may have various levels of decay or destruction.
1. Some will be completely unburned and will have suffered little heat damage.
 2. Others will be heavily burned with loss of the extremities and the calcination (which causes the bone to lose all structural integrity, leaving only calcium behind) of exposed bone.

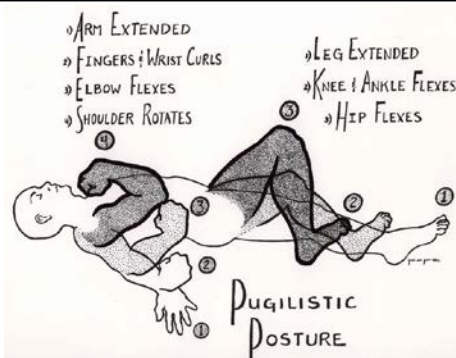
ANTHROPOLOGICAL EXAMINATIONS (cont'd)

- In the most extreme burn cases, only bones and bone fragments may survive.
- It may be necessary to leave the body as found until it is completely photographed and examined by a medical examiner (depending on your jurisdiction).

Slide 6-4

3. In the most extreme burn cases, only bones and bone fragments may survive.
4. It may be necessary to leave the body as found until it is completely photographed and examined by a medical examiner (depending on your jurisdiction).

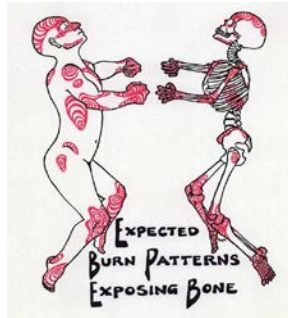
PUGILISTIC POSTURE



Slide 6-5

5. Slide 6-5: shows the progression of the pugilistic (boxerlike) posture.

BURN PATTERN



Slide 6-6

6. Slide 6-6: shows which areas of the body are more likely to lose flesh during a fire and have exposed bone.

CLASSIC PUGILISTIC POSTURE



Slide 6-7

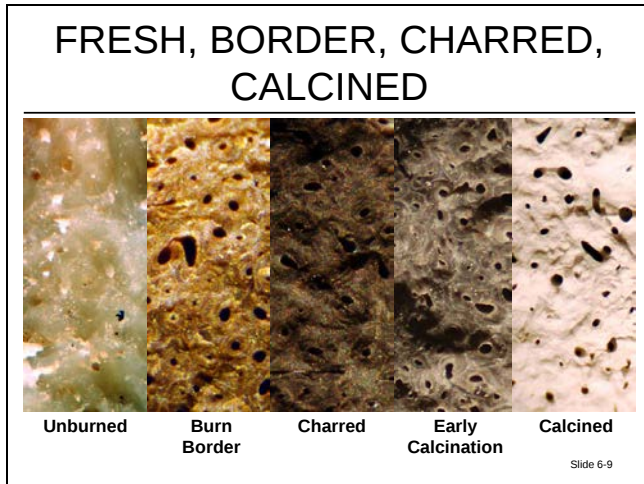
7. Slide 6-7: shows the classic pugilistic posture.

ACCELERATED BURNING: EXPOSURE OF FAT, MUSCLE, ORGANS AND BONE

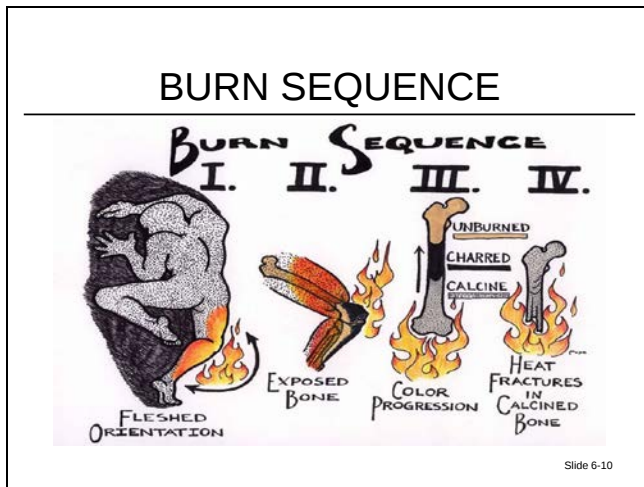


Slide 6-8

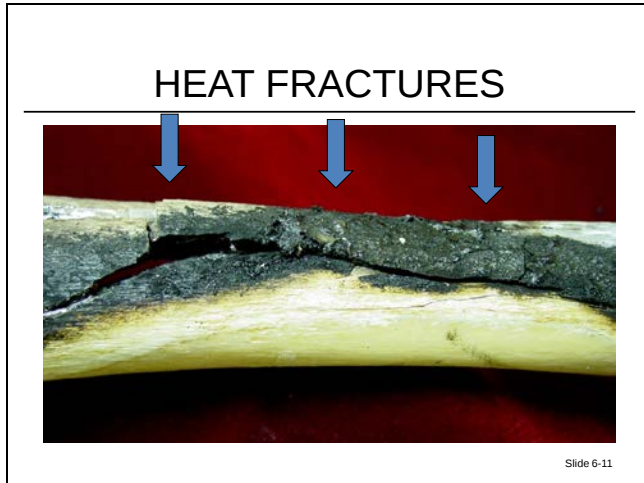
8. Slide 6-8: shows accelerated burning that exposes muscle, organs and bone and may be indicative of an ignitable liquid (IL). It can also indicate how long the scene was allowed to burn and the location of the body within the fire.



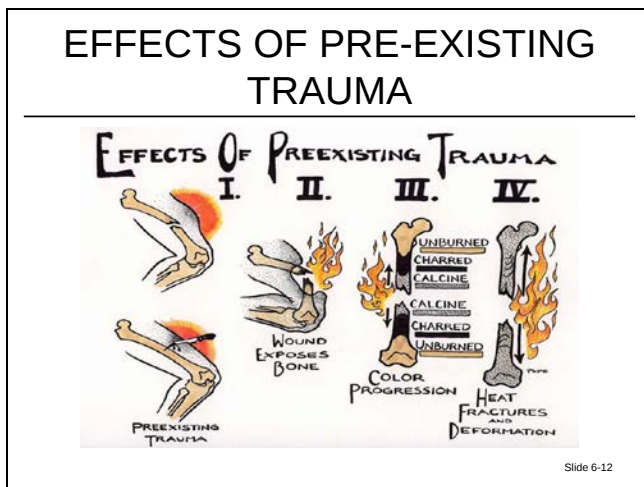
9. Slide 6-9: shows the stages the bone will go through when exposed to heat and fire. The longer the body is exposed and the more heat it is exposed to will determine the extent of the calcination process.



10. Slide 6-10: shows that the limb closest to the fire will receive the most fire damage. Color progression of the bone shows that a single bone may have different degrees of calcination depending on the location of the limb to fire.



11. Slide 6-11: picture depicting how a bone will look when fractured by fire. Deep charring of the bone around the fracture exposes more than one surface, unlike a bone with no fractures.



12. Slide 6-12: shows how, when a bone is fractured before being exposed to fire, you will essentially have two separate bones. More surface area is exposed, and one would therefore expect to see charring and calcinations of the exposed edges of the bone.

CRIMINAL ATTEMPTS TO BURN A BODY

- Stirring or stoking a fire can crush burned bone.
- Fire reduces recognizable features of the body.

Slide 6-13

B. Criminal attempts to burn a body.

1. Stirring or stoking a fire can crush burned bone.
2. Fire reduces recognizable features of the body.

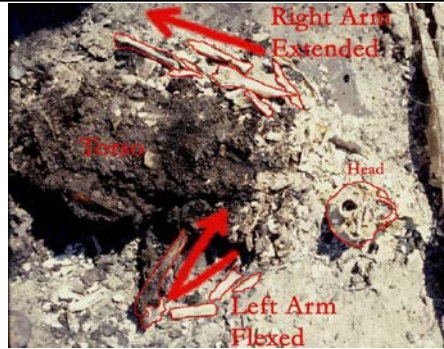
CRIMINAL ATTEMPTS TO BURN A BODY (cont'd)

- Heat embrittles bone, so make sure to handle fragments of bone with caution.
- Fragments of bone can be smaller than a penny, so sifting the scene is warranted in many cases.

Slide 6-14

3. Heat embrittles bone, so make sure to handle fragments of bone with caution.
4. Fragments of bone can be smaller than a penny, so sifting the scene is warranted in many cases.

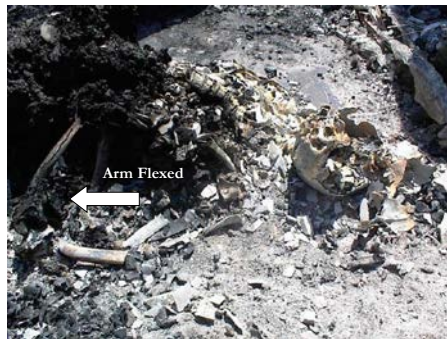
BURN PATTERNS FROM PROTECTION AND EXPOSURE



Slide 6-15

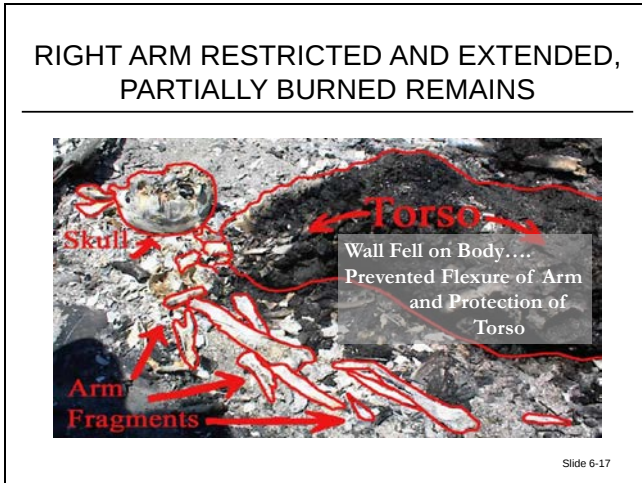
5. Slide 6-15: shows that when a body is burned, it can be very difficult to recognize that there is a corpse in the scene.

FLEXED LEFT ARM — ORIGINAL CONTEXT



Slide 6-16

6. Slide 6-16: shows that the position in which an investigator finds the remains can often tell the position of the body before the fire.



7. Slide 6-17: shows an illustration of how difficult it can be to recognize a burned body.

ANTHROPOLOGICAL
EVIDENCE

- It has been shown experimentally that the fat from a body will act as an accelerant and fuel the fire on a body.
 - In most cases, the extremities (arms, legs and head) will be most affected by the fire.

Slide 6-18

C. Anthropological evidence.

1. It has been shown experimentally that the fat from a body will act as an accelerant and fuel the fire on a body.

In most cases, the extremities (arms, legs, and head) will be most affected by the fire.

ANTHROPOLOGICAL EVIDENCE (cont'd)

- Though a body may burn, there will be evidence on the body that has value to the investigation.

Slide 6-19

2. Though a body may burn, there will be evidence on the body that has value to the investigation.

BURNING POOL OF FAT



Slide 6-20

3. Slide 6-20: Case studies have shown that when a body is doused with an IL and allowed to burn extensively, the IL can still be identified from the body and from samples taken from under the body. ILs tend to pool underneath the body, which may be considered a protective area.

FAT RENDERING FROM A CUT HUMAN BONE



Slide 6-21

4. Slide 6-21: This is a human bone with marrow and fat seeping down and fueling the fire.

II. BONES AND TEETH

BONES AND TEETH

- Use clean forceps to pick up other tissues, bones and teeth.
- For tissue and muscle, try to collect 1 to 2 cubic inches of material.
- Submit whole bones.
- Tissue should be placed into a clean airtight plastic container and frozen without preservatives (e.g., formalin or formaldehyde).

Slide 6-22

General.

- A. Use clean forceps to pick up other tissues, bones and teeth.
- B. For tissue and muscle, try to collect 1 to 2 cubic inches of material.
- C. Submit whole bones.
- D. Tissue should be placed into a clean, airtight plastic container and frozen without preservatives (e.g., formalin or formaldehyde).

BONES AND TEETH (cont'd)

- For teeth, the most important for the investigation are the nonrestored molars, followed by the nonrestored premolar, canine, and front teeth. Restored teeth follow the nonrestored ones in the same order of priority: molar, premolar, canine, front.
- Teeth and bone should be placed into a paper envelope and frozen.

Slide 6-23

- E. For teeth, the most important for the investigation are the nonrestored molars, followed by the nonrestored premolar, canine, and front tooth. Restored teeth follow after the nonrestored ones in the same order of priority: molar, premolar, canine, front.
- F. Teeth and bone should be placed into a paper envelope and frozen. This process is to enable the possibility of getting DNA.

BONES AND TEETH (cont'd)

- For long-term storage, refrigerate liquid blood and other reference samples.
- All other types of samples may be either refrigerated or frozen.

Slide 6-24

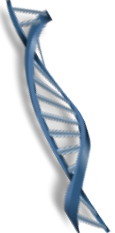
- G. For long-term storage, refrigerate liquid blood and other reference samples.
- H. All other types of samples may be either refrigerated or frozen.

III. DNA EXAMINATIONS

DNA EXAMINATIONS

What is DNA?

- DNA, or deoxyribonucleic acid, is the fundamental building block for an individual's entire genetic makeup. It is a component of virtually every cell in the human body.



Slide 6-25

What is DNA?

- A. DNA, or deoxyribonucleic acid, is the fundamental building block for an individual's entire genetic makeup. It is a component of virtually every cell in the human body.

DNA EXAMINATIONS (cont'd)

- DNA is a very complex molecule composed of two long polynucleotide strands arranged in a double helix.
- The polynucleotide strands connect the sugar phosphate backbone with paired nucleotides.

Slide 6-26

- B. DNA is a very complex molecule composed of two long polynucleotide strands arranged in a double helix.
- C. The polynucleotide strands connect the sugar phosphate backbone with paired nucleotides.

DNA EXAMINATIONS (cont'd)

- There are four nucleotides, and they are specifically paired:
 - Thymine is always paired with Adenine, and Cytosine is always paired with Guanine. These pairings set up a bar code that defines you.

Slide 6-27

D. There are four nucleotides, and they are specifically paired:

Thymine is always paired with Adenine, and Cytosine is always paired with Guanine. These pairings set up a bar code that defines you.

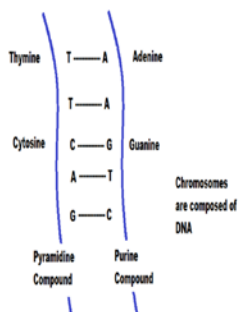
DNA EXAMINATIONS (cont'd)

- While over 99 percent of DNA is the same from one human to another, there are specific sections of the barcode that can be unique to an individual.

Slide 6-28

E. While over 99 percent of DNA is the same from one human to another, there are specific sections of the barcode that can be unique to an individual.

DNA EXAMINATIONS (cont'd)



Slide 6-29

DNA EXAMINATIONS (cont'd)

- Through the use of various technologies, a trace amount of DNA can be replicated to multiply the available DNA within certain specific segments.
- This is necessary in order for the instrumentation to have a sufficient quantity to properly detect the DNA.

Slide 6-30

- F. Through the use of various technologies, a trace amount of DNA can be replicated to multiply the available DNA within certain specific segments.
- G. This is necessary in order for the instrumentation to have a sufficient quantity to properly detect the DNA.

DNA EXAMINATIONS (cont'd)

- DNA typing was introduced in the mid-1980s and has revolutionized forensic science and the ability of law enforcement to match perpetrators with crime scenes.

Slide 6-31

- H. DNA typing was introduced in the mid-1980s and has revolutionized forensic science and the ability of law enforcement to match perpetrators with crime scenes.

DNA EXAMINATIONS (cont'd)

- Originally, almost all DNA typing looked at the nuclear DNA — the DNA coming from the nucleus of a cell.

Slide 6-32

- I. Originally, almost all DNA typing looked at the nuclear DNA — the DNA coming from the nucleus of a cell.

DNA EXAMINATIONS (cont'd)

- As a result, certain types of biological evidence would be acceptable for DNA typing and others would not. For example, a hair with a root tip could be tested while a hair without a root tip could not.
- DNA from the more persistent mitochondria from within the cells can be tested.

Slide 6-33

- J. As a result, certain types of biological evidence would be acceptable for DNA typing and others would not. For example, a hair with a root tip could be tested while a hair without a root tip could not.
- K. DNA from the more persistent mitochondria from within the cells can be tested.

DNA EXAMINATIONS (cont'd)

- Nuclear DNA can be used to identify or characterize an individual, but the sample must contain cells with the nucleus present.
- In older or degraded samples where the nucleus is no longer present, the mitochondria is often still present.

Slide 6-34

- L. Nuclear DNA can be used to identify or characterize an individual, but the sample must contain cells with the nucleus present.
- M. In older or degraded samples where the nucleus is no longer present, the mitochondria is often still present.

DNA EXAMINATIONS (cont'd)

- The issue with mitochondrial DNA is that it is inherited solely from an individual's mother.
- Siblings (other than identical twins) would have identical mitochondrial DNA yet unique nuclear DNA.

Slide 6-35

- N. The issue with mitochondrial DNA is that it is inherited solely from an individual's mother.
- O. Siblings (other than identical twins) would have identical mitochondrial DNA yet unique nuclear DNA.

DNA EXAMINATIONS (cont'd)

- Thousands of cases have been closed and innocent suspects freed and guilty ones punished because of the power of this silent biological witness at the crime scene.
- DNA is a powerful tool because, aside from identical twins, each person's nuclear DNA is different from every other individual's.

Slide 6-36

- P. Thousands of cases have been closed and innocent suspects freed and guilty ones punished because of the power of this silent biological witness at the crime scene.
- Q. DNA is a powerful tool because, aside from identical twins, each person's nuclear DNA is different from every other individual's.

DNA EXAMINATIONS (cont'd)

- DNA can also be used to identify a victim by taking nuclear or mitochondrial DNA from relatives, even when no body can be found.
- Forensically valuable DNA can be found on evidence that is decades old, and, in the case of mitochondrial DNA, on evidence that is even older.

Slide 6-37

- R. DNA can also be used to identify a victim by taking nuclear or mitochondrial DNA from relatives, even when no body can be found.
- S. Forensically valuable DNA can be found on evidence that is decades old, and, in the case of mitochondrial DNA, on evidence that is even older.

IV. IDENTIFYING DNA EVIDENCE

IDENTIFYING DNA EVIDENCE

- Only a few cells are sufficient to obtain useful DNA provided they have intact nuclei or mitochondria present.

Slide 6-38

- A. Only a few cells are sufficient to obtain useful DNA evidence, provided they have intact nuclei or mitochondria present.

IDENTIFYING DNA EVIDENCE (cont'd)

- Remember that just because you cannot see a stain does not mean there are not enough cells for DNA typing.
- The more that officers know how to use DNA, the more powerful a tool it becomes.

Slide 6-39

- B. Remember that just because you cannot see a stain does not mean there are not enough cells for DNA typing.
- C. The more that officers know how to use DNA, the more powerful a tool it becomes.

V. WHERE IS DNA IN THE HUMAN BODY?

WHERE IS DNA IN THE HUMAN BODY?

- Blood.
- Teeth.
- Semen.
- Skin cells.
- Tissues.
- Organs.
- Muscles.
- Brain cells.

Slide 6-40

- A. Blood.
- B. Teeth.
- C. Semen.
- D. Skin cells.
- E. Tissues.

F. Organs.

G. Muscles.

H. Brain cells.

WHERE IS DNA IN THE
HUMAN BODY? (cont'd)

- Bones.
- Hair.
- Saliva.
- Mucus.
- Perspiration.
- Fingernails.
- Urine.
- Feces, etc. (not always accepted).

Slide 6-41

I. Bones.

J. Hair.

K. Saliva.

L. Mucus.

M. Perspiration.

N. Fingernails.

O. Urine.

P. Feces, etc. (not always accepted).

VI. DNA AT THE CRIME SCENE

DNA AT THE CRIME SCENE

- Where can DNA evidence be found at a crime scene?
- DNA evidence can be collected from virtually anywhere. DNA has helped solve many cases when imaginative investigators collected evidence from nontraditional sources.
- Be especially cognizant of drink containers and eating utensils.

Slide 6-42

- A. Where can DNA evidence be found at a crime scene?
- B. DNA evidence can be collected from virtually anywhere. DNA has helped solve many cases when imaginative investigators collected evidence from nontraditional sources.
- C. Be especially cognizant of drink containers and eating utensils.

DNA AT THE CRIME SCENE (cont'd)

- Anywhere a person may touch.
 - Hat, mask, bandana.
 - Eyeglasses.
 - Used condoms.
 - Bite marks.
 - Blanket or pillow.
 - Tape or ligature, etc.

Slide 6-43

- D. Anywhere a person may touch.
1. Hat, mask, bandana.
 2. Eyeglasses.
 3. Used condoms.

4. Bite marks.
5. Blanket or pillow.
6. Tape or ligature, etc.

VII. DNA EXAMINATIONS CONTAMINATION

DNA EXAMINATIONS CONTAMINATION

- To avoid contamination of evidence that may contain DNA, always take the following precautions:
 - Wear gloves, and change them often.
 - Use disposable instruments or clean them thoroughly before and after handling each sample.
 - Avoid touching the area where you believe DNA may exist.

Slide 6-44

- A. To avoid contamination of evidence that may contain DNA, always take the following precautions:
1. Wear gloves, and change them often.
 2. Use disposable instruments or clean them thoroughly before and after handling each sample.
 3. Avoid touching the area where you believe DNA may exist.

DNA EXAMINATIONS CONTAMINATION (cont'd)

- Avoid talking, sneezing and coughing over evidence.
- Avoid touching your face, nose and mouth when collecting and packaging evidence.
- Air-dry evidence thoroughly before packaging.
- Put evidence into new paper bags or envelopes, not into plastic bags. Do not use staples.

Slide 6-45

- B. Avoid talking, sneezing and coughing over evidence.
- C. Avoid touching your face, nose and mouth when collecting and packaging evidence.
- D. Air-dry evidence thoroughly before packaging.
- E. Put evidence into new paper bags or envelopes, not into plastic bags. Do not use staples.

VIII. DNA TRANSPORTATION AND STORAGE

DNA TRANSPORTATION AND STORAGE

- When transporting and storing evidence that may contain DNA, it is important to keep the evidence dry and at room temperature.
- Direct sunlight and warmer conditions may also be harmful to DNA, so avoid keeping evidence in places that may get hot, such as a room or police car without air conditioning.

Slide 6-46

- A. When transporting and storing evidence that may contain DNA, it is important to keep the evidence dry and at room temperature.
- B. Direct sunlight and warmer conditions may also be harmful to DNA, so avoid keeping evidence in places that may get hot, such as a room or police car without air conditioning.

IX. ELIMINATION SAMPLES

ELIMINATION SAMPLES

- As with fingerprints, the effective use of DNA will usually require the collection and analysis of elimination samples.
- An investigator should identify appropriate people, such as household members, for future elimination sample testing.
- Don't forget firefighters and police at the scene.

Slide 6-47

- A. As with fingerprints, the effective use of DNA will usually require the collection and analysis of elimination samples.
- B. An investigator should identify appropriate people, such as household members, for future elimination sample testing.
- C. Don't forget firefighters and police at the scene.

X. COMBINED DNA INDEX SYSTEM

COMBINED DNA INDEX SYSTEM

- Combined DNA Index System (CODIS), an electronic database of DNA profiles that can identify suspects, is similar to the Integrated Automated Fingerprint Identification System (IAFIS) database.
- Just as fingerprints found at a crime scene can be run through IAFIS in search of a suspect or link to another crime scene, DNA profiles from a crime scene can be entered into CODIS.

Slide 6-48

- A. Combined DNA Index System (CODIS), an electronic database of DNA profiles that can identify suspects, is similar to the Integrated Automated Fingerprint Identification System (IAFIS) database.

- B. Just as fingerprints found at a crime scene can be run through IAFIS in search of a suspect or link to another crime scene, DNA profiles from a crime scene can be entered into CODIS.

XI. DNA CONSIDERATIONS

DNA CONSIDERATIONS

- The following are only a few of the general items to consider with items for DNA analysis. Please refer to the FBI Handbook for additional considerations:
 - Document, document, document.
 - You must know where the sample originated.
 - If not collected and preserved properly, biological degradation will destroy the value of DNA.

Slide 6-49

The following are only a few of the general items to consider with items for DNA analysis. Please refer to the FBI Handbook for additional considerations:

- A. Document, document, document.
- B. You must know where the sample originated.
- C. If not collected and preserved properly, biological degradation will destroy the value of DNA.

DNA CONSIDERATIONS (cont'd)

- Contamination must be avoided.
- Care in transfer of DNA evidence from source to storage to analytical media must be paramount, as transfer is a major source of potential contamination.
- Proper collection, preservation and packaging depends on the liquid or solid state of the evidence as well as its condition.

Slide 6-50

- D. Contamination must be avoided.
- E. Care in transfer of DNA evidence from source to storage to analytical media must be paramount, as transfer is a major source of potential contamination.
- F. Proper collection, preservation and packaging depends on the liquid or solid state of the evidence as well as its condition.

XII. BLOOD AND BIOLOGICAL EVIDENCE

BLOOD AND BIOLOGICAL EVIDENCE

- Cigarette butts should be picked up with gloved hands or forceps.
 - Do not collect ashes. Air-dry and package in paper.
 - Only submit an ashtray if it is also going to be checked for latent prints.

Slide 6-51

A. Cigarettes, gum and envelopes.

1. Cigarette butts should be picked up with gloved hands or forceps.
 - a. Do not collect ashes. Air-dry and package in paper.
 - b. Only submit an ashtray if it is also going to be checked for latent prints.

BLOOD AND BIOLOGICAL EVIDENCE (cont'd)

- Chewing gum should be picked up with gloved hands or forceps. Air-dry and package in paper.
- Envelopes and stamps should be picked up with gloved hands or forceps and placed in a clean envelope.

Slide 6-52

2. Chewing gum should be picked up with gloved hands or forceps. Air-dry and package in paper.
3. Envelopes and stamps should be picked up with gloved hands or forceps and placed in a clean envelope.

OTHER BIOLOGICAL SAMPLES



- The liver and kidneys are the body's poison filters and are commonly macerated in toxicology for testing purposes.
- The trachea and lungs may also be tested for inhaled chemical residues including ignitable liquids (ILs).

Slide 6-53

B. Other biological samples.

1. The liver and kidneys are the body's poison filters and are commonly macerated in toxicology for testing purposes.
2. The trachea and lungs may also be tested for inhaled chemical residues including ILs.

OTHER BIOLOGICAL SAMPLES (cont'd)



- The carbonization of the interior of the trachea indicates that the person was breathing hot fumes and gases within a fire scene.

Slide 6-54

3. The carbonization of the interior of the trachea indicates that the person was breathing hot fumes and gases within a fire scene.

OTHER BIOLOGICAL SAMPLES (cont'd)

- Skin can retain impression evidence, and modern techniques have allowed latent prints to be recovered from its surface.
- The presence of bruising, contusions, lacerations, punctures, and bullet entrance and exit wounds on skin are also critical evidence items.

Slide 6-55

4. Skin can retain impression evidence, and modern techniques have allowed latent prints to be recovered from its surface.
5. The presence of bruising, contusions, lacerations, punctures, and bullet entrance and exit wounds on skin are also critical evidence items.

OTHER BIOLOGICAL SAMPLES (cont'd)

- The skin, down to the subcutaneous fat level, may retain IL residues if any had been poured over its surface.

Slide 6-56

6. The skin, down to the subcutaneous fat level, may retain IL residues if any had been poured over its surface.

XIII. ANIMAL, INSECT AND PLANT CONTRIBUTIONS

**ANIMAL AND INSECT
CONTRIBUTIONS**

- Materials from animals and insects may be used to show the time of death and how and when remains were scattered.
- In some cases, the presence of certain insects, animal hairs or animal feces has been used to link a suspect to a scene.

Slide 6-57

- A. Materials from animals and insects may be used to show the time of death and how and when remains were scattered.
- B. In some cases, the presence of certain insects, animal hairs or animal feces have been used to link a suspect to a scene.

PLANT CONTRIBUTIONS

- Plant fibers and pollen may also be used in the same manner to link a suspect or victim with a scene.

Slide 6-58

- C. Plant fibers and pollen may also be used in the same manner to link a suspect or victim with a scene.

PLANT CONTRIBUTIONS (cont'd)

- Wood may retain certain impression evidence; it may be used to establish the make, manufacture, or provenance of an object; or it may suggest whether the source of terpenes found in a fire scene was accidental or deliberate (hardwood versus softwood).

Slide 6-59

- D. Wood may retain certain impression evidence; it may be used to establish the make, manufacture, or provenance of an object; or it may suggest whether the source of terpenes found in a fire scene was accidental or deliberate (hardwood versus softwood).

XIV. TOXICOLOGY

TOXICOLOGY

- Forensic toxicology.
- Key fire toxicants and their effects on victims.
- The fire victim as the data collector.

Slide 6-60

A. Outline.

1. Forensic toxicology.
2. Key fire toxicants and their effects on victims.
3. The fire victim as the data collector.

TOXICOLOGY (cont'd)

- Victim documentation and burn injuries.
- The autopsy report.
- Interpretative considerations.

Slide 6-61

4. Victim documentation and burn injuries.
5. The autopsy report.
6. Interpretative considerations.

WHAT IS FORENSIC TOXICOLOGY?

- Three major subfields:
 - Human performance (behavioral responses under the influence of a drug).
 - Drug testing (military, driving under the influence (DUI)/driving while intoxicated (DWI), workplace, sports, etc.).
 - Post-mortem.

Slide 6-62

B. Definitions.

1. Three major subfields:
 - a. Human performance (behavioral responses under the influence of a drug).
 - b. Drug testing (military, driving under the influence (DUI)/driving while intoxicated (DWI), workplace, sports, etc.).
 - c. Post-mortem.

WHAT IS FORENSIC TOXICOLOGY? (cont'd)

- Samples: urine, blood, vitreous humor, bile, liver and various other tissues.
- Analytical methods include spectrophotometry, chromatography, immunoassay, etc.

Slide 6-63

2. Samples: urine, blood, vitreous humor (fluid from inside the eye), bile (fluid from gall bladder), liver and various other tissues.
3. Analytical methods include spectrophotometry, chromatography, immunoassay, etc.

WHAT IS FORENSIC TOXICOLOGY? (cont'd)

- Toxicology is the study of poisons.
- Forensic toxicology is the application of toxicology for the purposes of the law.
- What is a poison? A chemical or combination of chemicals that is harmful to a body.

Slide 6-64

4. Toxicology is the study of poisons, which include chemicals taken into the body by ingestion, inhalation, injection or absorption.
5. Forensic toxicology is the application of toxicology for the purposes of the law.
6. What is a poison? A chemical or a combination of chemicals that is harmful to a body.

WHAT IS FORENSIC TOXICOLOGY? (cont'd)

- Some chemicals are beneficial to the body at one dose but harmful in a higher concentration.
- Some chemicals are more harmful depending on how they are introduced.

Slide 6-65

7. Some chemicals are beneficial to the body at one dose but harmful in a higher concentration.
8. Some chemicals are more harmful depending on how they are introduced.

TOXICOLOGY (cont'd)

- Fields that contribute.
 - Chemistry.
 - Biology.
 - Pharmacology.
 - Pathology.
 - Immunology.
 - Physiology.

Slide 6-66

C. Fields that contribute to the field of toxicology.

1. Chemistry.
2. Biology.
3. Pharmacology.
4. Pathology.
5. Immunology.
6. Physiology.

TOXICOLOGY (cont'd)

- Three broad divisions:
 - Economic.
 - Drug development.
 - Pesticides.
 - Insecticides.
 - Food additives.

Slide 6-67

D. Three broad divisions:

1. Economic.
 - a. Drug development.
 - b. Pesticides.
 - c. Insecticides.
 - d. Food additives.

TOXICOLOGY (cont'd)

- Environmental.
 - Pollution.
 - Industrial hygiene.

Slide 6-68

2. Environmental.
 - a. Pollution.
 - b. Industrial hygiene.

TOXICOLOGY (cont'd)

- Forensic.
 - Diagnosis.
 - Therapy.
 - Medicolegal.

Slide 6-69

3. Forensic.
 - a. Diagnosis.
 - b. Therapy.
 - c. Medicolegal.

XV. DEATH INVESTIGATION IN THE UNITED STATES

DEATH INVESTIGATION IN THE UNITED STATES

- Coroner.
 - Elected by the people or appointed by the governmental authority.
 - Specific training or experience in medicine is not required except in some states. (For example, Ohio requires a coroner to be a medical or osteopathic doctor.)

Slide 6-70

- A. Coroner.
 1. Elected by the people or appointed by the governmental authority.
 2. Specific training or experience in medicine is not required except in some states. (For example, Ohio requires a coroner to be a medical or osteopathic doctor.)

DEATH INVESTIGATION IN THE UNITED STATES (cont'd)

- Medical examiner.
 - Appointed by a health department.
 - Must be a physician (usually a pathologist) trained in forensic medicine.

Slide 6-71

B. Medical examiner.

1. Appointed by a health department.
2. Must be a physician (usually a pathologist) trained in forensic medicine.

DEATH INVESTIGATION IN THE UNITED STATES (cont'd)

- Before the body is removed for autopsy, there must be an examination of the location in which it has been found.
 - Trace and other evidence must be collected.
 - The body must be photographed.
 - Is the area under the body affected by the fire?

Slide 6-72

C. Best practices.

Before the body is removed for autopsy, there must be an examination of the location in which it has been found.

1. Trace and other evidence must be collected.
2. The body must be photographed.
3. Is the area under the body affected by the fire?

DEATH INVESTIGATION IN THE UNITED STATES (cont'd)

- Is there any indication that the body was moved after the fire or protected from the fire?
- What is the proximity of the body to the seat of the fire?
- Are there indications that the body was splashed with an IL in an attempt to burn it?

Slide 6-73

4. Is there any indication that the body was moved after the fire or protected from the fire?
5. What is the proximity of the body to the seat of the fire?
6. Are there indications that the body was splashed with an IL in an attempt to burn it?

TOXICITY AND THE FIRE SCENE

- If a body is found, the pathologist will take samples and have them tested for the presence of:
 - Alcohol.
 - Drugs.
 - Poisons.
 - Unusual chemicals.
 - The levels of expected chemicals.

Slide 6-74

D. Toxicity and the fire scene.

1. If a body is found, the pathologist will take samples and have them tested for the presence of:
 - a. Alcohol.
 - b. Drugs.
 - c. Poisons.

- d. Unusual chemicals.
- e. The levels of expected chemicals.

TOXICITY AND THE FIRE SCENE (cont'd)

- The presence of these factors can often explain why a person did not escape the fire or if they were deceased before the fire began.

Slide 6-75

2. The presence of these factors can often explain why a person did not escape the fire or if they were deceased before the fire began.

RATING A MATERIAL'S TOXICITY

- When looking up the physical properties of chemicals, you may encounter the following abbreviations that relate to its toxicity:
 - Threshold limit value (TLV) — the level you can be exposed to for a day, each day of your working lifetime, without experiencing any ill effects.
 - Short-term exposure limit (STEL) — the acceptable average level of exposure over a short period (15 minutes) without ill effects.

Slide 6-76

- E. Rating toxicity.

When looking up the physical properties of chemicals, you may encounter the following abbreviations that relate to its toxicity:

1. Threshold limit value (TLV) — the level you can be exposed to for a day, each day of your working lifetime, without experiencing any ill effects.
2. Short-term exposure limit (STEL) — the acceptable average level of exposure over a short period (15 minutes) without ill effects.

RATING A MATERIAL'S TOXICITY (cont'd)

- Short-term lethal concentration (STLC) — the level of exposure to a chemical in the short term (10 minutes) that is likely to cause death.
- Immediately dangerous to life and health (IDLH) — a chemical without a safe exposure limit that is likely to damage a person or kill them immediately after exposure.

Slide 6-77

3. Short-term lethal concentration (STLC) — the level of exposure to a chemical in the short term (10 minutes) that is likely to cause death.
4. Immediately dangerous to life and health (IDLH) — a chemical without a safe exposure limit that is likely to damage a person or kill them immediately after exposure.

XVI. KEY FIRE TOXICANT: CARBON MONOXIDE

KEY FIRE TOXICANT: CARBON MONOXIDE

- Carbon monoxide is produced in every hydrocarbon fire in varying amounts.
- 75-80 percent of fire fatalities occur from carbon monoxide poisoning.

Slide 6-78

A. Carbon monoxide.

1. Carbon monoxide is produced in every hydrocarbon fire in varying amounts.
2. 75-80 percent of fire fatalities result from carbon monoxide poisoning.

KEY FIRE TOXICANT: CARBON MONOXIDE (cont'd)

- Carbon monoxide binds with hemoglobin in a red blood cell and keeps the cell from being able to transport oxygen.
- Carbon monoxide poisoning is a type of chemical asphyxiation.
- A 1984 study in Dallas, Texas, revealed it to be at the IDLH level in 10.5 percent of all house fires.

Slide 6-79

3. Carbon monoxide binds with hemoglobin in a red blood cell and keeps the cell from being able to transport oxygen.
4. Carbon monoxide poisoning is a type of chemical asphyxiation.
5. A 1984 study in Dallas, Texas, revealed it to be at the IDLH level in 10.5 percent of all house fires.

CARBOXYHEMOGLOBIN LEVELS: CARBON MONOXIDE EFFECTS

0-10 %	Normal, shortness of breath with vigorous exercise.
10-20 %	Headache, flushed skin, shortness of breath with moderate exercise.
20-30 %	Headache, throbbing temples, irritability, emotional instability, impaired judgment, memory impairment, rapid fatigue.
30-40 %	Dizziness, weakness, nausea, vomiting, severe headache, visual disturbances, confusion, incapacitation*. (*Victim is unconscious but still breathing; victim is no longer capable of self-preservation.)
40-50 %	Intensified symptoms, hallucinations.
>50 %	Syncope, coma, tachycardia, convulsions, loss of reflexes, respiratory paralysis, death.

Slide 6-80

WASHOUT OF CARBON MONOXIDE IN THE BLOOD

- The half-life of carbon monoxide in the blood is affected by the concentration of oxygen in the air.
- When the air consists of 21 percent O₂, the half-life of carbon monoxide in the blood is four to five hours.

Slide 6-81

B. Washout.

1. The half-life of carbon monoxide in the blood is affected by the concentration of oxygen in the air.
2. When the air consists of 21 percent O₂, the half-life of carbon monoxide in the blood is four to five hours.

WASHOUT OF CARBON MONOXIDE IN THE BLOOD (cont'd)

- When the air consists of 100 percent O₂, the half-life of carbon monoxide in the blood is 45-90 minutes.
- At hyperbaric O₂, the half-life of carbon monoxide in the blood is 20-30 minutes.

Slide 6-82

3. When the air consists of 100 percent O₂, the half-life of carbon monoxide in the blood is 45-90 minutes.
4. At hyperbaric O₂, the half-life of carbon monoxide in the blood is 20-30 minutes.

XVII. KEY LETHAL TOXICANT: CYANIDE

**KEY LETHAL TOXICANT:
CYANIDE**

- Hydrogen cyanide (HCN) is produced during the combustion of nitrogen-containing fuels: polyurethane, polyacrylonitrile-butadiene-styrene (ABS), wool, nylon, silk, urea formaldehyde, etc.

Slide 6-83

A. Hydrogen cyanide (HCN).

1. HCN is produced during the combustion of nitrogen-containing fuels: polyurethane, polyacrylonitrile-butadiene-styrene (ABS), wool, nylon, silk, urea formaldehyde, etc.

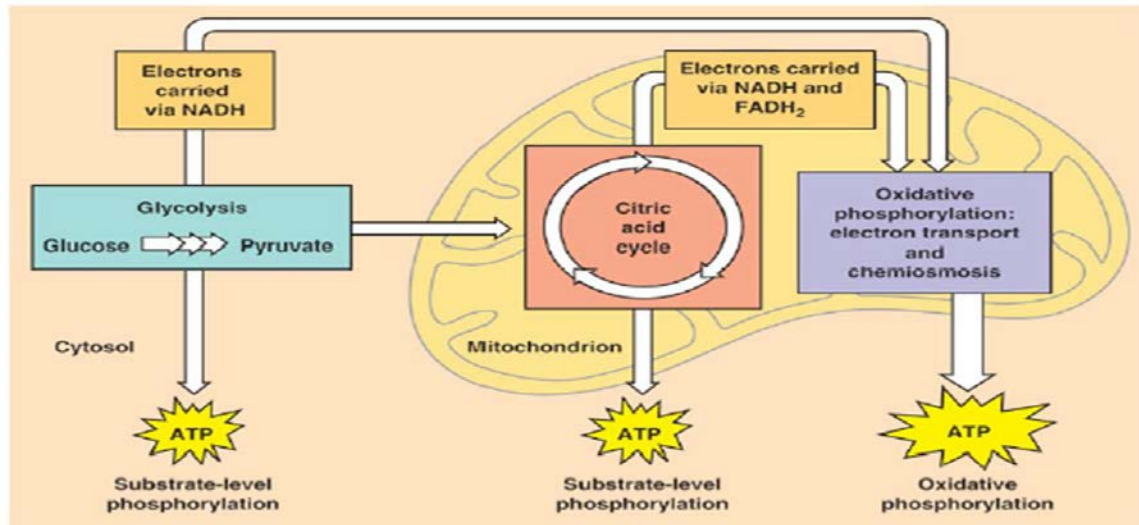
**KEY LETHAL TOXICANT:
CYANIDE (cont'd)**

- A 1984 study in Dallas, Texas, revealed the HCN was only found in 12 percent of the house fires and that the highest levels were at the STEL in only 10.5 percent of the fires (Lowry et al.).

Slide 6-84

2. A 1984 study in Dallas, Texas, revealed that HCN was only found in 12 percent of house fires and that the highest levels were at the STEL in only 10.5 percent of the fires (Lowry et al.).

CITRIC ACID CYCLE INTERFERENCE: HYDROGEN CYANIDE



Disruption of adenosine triphosphate (ATP) production due to cyanide-cytochrome c oxidase binding.

Slide 6-85

BLOOD CYANIDE LEVELS AND EFFECTS

Range (mg/L)	Effect
<0.25	Normal
0.25<CN<2	Potentially Toxic (Incapacitating)
>2-3	Potentially Lethal

- Above 180 parts per million (ppm), unconsciousness occurring within a few minutes.
- Above 300 ppm, death occurring rapidly.

Slide 6-86

OTHER NOXIOUS GASES

- Residual ILs (toxic and potentially flammable/explosive).
 - Flammability ranges with lower flammable limit (LFL) and upper flammable limit (UFL):
 - Ammonia 15-25 percent.
 - Alcohols 1-36 percent.
 - Aromatics (gasoline) 1-7 percent.
 - Acetylene 2-85 percent.

Slide 6-87

B. Other noxious gases.

1. Residual ILs (toxic and potentially flammable/explosive).

Flammability ranges with lower flammable limit (LFL) and upper flammable limit (UFL):

- Ammonia 15-25 percent.
- Alcohols 1-36 percent.
- Aromatics (gasoline) 1-7 percent.
- Acetylene 2-85 percent.

OTHER NOXIOUS GASES (cont'd)

- Carbon monoxide 12-74 percent.
- Hydrogen sulfide 4-44 percent. (Exposures above 500 ppm cause immediate loss of consciousness and death.)
- Hydrogen cyanide 5.6-40 percent.

Slide 6-88

- e. Carbon monoxide 12-74 percent.
- f. Hydrogen sulfide 4-44 percent. (Exposures above 500 parts per million (ppm) cause immediate loss of consciousness and death.)
- g. Hydrogen cyanide 5.6-40 percent.

OTHER NOXIOUS GASES (cont'd)

- Chemicals inherent to the scene, including pesticides and herbicides.

Slide 6-89

- 2. Chemicals inherent to the scene, including pesticides and herbicides.

OTHER NOXIOUS GASES (cont'd)

- Decomposition products from materials at the scene (carbon monoxide, hydrogen sulfide, hydrogen cyanide, hydrogen chloride, aldehydes, phosgene, acrolein, acrylonitrile, arsenic, benzopyrene, chromium, other organic compounds, etc.).

Slide 6-90

3. Decomposition products from materials at the scene (carbon monoxide, hydrogen sulfide, hydrogen cyanide, hydrogen chloride, aldehydes, phosgene, acrolein, acrylonitrile, arsenic, benzopyrene, chromium, other organic compounds, etc.).

CHARACTERIZING A FUEL

- Temperature, heat flux, combustion gases.



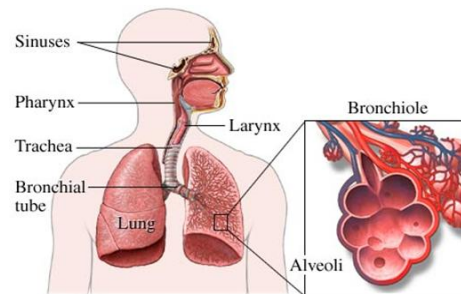
Slide 6-91

4. Characterizing a fuel:

Temperature, heat flux, combustion gases.

DATA COLLECTOR

- Collecting products of combustion.
- Capturing temperature data on skin.



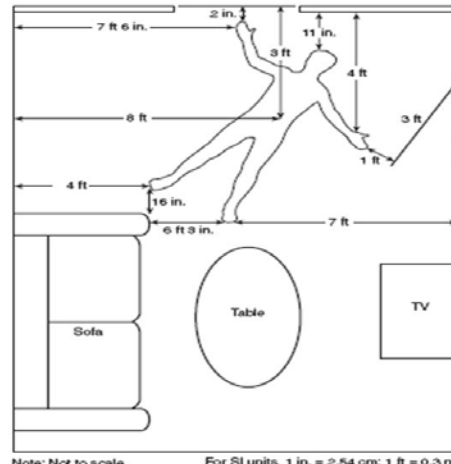
Slide 6-92

5. Data collector:
 - a. Collecting products of combustion.
 - b. Capturing temperature data on skin.

XVIII. DOCUMENTATION OF THE VICTIM

DOCUMENTATION OF THE VICTIM

- Photographic and diagrammatic.
 - Location of body: on bed, next to doorway or window.
 - Position of the body: supine or prone.



Note: Not to scale. For SI units, 1 in. = 2.54 cm; 1 ft = 0.3 m.

FIGURE 23.2.2.2 Diagram Showing Location of Body in Relationship to Room and Furnishings.

Slide 6-93

Photographic and diagrammatic.

- A. Location of body: on bed, next to doorway or window.
- B. Position of the body: supine or prone.

DOCUMENTATION OF THE VICTIM (cont'd)

- Items found with or near the body.
 - Drug paraphernalia.
 - Cigarettes.
 - Alcohol.
 - Extinguisher.

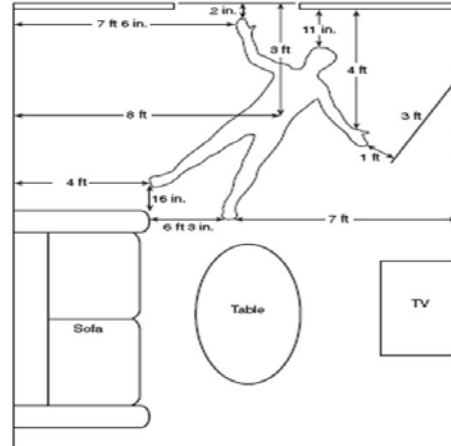


FIGURE 23.2.2.2 Diagram Showing Location of Body in Relationship to Room and Furnishings.

Slide 6-94

C. Items found with or near the body.

1. Drug paraphernalia.
2. Cigarettes.
3. Alcohol.
4. Extinguisher.

DOCUMENTATION OF THE VICTIM (cont'd)

- Debris on or underneath the body.
 - Items preserved or burned underneath the body.
 - Victim passed out before drop down or other indicators of fire progression.



FIGURE 15.2.6.9 Protected Area Where Body Was Located.
Slide 6-95

D. Debris on or underneath the body.

1. Items preserved or burned underneath the body.
2. Victim passed out before drop down or other indicators of fire progression.

DOCUMENTATION OF THE VICTIM (cont'd)

- Clothing on the body.
 - Manufacturer and material type.
 - Areas of preservation.
- Burn patterns on the clothing and body.



FIGURE 15.2.6.9 Protected Area Where Body Was Located.
Slide 6-96

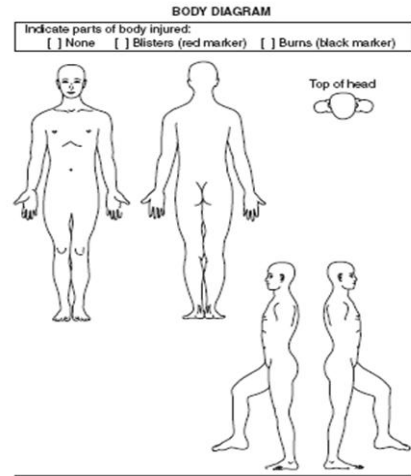
E. Clothing on the body.

1. Manufacturer and material type.
2. Areas of preservation.

F. Burn patterns on the clothing and body.

DOCUMENTATION OF THE VICTIM (cont'd)

- Documentation of the victim does not stop at the scene.



Slide 6-97

G. Documentation of the victim does not stop at the scene.

DOCUMENTATION OF THE VICTIM (cont'd)

- Attend the autopsy.
 - Toxicology.
 - Airway and skin damage.
 - Presence or absence of soot.
- Remember that the pathologist is not a fire expert.



Slide 6-98

- H. Attend the autopsy.
 - 1. Toxicology.
 - 2. Airway and skin damage.
 - 3. Presence or absence of soot.
- I. Remember that the pathologist is not a fire expert.

XIX. BURN INJURIES

BURN INJURIES

- First degree: reddening of skin.
- Second degree: blistering.
- Third degree: full-thickness.



Slide 6-99

- A. Degrees.
 - 1. First degree: reddening of skin.
 - 2. Second degree: blistering.

3. Third degree: full-thickness.

BURN INJURIES (cont'd)

- Fourth degree: charring and underlying tissue damage.

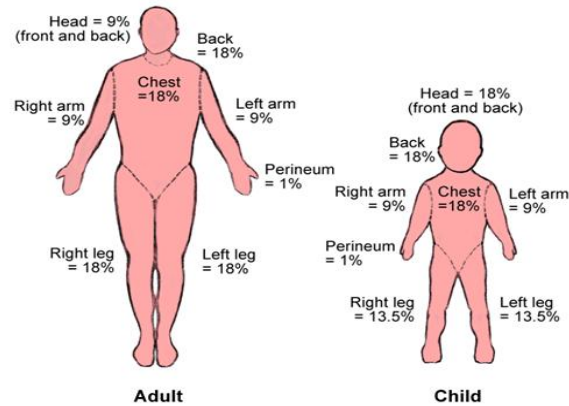


Slide 6-100

4. Fourth degree: charring and underlying tissue damage.

ESTIMATING BURN INJURIES

- Rule of nines.



Slide 6-101

B. Estimating burn injuries.

1. The rule of nines assesses the percentage of body that is burned and is used to help create a treatment plan that may include fluid resuscitation. It can assist in determining the guidelines for transferring a person to the burn unit.

ESTIMATING BURN INJURIES (cont'd)

- Rule of palms — victim's palm is equal to 1 percent of the surface area of the body.



Slide 6-102

2. The rule of palms — the victim's palm is representative of 1 percent of the surface area of the body.

XX. THE AUTOPSY REPORT: UNDERSTANDING KEY TOXICANTS, THERMAL INJURIES AND THEIR SIGNIFICANCE

THE AUTOPSY REPORT

- Toxicants found in the blood of victims can provide data points related to:
 - Types of materials that were burning at the time the victim(s) died.

Slide 6-103

- A. Toxicants found in the blood of victims can provide data points related to:
 1. Types of materials that were burning at the time the victim(s) died.

THE AUTOPSY REPORT (cont'd)

- Location of victim(s) with respect to the origin of the fire.
- Stage of fire at the time the victim(s) died.
- Effect of alcohol and illicit and prescription drugs on ability of victim(s) to escape from the fire.

Slide 6-104

2. Location of victim(s) with respect to the origin of the fire.
3. Stage of fire at the time the victim(s) died.
4. Effect of alcohol and illicit and prescription drugs on ability of victim(s) to escape from the fire.

INTERPRETATIVE CONSIDERATIONS

- The investigator must consider the dynamics of the fire when evaluating the toxicological data.
 - Did the room go to flashover, and if so, when?
 - Was the fire underventilated or smoldering?

Slide 6-105

B. Interpretative considerations.

1. The investigator must consider the dynamics of the fire when evaluating the toxicological data.
 - a. Did the room go to flashover, and if so, when?
 - b. Was the fire underventilated or smoldering?

INTERPRETATIVE CONSIDERATIONS (cont'd)

- Accuracy of toxicological analysis.
 - Method used for testing.
 - Condition of the sample.
 - Validation techniques.
- Additive effects of toxicants and other drugs such as alcohol.

Slide 6-106

2. Accuracy of toxicological analysis.
 - a. Method used for testing.
 - b. Condition of the sample.
 - c. Validation techniques.
3. Additive effects of toxicants and other drugs such as alcohol.

INTERPRETATIVE CONSIDERATIONS (cont'd)

- Smoker (4-8 percent baseline) or nonsmoker (6-2 percent baseline).
- Movement or actions of individual during fire development.
- Individual infant, child and adult respiratory differences.
- Carbon monoxide is stable post-mortem.

Slide 6-107

4. Smoker (4-8 percent baseline) or nonsmoker (6-2 percent baseline).
5. Movement or actions of individual during fire development.
6. Individual infant, child and adult respiratory differences.
7. Carbon monoxide is stable post-mortem.

INTERPRETATIVE CONSIDERATIONS (cont'd)

- Cyanide has been shown to decrease/increase over time in vivo and in vitro.
 - Increases due to bacteria, breakdown of sugars, vitamin B12 (cyanocobalamin).
 - Decreases due to release from sample.
 - The original value of cyanide at the time of death is not always the same as the value at the time the blood is analyzed.

Slide 6-108

8. Cyanide has been shown to decrease/increase over time in vivo and in vitro.
 - a. Increases due to bacteria, breakdown of sugars, vitamin B12 (cyanocobalamin).
 - b. Decreases due to release from sample.
 - c. The original value of cyanide at the time of death is not always the same as the value at the time the blood is analyzed.

UNKNOWN CHEMICAL EXAMINATIONS

- The factors that will determine the likelihood of survivability are:
 - The nature of the chemical — organic or inorganic.



Slide 6-109

C. Unknown chemical examinations.

The factors that will determine the likelihood of survivability are:

1. The nature of the chemical — organic or inorganic.

UNKNOWN CHEMICAL EXAMINATIONS (cont'd)

- The phase of the chemical — solid, liquid or gas.
- The degree of heat to which the chemical is exposed.



Slide 6-110

2. The phase of the chemical — solid, liquid or gas.
3. The degree of heat to which the chemical is exposed.

XXI. SUMMARY



SUMMARY



- Anthropological examinations.
- Bones and teeth.
- DNA examinations.
- Identifying DNA evidence.
- Where is DNA in the human body?
- DNA at the crime scene.
- DNA examinations contamination.
- DNA transportation and storage.

Slide 6-111



SUMMARY (cont'd)



- Elimination samples.
- Combined DNA index system.
- DNA considerations.
- Blood and biological evidence.
- Animal, insect and plant contributions.
- Toxicology.
- Death investigation in the United States.
- Key fire toxicant: carbon monoxide.

Slide 6-112



SUMMARY (cont'd)



- Key lethal toxicant: cyanide.
- Documentation of the victim.
- Burn injuries.
- The autopsy report: understanding key toxicants, thermal injuries and their significance.

Slide 6-113

UNIT 7: SAMPLE PRESENTATION OF DOWNRANGE EXERCISE

TERMINAL OBJECTIVE

The students will be able to:

- 7.1 *Assess fire scenes; present findings; justify conclusions; and distinguish between critical items of evidence, the types of testing each would be subjected to, and the analysis results each would produce.*

ENABLING OBJECTIVES

The students will be able to:

- 7.1 *Present documentary evidence in a visual format using PowerPoint, overhead projector or large sketch diagrams.*
- 7.2 *Justify the relevance of all evidence identified.*
- 7.3 *Qualify the relevance of the evidence identified and collected.*
-

This page intentionally left blank.



UNIT 7: SAMPLE PRESENTATION OF DOWNRANGE EXERCISE

Slide 7-1

ENABLING OBJECTIVES

- Present documentary evidence in a visual format using PowerPoint, overhead projector or large sketch diagrams.
- Justify the relevance of all evidence identified.
- Qualify the relevance of the evidence identified and collected.

Slide 7-2

I. SAMPLE TITLE PAGE

SAMPLE TITLE PAGE

R214: Forensic Evidence Collection,
Practical Exercise

Scenario 3
Case No: 12-003

Slide 7-3

II. EVIDENCE COLLECTION TEAM

EVIDENCE COLLECTION TEAM
• Dave Dunaj. • Tom Fucci. • Charles Green. • S. R. Hunter.
Slide 7-4

- A. Dave Dunaj.
- B. Tom Fucci.
- C. Charles Green.
- D. S. R. Hunter.

III. CASE SUMMARY

CASE SUMMARY
• Date: Aug. 1, 2012. • Location: 18526 Toms Creek Road, Emmitsburg, MD. • Time: 0330 hours. • Owner: Mr. Ed Grimm.
Slide 7-5

- A. General information.
 - 1. Date: Aug. 1, 2012.
 - 2. Location: 18526 Toms Creek Road, Emmitsburg, MD.

3. Time: 0330 hours.
4. Owner: Mr. Ed Grimm.

CASE SUMMARY (cont'd)

- A witness sees smoke coming from the rear of the residence and calls 911.
- The same witness also reports seeing a man running from the building.
- The fire department is dispatched at 0331 hours.

Slide 7-6

5. A witness sees smoke coming from the rear of the residence and calls 911.
6. The same witness also reports seeing a man running from the building.
7. The fire department is dispatched at 0331 hours.

CASE SUMMARY (cont'd)

- The fire department arrives on scene at 0336 hours.
- The fire is declared controlled at 0356 hours, and a fire investigator is requested.
- The evidence collection team arrives at 1400 hours.

Slide 7-7

8. The fire department arrives on scene at 0336 hours.
9. The fire is declared controlled at 0356 hours, and a fire investigator is requested.
10. The evidence collection team arrives at 1400 hours.

SCENE OVERVIEW

- Fire damage is evident to the exterior of the structure.
- Window at front of structure is broken.
- Portable heater is present on ground below window.



Slide 7-8

B. Scene overview.

1. Fire damage is evident to the exterior of the structure.
2. Window at front of structure is broken.
3. Portable heater is present on ground below window.

SCENE INTERIOR

Lower northwest wall



Lower northeast wall



Slide 7-9

4. Notice:
 - a. Lower northwest wall.
 - b. Lower northeast wall.

SCENE INTERIOR (cont'd)

Lower southeast wall



Lower southwest wall



Slide 7-10

c. Lower southeast wall.

d. Lower southwest wall.

SCENE INTERIOR (cont'd)

Upper northwest wall



Upper north wall



Slide 7-11

e. Upper northwest wall.

f. Upper north wall.

SCENE INTERIOR (cont'd)

Upper southeast wall



Broken window on south wall



Slide 7-12

- g. Upper southeast wall.
- h. Broken window on south wall.

SCENE INTERIOR (cont'd)

Upper southwest wall



Slide 7-13

- i. Upper southwest wall.

IV. EVIDENCE, LOCATION AND DOCUMENTATION

EVIDENCE, LOCATION AND DOCUMENTATION

- Evidence 1.
 - Shoe impression found on the ground in front of the residence, adjacent to the dumpster.



Slide 7-14

A. Evidence 1.

1. Shoe impression found on the ground in front of the residence, adjacent to the dumpster.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Impression was photographed, and a casting was made for comparison analysis and identification.



Slide 7-15

2. Impression was photographed, and a casting was made for comparison analysis and identification.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 2.
 - Suspected blood drops found on concrete sidewalk in front of the residence.
 - A sample was collected for serology and DNA analysis.



Slide 7-16

B. Evidence 2.

1. Suspected blood drops found on concrete sidewalk in front of the residence.
2. A sample was collected for serology and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 3.
 - Portable electric heater found outside of residence, under window.



Slide 7-17

C. Evidence 3.

1. Portable electric heater found outside of residence, under window.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Suspected blood and a broken glass fragment present.
- Unit was packaged for latent print, serology and DNA analysis.



Slide 7-18

2. Suspected blood and a broken glass fragment present.
3. Unit was packaged for latent print, serology and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 4 and 10.
 - Broken window with suspected blood present (4) and latent fingerprints (10) found.



Slide 7-19

D. Evidence 4 and 10.

1. Broken window with suspected blood present (4) and latent fingerprints (10) found.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Fingerprints were lifted for comparison analysis, and blood was collected for serology and DNA analysis.



Slide 7-20

2. Fingerprints were lifted for comparison analysis, and blood was collected for serology and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 5.
 - Burnt article of clothing found inside residence, hanging on a piece of drywall.
 - Clothing should be packaged in paper bag and submitted for serology and DNA analysis.



Slide 7-21

E. Evidence 5.

1. Burnt article of clothing found inside residence, hanging on a piece of drywall.
2. Clothing should be packaged in a paper bag and submitted for serology and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 6.
 - Burnt strip of clothing found inside residence, hanging on couch.



Slide 7-22

F. Evidence 6.

1. Burnt strip of clothing found inside residence, hanging on couch.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Clothing should be packaged in steel can and submitted for testing for presence of ignitable liquids (ILs).



Slide 7-23

2. Clothing should be packaged in a steel can and submitted for testing for presence of ignitable liquids (ILs).

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 7.
 - Fragments of a glass beer bottle found inside residence, on floor behind couch.



Slide 7-24

G. Evidence 7.

1. Fragments of a glass beer bottle found inside residence, on floor behind couch.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Glass fragments should be packaged in a steel can and submitted for testing for presence of ILs, latent print and DNA analysis.



Slide 7-25

2. Glass fragments should be packaged in a steel can and submitted for testing for presence of ILs, latent print and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 8.
 - Burnt pieces of paper found inside residence, on floor in center of room.



Slide 7-26

H. Evidence 8.

1. Burnt pieces of paper found inside residence, on floor in center of room.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Paper should be packaged in steel can and submitted for testing for presence of ILs, latent print and DNA analysis.



Slide 7-27

2. Paper should be packaged in a steel can and submitted for testing for presence of ILs, latent print and DNA analysis.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Evidence 9.
 - Burnt remnants of a plastic container found inside residence, on the seat of the burnt chair.



Slide 7-28

I. Evidence 9.

1. Burnt remnants of a plastic container found inside residence, on the seat of the burnt chair.

EVIDENCE, LOCATION AND DOCUMENTATION (cont'd)

- Container remnants should be packaged in a steel can and submitted for testing for presence of ILs, latent prints and DNA analysis.



Slide 7-29

2. Container remnants should be packaged in a steel can and submitted for testing for presence of ILs, latent prints and DNA analysis.

V. EVIDENCE PACKAGING

EVIDENCE PACKAGING

- Shoe impression casting.
- This was the first item of evidence processed due to the time involved to dry the casting material.



Slide 7-30

A. General.

1. Shoe impression casting.
2. This was the first item of evidence processed due to the time involved to dry the casting material.

EVIDENCE PACKAGING (cont'd)

- Burnt article of clothing with possible bloodstains.
- In-process, being packaged in a large paper bag to preserve DNA that may be present.



Slide 7-31

3. Burnt article of clothing with possible bloodstains. In-process, being packaged in a large paper bag to preserve DNA that may be present.

LABORATORY SUBMISSIONS

- Ten items of evidence were submitted to the lab.
- Notable items included:
 - Latent fingerprints.
 - Blood evidence.
 - A burnt article of clothing.
 - Parts of a suspected incendiary device.

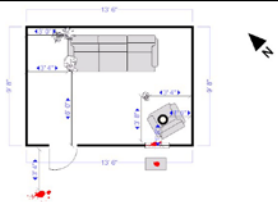


Slide 7-32

B. Laboratory submissions.

1. Ten items of evidence were submitted to the lab.
2. Notable items included:
 - a. Latent fingerprints.
 - b. Blood evidence.
 - c. A burnt article of clothing.
 - d. Parts of a suspected incendiary device.

CRIME SCENE SKETCH



Show Imprint Located
Approx. 350' from Front
of entrance, and 4' from
East Side Property Line.

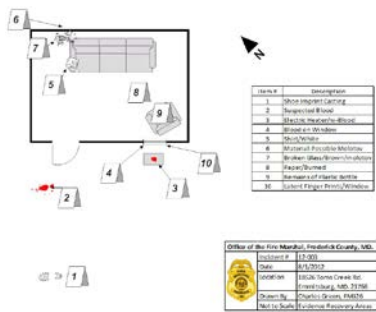
Office of the State Attorney, Loudoun County, VA	
Incident #	12-000
Date	8/11/2012
Location	18025 Nokes Creek Rd.
Investigator	James J. Hays
Drawn By	Charles Brown, P.0000
Red to Scale	1:100

Slide 7-33

C. Crime scene sketch:

Be sure to include critical elements on your sketch, such as direction, scale, locations of evidence, address, investigation, etc.

CRIME SCENE SKETCH (cont'd)



Slide 7-34

This page intentionally left blank.

ACTIVITY 7.1

Burn Cell Scenes

Purpose

Coordinate with other team members to assess evidence present at a fire scene.

Directions to Students

1. Work in your table group.
2. Use the scenario provided by the instructor to complete the activity.
3. Locate at least six items of evidence within the scene.
4. Determine how to preserve the evidence.
5. Properly document evidence.
6. Properly package/label three items.
7. Prepare a crime scene sketch.
8. Take two evidence collection kits per table down to the burn range.
9. Complete a laboratory submission request for all items found.
10. Be prepared to give a 15- to 20-minute presentation on the last day of class. Note: Questions from the class will be encouraged, so be prepared to provide justifications.

This page intentionally left blank.

VI. SUMMARY



SUMMARY

- Sample title page.
- Evidence collection team.
- Case summary.
- Evidence, location and documentation.
- Evidence packaging.

Slide 7-36

This page intentionally left blank.

APPENDIX A

SCENARIOS 1-4

This page intentionally left blank.

CONTENTS

The appendix contains the following materials:

- Fire Investigation: Forensic Evidence Practical Exercise — Scenarios 1-4.
- Photo Log.
- Evidence Transmittal Form

This page intentionally left blank.

FIRE INVESTIGATION: FORENSIC EVIDENCE PRACTICAL EXERCISE

Scenario 1

Date: Sept. 20, 2014

Location: 16825 Seton Ave.

At approximately 0430 hours, Mr. David Petty was on vacation and fishing in Toms Creek in Emmitsburg, Maryland. While there, he hears and notices a vehicle off in the distance backing into a space near where his car is parked. Mr. Petty sees a man exit the vehicle and walk toward the bungalows located a short distance away.

Mr. Petty wades back across the creek and loses sight of the vehicle and the subject. A short time later (five-10 minutes), he sees what he believes to be the same person “hurrying” across the parking lot carrying something on fire or lighted. He said the subject threw the item in the direction of the creek bank.

Mr. Petty again loses sight of the individual but hears a car start, followed by what appears to be a car door being slammed. He then sees the same subject run across the parking lot and leave the area. Mr. Petty continues to wade across the creek and, upon reaching the bank, sees a glow from one of the bungalow windows. He immediately calls 911 to report a fire. The fire department is dispatched and arrives at the scene four minutes later to report a working fire.

Extinguishment takes 15 minutes. An investigator is requested. She responds and determines that the fire was intentionally set. The scene is secured, and a team of evidence techs is called to process any evidence.

Note: Mr. Petty left the scene because he was in a hurry to return home. He is unable to be interviewed, as is the investigator, who had to respond to another fire on the other side of the county. Only fire department personnel remain, who provided the case number left by the investigator — Case No. 14-001.

Scenario 2

Date: Sept. 20, 2014

Location: 15286 North Seton Ave.

At approximately 0245 hours, units from the Emmitsburg Fire Department were dispatched at the report of a building fire at the Harkins residence located at 15826 N. Seton Ave. Engine 6 arrived on scene about five minutes later and reported heavy smoke coming from the structure. The fire was tapped out at 0315 hours.

An investigator is summoned to the scene and determined that the fire was intentionally set. A preliminary investigator reveals that the fire was reported to the 911 call center by a neighbor, Laura Joy, at 0244 hours. She stated that she awoke to the sound of what she thought was breaking glass. She arose to investigate and observed fire coming from the front of the house. The investigator learned that Ms. Harkins' home was monitored by Brinks Security, which received an intrusion alarm on the front window and a motion alarm in the family room at the residence at 0240 hours. Police units were dispatched and arrived just minutes before fire personnel.

The investigator secured the scene and requests crime scene investigator (CSI) techs to process it for evidence.

Note: Ms. Harkins, the homeowner, is out of town at a funeral. She is unable to be interviewed. The investigator had to leave because his wife is in the hospital having their first child. Police units just left in response to a hostage situation. Only fire department personnel remain, who provided the case number left by the investigator — Case No. 14-002.

Scenario 3

Date: Sept. 20, 2014

Location: 18526 Toms Creek Road

At approximately 0330 hours, Mr. Barry Davis was walking his dog when he noticed smoke coming from the rear of a house located at 18526 Toms Creek Rd. Mr. Davis calls 911 on his cellphone to report a possible fire at the location. Mr. Davis also tells the 911 operator that he saw someone running from behind the house and jumping the next-door neighbor's fence.

Units from the Emmitsburg Fire Department are dispatched at 0331 hours and arrive on scene at 0336 hours. Flames are blowing from all the windows, but the fire is brought under control in about 20 minutes. Afterward, a fire investigator is requested and dispatched to the scene.

The investigator's exam reveals that the most significant damage was to the front room. Upon further investigation, he is unable to identify the specific cause. As such, the fire is ruled undetermined.

The scene was secured and a team of evidence techs has been called in to help process the scene for any evidence.

Note: The homeowner, Mr. Ed Grimm, is on vacation in the Virgin Islands and unable to be interviewed. The investigator suffered chest pains and had to be transported to the hospital via Emergency Medical Services (EMS). A fire department booster truck firefighter remained and provided a case number left by the investigator — Case No. 14-003.

Scenario 4

Date: Sept. 20, 2014

Location: 12886 Watkins Mill

At approximately 0140 hours, Mr. Joel Billon arrived home after a night of binge drinking. At approximately 0410 hours, Mr. Billon got up to use the bathroom when he noticed a lot of smoke in the hallway and heard the sound of his smoke detector sounding. He immediately called 911 and reported that his house was on fire. He grabbed his bathrobe and ran out the front door to await the arrival of the fire department.

Units from the Emmitsburg Fire Department are dispatched around 0411 hours and arrive four minutes later to observe heavy fire showing from side A of the structure.

The fire is brought under control in about 20 minutes. The fire investigator, who was dispatched to the scene, determines that the fire was intentionally set. The most significant damage appears to be in the front room.

Further examination cannot rule out the possibility that the fire was incendiary. The scene has been secured and a team of crime scene investigators was dispatched to process any evidence.

Note: Mr. Billon passed out at the scene from severe alcohol poisoning and required transport to the hospital via ambulance. Before passing out, he became involved in a violent physical altercation with the investigator resulting in the investigator being knocked out. The investigator was also transported to the hospital via ambulance. Fire department personnel who remained provided the case number left by the investigator as noted on his clipboard, dropped during the fight — Case No. 14-004.

APPENDIX B

PHOTO LOG

This page intentionally left blank.

Photo Log

Case Number: _____

Address: _____

Date: _____

Equipment: _____

Photographer: _____

[illegible]

APPENDIX C

EVIDENCE TRANSMITTAL FORM

This page intentionally left blank.



BURN CELL NO. _____
EVIDENCE TRANSMITTAL FORM

Investigator Name _____ Copy of report to: _____
 Agency Address _____

 Phone: (____) _____ Phone: (____) _____

* Subject: _____ Case/Incident No. _____
 * Suspect _____ Date of Fire _____
 * Address _____ Date Evidence Taken _____
 Date Submitted _____

Evidence Taken by: _____
 Evidence Transported by: _____
 Evidence Received by: _____

	<u>List of Exhibits</u>	<u>Location Taken From</u>
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10		

Laboratory Examination Requested	Exhibit	Examination(s)
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

This page intentionally left blank.

UNIT 8: EVIDENCE AND THE ISSUES AFFECTING IT IN THE SCENE

TERMINAL OBJECTIVE

The students will be able to:

- 8.1 *Identify the effects of fire and associated suppression activities on forensic evidence that may be present at the fire scene.*

ENABLING OBJECTIVES

The students will be able to:

- 8.1 *Describe the effect of temperature on various types of forensic evidence.*
- 8.2 *Describe the effects of fire suppression and scene overhaul on various types of forensic evidence.*
-

This page intentionally left blank.



UNIT 8: EVIDENCE AND THE ISSUES AFFECTING IT IN THE SCENE

Slide 8-1

ENABLING OBJECTIVES

- Describe the effect of temperature on various types of forensic evidence.
- Describe the effects of fire suppression and scene overhaul on various types of forensic evidence.

Slide 8-2

I. COMMON TYPES OF FORENSIC EVIDENCE

COMMON TYPES OF FORENSIC EVIDENCE

- Limitations:
 - We have already identified what evidence is, and while there are many potential types of evidence that can be found in different crime scenes, the nature of fire precludes some types of evidence while others, specifically ignitable liquids (ILs), may be more common in fire scenes.

Slide 8-3

Limitations.

- A. We have already identified what evidence is, and while there are many potential types of evidence that can be found in different crime scenes, the nature of fire precludes some types of evidence while others, specifically ignitable liquids (ILs), may be more common in fire scenes.

**COMMON TYPES OF
FORENSIC EVIDENCE (cont'd)**

- In this unit, discussions will be limited to certain broad types of evidence.
- Be aware that not all laboratories will accept all types of evidence or have the personnel or equipment/instrumentation to perform all of the tests that may be requested and/or necessary.

Slide 8-4

- B. In this unit, discussions will be limited to certain broad types of evidence.
- C. Be aware that not all laboratories will accept all types of evidence or have the personnel or equipment/instrumentation to perform all of the tests that may be requested and/or necessary.

**COMMON TYPES OF
FORENSIC EVIDENCE (cont'd)**

- Laboratories may have to work cooperatively within a jurisdiction in order to offer a wider range of forensic tests.

Slide 8-5

- D. Laboratories may have to work cooperatively within a jurisdiction in order to offer a wider range of forensic tests.

II. THE EFFECT OF TEMPERATURE

PROGRESSION WITHIN A FIRE SCENE

- Think of a scene as consisting of multiple layers or zones that are stacked from the floor to the ceiling.



Slide 8-6

A. Progression within a fire scene.

1. Think of a scene as consisting of multiple layers or zones that are stacked from the floor to the ceiling.

PROGRESSION WITHIN A FIRE SCENE (cont'd)

- Initially, the layers in the lowest area of the compartment may be at or below the origin of the fire and would therefore be cooler than the layers above.



Slide 8-7

2. Initially, the layers in the lowest area of the compartment may be at or below the origin of the fire and would therefore be cooler than the layers above.

PROGRESSION WITHIN A FIRE SCENE (cont'd)

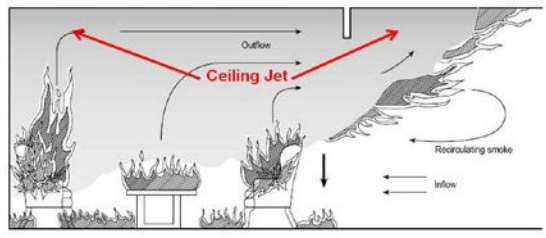
- The longer a fire is allowed to burn before suppression, the higher the temperatures will rise in the lower layers of the compartment.
- All areas can approach similar temperature levels given sufficient time and fuel load (especially at flashover).

Slide 8-8

3. The longer a fire is allowed to burn before suppression, the higher the temperatures will rise in the lower layers of the compartment.
4. All areas can approach similar temperature levels given sufficient time and fuel load (especially at flashover).

PROGRESSION WITHIN A FIRE SCENE (cont'd)

FIGURE 3.5.3.2(d) Flashover conditions in compartment fire.

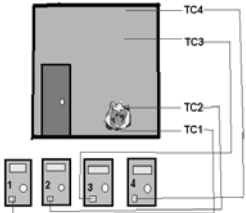


The ceiling jet is a layer of superheated gases that generate radiant energy that causes all available fuel packages in the compartment to reach their ignition temperature; this is one of the primary driving forces behind the phenomenon of flashover.

Slide 8-9

FIRE EXPERIMENT

- Four digital thermometers.
- Four thermocouples.
 - 1 — on or under the flooring where the IL is to be poured.
 - 2 — in the seat of the furniture or 24 inches above the floor.
 - 3 — at head height (about 5 feet 10 inches).
 - 4 — just below the ceiling (about 2 inches from it).



Slide 8-10

B. Fire experiment.

1. Four digital thermometers.
2. Four thermocouples.
 - a. 1 — on or under the flooring where the IL is to be poured.
 - b. 2 — in the seat of the furniture or 24 inches above the floor.
 - c. 3 — at head height (about 5 feet 10 inches).
 - d. 4 — just below the ceiling (about 2 inches from it).

DVD PRESENTATION

“BURN 02”



Slide 8-11

GASOLINE ACCELERANT

Time (minute) versus temperature (F).

TIME	TC1	TC2	TC3	TC4
0:00	74	73	81	85
0:30	74	177	237	251
1:00	75	311	525	440
1:30	81	531	830	617
2:00	197	714	1,814	1,616

Slide 8-12

3. Time versus temperature.

NOT ALL IGNITABLE LIQUIDS BEHAVE THE SAME WAY

- For example, take the use of commercial turpentine as an accelerant.
- Note the time delay in the progression of the fire relative to what we saw earlier with gasoline.

Slide 8-13

C. Not all ILs behave the same way.

1. For example, take the use of commercial turpentine as an accelerant.
2. A video showing turpentine used as an accelerant will be shown so as to compare with what we saw earlier with gasoline. The thermocouples and digital thermometers are placed in the same locations as the gasoline fire. Note the time delay in the progression of the fire relative to what we saw earlier with gasoline.

DVD PRESENTATION

“BURN 03”



Slide 8-14

POTENTIAL EVIDENCE



Slide 8-15

D. Potential evidence.

What are the potential items of evidence in the scene pictured on Slide 8-15 that could have ILs?

III. THE EFFECTS OF FIREFIGHTING TECHNIQUES

SUPPRESSION AND OVERHAUL

- During overhaul activities, firefighters may need to pass through the scene after the fire is initially extinguished and move items or tear open potential hot spots.
- Evidence can be compromised or lost through these actions.



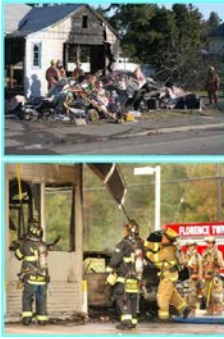
Slide 8-16

A. Suppression and overhaul.

1. During overhaul activities, firefighters may need to pass through the scene after the fire is initially extinguished and move items or tear open potential hot spots.
2. Evidence can be compromised or lost through these actions.

SUPPRESSION AND OVERHAUL (cont'd)

- Massive volumes of water can wash, displace and destroy evidence.
- Firefighters may move, step on or cross-contaminate evidence.



Slide 8-17

3. Massive volumes of water can wash, displace and destroy evidence.
4. Firefighters may move, step on or cross-contaminate evidence.

FOAM

- The use of foam on surfaces may wash, chemically affect or displace evidence.
- Some types of foams contain ignitable components that can be misinterpreted as an IL (e.g., 2-butoxyethoxy ethanol).



Slide 8-18

B. Foam.

1. The use of foam on surfaces may wash, chemically affect or displace evidence.
2. Some types of foams contain ignitable components that can be misinterpreted as an IL (e.g., 2-butoxyethoxy ethanol).

FOAM (cont'd)

- A high concentration of the foam may mask residue from an IL.
- Always submit a comparison sample of a firefighting foam to the laboratory to determine the effects on fire debris analysis. If foam was used, inform the laboratory upon submission.

Slide 8-19

3. A high concentration of the foam may mask residue from an IL.
4. Always submit a comparison sample of a firefighting foam to the laboratory to determine the effects on fire debris analysis. If foam was used, inform the laboratory upon submission.

IV. SUMMARY



SUMMARY

- Common types of forensic evidence.
- The effect of temperature.
- The effects of firefighting techniques.

Slide 8-20

UNIT 9: ESSENTIAL COMPONENTS OF A FORENSIC REPORT

TERMINAL OBJECTIVE

The students will be able to:

- 9.1 *Read a forensic report, identify the key elements in the report, and isolate for clarification any points that may be identified.*

ENABLING OBJECTIVES

The students will be able to:

- 9.1 *Describe the wording of findings and describe any disclaimers that may be present in a report.*
- 9.2 *Define any items that may require clarification in a report.*
-

This page intentionally left blank.



UNIT 9: ESSENTIAL COMPONENTS OF A FORENSIC REPORT

Slide 9-1

ENABLING OBJECTIVES

- Describe the wording of findings, and describe any disclaimers that may be present in a report.
- Define any items that may require clarification in a report.

Slide 9-2

I. THE FORENSIC LABORATORY REPORT

THE FORENSIC LABORATORY REPORT

- The ultimate work product of any forensic laboratory takes place when it is called to provide expert testimony.
- Before that occurs, however, the laboratory will issue a report of its findings.

Slide 9-3

A. General.

1. The ultimate work product of any forensic laboratory takes place when it is called to provide expert testimony.
2. Before that occurs, however, the laboratory will issue a report of its findings.

THE FORENSIC LABORATORY
REPORT (cont'd)

- Care must be used in the construction of this report, as it must be succinct without being overly simple.

Slide 9-4

3. Care must be used in the construction of this report, as it must be succinct without being overly simple.

THE FORENSIC LABORATORY
REPORT (cont'd)

- Some investigators have complained that reading a report from the laboratory is like reading a foreign language.
- There are limitations on what the scientist can say in the report because whatever is written must be fully defensible to a reasonable degree of scientific certainty.

Slide 9-5

4. Some investigators have complained that reading a report from the laboratory is like reading a foreign language.
5. There are limitations on what the scientist can say in the report because whatever is written must be fully defensible to a reasonable degree of scientific certainty.

THE FORENSIC LABORATORY REPORT (cont'd)

- The analyst should never have items in the report that are supposition.
- The analyst should strive to make the report clear and minimize jargon.

Slide 9-6

6. The analyst should never have items in the report that are supposition.
7. The analyst should strive to make the report clear and minimize jargon.

REPORTING REQUIREMENTS

- The Report Writing Guide of Technical/Scientific Working Group of Fire and Explosives (T/SWGFEX) sections within American Society for Testing and Materials (ASTM) E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry* and under Section 5.10 of International Standards Organization 17025, describe the items to be included in a report or contained in a case file.

Slide 9-7

B. Reporting requirements.

1. The Report Writing Guide of Technical/Scientific Working Group of Fire and Explosives (T/SWGFEX) sections within American Society for Testing and Materials (ASTM) E1618, *Standard Test Method for Ignitable Liquid Residues in Extracts from Fire Debris Samples by Gas Chromatography-Mass Spectrometry* and under Section 5.10 of International Standards Organization 17025, describe the items to be included in a report or contained in a case file.

REPORTING REQUIREMENTS (cont'd)

- The Report Writing Guide divides the contents of the report into what must be included, what should be included, and what may be included.

Slide 9-8

2. The Report Writing Guide divides the contents of the report into what must be included, what should be included, and what may be included.

REPORTING REQUIREMENTS (cont'd)

- Items that must be included:
 - Unique, identifying, laboratory number.
 - Identification of the laboratory issuing the report.
 - Report date.

Slide 9-9

3. Items that must be included:
- a. Unique, identifying, laboratory number.
 - b. Identification of the laboratory issuing the report.
 - c. Report date.

REPORTING REQUIREMENTS (cont'd)

- Identification of requesting/submitting agency or person.
- Name and signature of the author(s).
- Description of the evidence.

Slide 9-10

- d. Identification of requesting/submitting agency or person.
- e. Name and signature of the author(s).
- f. Description of the evidence.

REPORTING REQUIREMENTS PER AMERICAN SOCIETY FOR TESTING AND MATERIALS E1618

- “12.1.1 The description of the evidence would seem to be merely a clerical matter, but it is important that the analyst be sure that the evidence is described accurately, not simply as it was identified by the submitting agent. Fire debris samples, especially, tend to appear similar from the outside.”

Slide 9-11

C. Reporting requirements per ASTM E1618.

1. “12.1.1 The description of the evidence would seem to be merely a clerical matter, but it is important that the analyst be sure that the evidence is described accurately, not simply as it was identified by the submitting agent. Fire debris samples, especially, tend to appear similar from the outside.”

REPORTING REQUIREMENTS PER
AMERICAN SOCIETY FOR TESTING AND
MATERIALS E1618 (cont'd)

- Accurate description is necessary.
- Don't regurgitate what is on the submission form.

Slide 9-12

2. Accurate description is necessary.
3. Don't regurgitate what is on the submission form.

REPORTING REQUIREMENTS PER
AMERICAN SOCIETY FOR TESTING AND
MATERIALS E1618 (cont'd)

- "12.1.1.1 While it may not be possible for the analyst to distinguish by visual inspection the difference between carpeting from the living room and carpeting from the hallway,..."

Slide 9-13

4. "12.1.1.1 While it may not be possible for the analyst to distinguish by visual inspection the difference between carpeting from the living room and carpeting from the hallway,..."

REPORTING REQUIREMENTS PER
AMERICAN SOCIETY FOR TESTING AND
MATERIALS E1618 (cont'd)

- ...it is possible to determine by visual inspection the difference between bedding from the master bedroom and carpeting from the hallway or concrete from the basement.”

Slide 9-14

5. “...it is possible to determine by visual inspection the difference between bedding from the master bedroom and carpeting from the hallway or concrete from the basement.”

REPORTING REQUIREMENTS PER
AMERICAN SOCIETY FOR TESTING AND
MATERIALS E1618 (cont'd)

- Analysts sometimes encounter samples where what is seen in the can does not match the description on the submission form.
 - What are possible causes of the discrepancy?
 - How should the analyst use the description provided by the submitter if there is a discrepancy?

Slide 9-15

6. Analysts sometimes encounter samples where what is seen in the evidence container does not match the description on the submission form.
- a. What are possible causes of the discrepancy?
- b. How should analysts use the description provided by the submitter if there is a discrepancy?

II. THE FINDINGS

THE FINDINGS

- The last of the must-include items in the report is the result/conclusion or findings from the laboratory.
- For positive results, these often simply state which ASTM class (or classes, in the event of a mixture) was or were found for each sample.

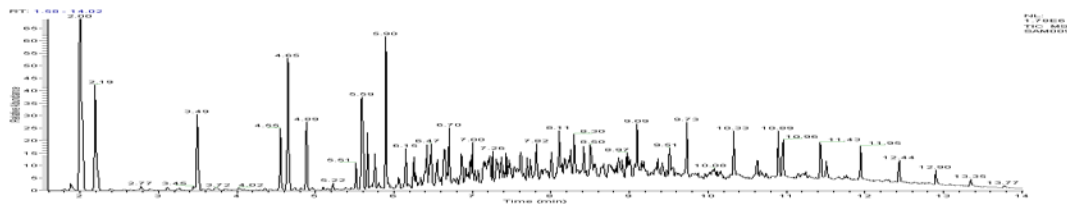
Slide 9-16

A. General.

1. The last of the must-include items in the report is the result/conclusion or findings from the laboratory.
2. For positive results, these often simply state which ASTM class (or classes, in the event of a mixture) was or were found for each sample.

POSITIVE FINDINGS (cont'd)

- Mixtures of two or more products should report all classes identified.
 - Example: A mix of gasoline and a heavy petroleum distillate (HPD) was found.
- If a disclaimer is included, the scientist will call the investigator to explain what is meant.



Slide 9-18

2. Mixtures of two or more products should report all classes identified.

Example: A mix of gasoline and a heavy petroleum distillate (HPD) was found.

3. If a disclaimer is included, the scientist will call the investigator to explain what is meant.

POSITIVE FINDINGS (cont'd)

- ASTM E1618 suggests a positive disclaimer; however, most laboratories do not include one.
- In essence, a positive disclaimer states that a positive result is only valid for the particular sample and that the analyst has no idea how or when it got there.

Slide 9-19

4. ASTM E1618 suggests a positive disclaimer; however, most laboratories do not include one.
5. In essence, a positive disclaimer states that a positive result is valid only for the particular sample and that the analyst has no idea how or when it got there.

POSITIVE FINDINGS (cont'd)

- As a result, some analysts and investigators feel that the presence of the ignitable liquid (IL) could be rendered meaningless.
- There is debate among laboratories and investigative agencies as to the value of this and whether to include it in the report.

Slide 9-20

6. As a result, some analysts and investigators feel that the presence of an ignitable liquid (IL) could be rendered meaningless.
7. There is debate among laboratories and investigative agencies as to the value of evidence of IL and whether to include it in the report.

THE AMERICAN SOCIETY FOR TESTING
AND MATERIALS E1618 POSITIVE
DISCLAIMER

- "...the identification of 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."

Slide 9-21

8. The ASTM positive disclaimer: "...the identification of 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."

POSITIVE FINDINGS (cont'd)

- An objective analyst has no knowledge of how the IL came to be on the sample or how long it was present.
- Comparison samples are essential to this effort.

Slide 9-22

9. An objective analyst has no knowledge of how the IL came to be on the sample or how long it was present.
10. Comparison samples are essential to this effort.

POSITIVE FINDINGS (cont'd)

- An objective analyst should also be sufficiently familiar with ILs present in certain materials so that their presence can be accounted for and a specific disclaimer included in the report if necessary.

Slide 9-23

11. An objective analyst should also be sufficiently familiar with ILs inherent to certain materials so that their presence can be accounted for and a specific disclaimer included in the report if necessary.

POSITIVE FINDINGS (cont'd)

- For example, if the sample were a pair of shoes for which an exemplar is unavailable, the report might state:
 - A medium petroleum distillate (MPD), which may be an artifact of the manufacturing process for shoes, was determined in the following.

Slide 9-24

12. For example, if the sample were a pair of shoes for which an exemplar is unavailable, the report might state:

A medium petroleum distillate (MPD), which may be an artifact of the manufacturing process for shoes, was determined in the following.

POSITIVE FINDINGS (cont'd)

- On occasion, the analyst or investigator must convince a supervisor of the necessity of going to a local store and buying an exemplar.

Slide 9-25

13. On occasion, the analyst or investigator must convince a supervisor of the necessity of going to a local store and buying an exemplar.

III. QUALIFIERS

THE USE OF QUALIFIERS IN REPORTS

- Some standards permit the laboratory to use such terms and qualifiers as residue, weathered or evaporated to describe an IL.
- This may not be permitted by some laboratory standard operating procedures (SOPs).

Slide 9-26

The use of qualifiers in reports.

- A. Some standards permit the laboratory to use such terms and qualifiers as residue, weathered or evaporated to describe an IL.
- B. This may not be permitted by some laboratory standard operating procedures (SOPs).

THE USE OF QUALIFIERS IN REPORTS (cont'd)

- The term fire-aged is not typically allowed as it is prejudicial, and the weathering of an IL will progress in a linear fashion whether it is caused by a fire or by simple evaporation.

Slide 9-27

- C. The term fire-aged is not typically allowed as it is prejudicial, and the weathering of an IL will progress in a linear fashion whether it is caused by a fire or by simple evaporation.

THE USE OF QUALIFIERS IN REPORTS (cont'd)

- For identifying an IL, the following phrases are considered equivalent: was present in; was detected in; was identified in; was recovered from; and was found in.

Slide 9-28

- D. For identifying an IL, the following phrases are considered equivalent: was present in; was detected in; was identified in; was recovered from; and was found in.

THE USE OF QUALIFIERS IN REPORTS (cont'd)

- The conclusion should be understandable to a lay person; however, E1618 also strongly suggests under 12.4 that:
 - “Certain words should not appear without explanation within the report. All extracts from organic materials are likely to contain hydrocarbons. The word hydrocarbon should not appear in a report unless hydrocarbons can be specifically identified and classified.”

Slide 9-29

E. The conclusion should be understandable to a lay person; however, E1618 also strongly suggests under 12.4 that:

1. “Certain words should not appear without explanation within the report. All extracts from organic materials are likely to contain hydrocarbons. The word hydrocarbon should not appear in a report unless those hydrocarbons can be specifically identified and classified.”

THE USE OF QUALIFIERS IN REPORTS (cont'd)

- “The phrase hydrocarbons from an unknown source is expressly prohibited. Similarly, words such as consistent with, in the boiling range of, similar to, or characteristic of a particular ignitable liquid should not be used unless that liquid has been positively identified.”

Slide 9-30

2. “The phrase hydrocarbons from an unknown source is expressly prohibited. Similarly, words such as consistent with, in the boiling range of, similar to, or characteristic of a particular ignitable liquid should not be used unless that liquid has been positively identified.”

IV. NEGATIVE FINDINGS

NEGATIVE FINDINGS

- When in doubt, the analyst should always report a negative. A positive should only be reported when the analyst is certain of a determination and has exhausted all resources to better characterize the sample. These resources include:
 - Re-extraction (by the same or alternate method).
 - Reanalysis.
 - Peer review and consultation.

Slide 9-31

General.

- A. When in doubt, the analyst should always report a negative. A positive should only be reported when the analyst is certain of a determination and has exhausted all resources to better characterize the sample. These resources include:
1. Re-extraction (by the same or alternate method).
 2. Reanalysis.
 3. Peer review and consultation.

NEGATIVE FINDINGS (cont'd)

- In some instances, you will have samples where you are convinced that no IL has ever been near the submitted sample.
- In others, you will see a pattern of components that cannot be conclusively compared with an existing standard or that fails to meet the ASTM requirements.

Slide 9-32

- B. In some instances, you will have samples where you are convinced that no IL has ever been near the submitted sample.

- C. In others, you will see a pattern of components that cannot be conclusively compared with an existing standard or that fails to meet the ASTM requirements.

NEGATIVE FINDINGS (cont'd)

- Some laboratories consider multiple levels for negatives a problem. They feel that multiple levels can confuse the investigator to whom the report is sent, as well as the prosecutor and the defense.

Slide 9-33

- D. Some laboratories consider multiple levels for negatives a problem. They feel that multiple levels can confuse the investigator to whom the report is sent, as well as the prosecutor and the defense.

NEGATIVE FINDINGS (cont'd)

- The position of these laboratories is that if the analyst is uncertain of a determination and cannot report it as an ASTM classification, then a single negative statement should be used.

Slide 9-34

- E. The position of these laboratories is that if the analyst is uncertain of a determination and cannot report it as an ASTM classification, then a single negative statement should be used.

NEGATIVE FINDINGS (cont'd)

- For example, the analyst can use the following expression: An IL could not be determined on the following sample.
 - Here is a negative statement that can be used in all situations.

Slide 9-35

F. For example, the analyst can use the following expression: An IL could not be determined on the following sample.

1. Here is a negative statement that can be used in all situations.

NEGATIVE FINDINGS (cont'd)

- It addresses the fact that an IL could not be determined on the sample in question.
- It leaves open the possibility that an alternative standard obtained at a later date could provide an identification.
- It fits with the negative disclaimer recommended by ASTM.

Slide 9-36

2. It addresses the fact that an IL could not be determined on the sample in question.
3. It leaves open the possibility that an alternative standard obtained at a later date could provide identification.
4. It fits with the negative disclaimer recommended by ASTM.

NEGATIVE FINDINGS (cont'd)

- Some laboratories believe that there are three levels of findings:
 - Positive.
 - Inconclusive.
 - Negative.

Slide 9-37

G. Some laboratories believe that there are three levels of findings:

1. Positive.
2. Inconclusive.
3. Negative.

NEGATIVE FINDINGS (cont'd)

- They reserve the inconclusive finding for those analyses where a chromatographic pattern suggests an IL, but it cannot be conclusively called. This may happen in the following circumstances:
 - Novel product.
 - Microbial degradation.
 - Complex mixtures (including strong matrix additives).

Slide 9-38

H. They reserve the inconclusive finding for those analyses where a chromatographic pattern suggests an IL, but it cannot be conclusively called. This may happen with the following circumstances:

1. Novel product.
2. Microbial degradation.
3. Complex mixtures (including strong matrix additives).

NEGATIVE FINDINGS (cont'd)

- Regardless of the degree of finding used, the findings require a clear opinion of whether or not an IL was identified.

Slide 9-39

- I. Regardless of the degree of finding used, the findings require a clear opinion of whether or not an IL was identified.

NEGATIVE FINDINGS (cont'd)

- For negatives, the ASTM E1618 disclaimer may be included:
 - Negative results do not preclude the possibility that ILs were present at the fire scene.
- Some believe that this helps to prevent misunderstandings by readers of the report.

Slide 9-40

- J. For negatives, the ASTM E1618 disclaimer may be included:

Negative results do not preclude the possibility that ILs were present at the fire scene.

- K. Some believe that this helps to prevent misunderstandings by readers of the report.

V. FUTURE REQUIREMENTS

ACCREDITATIONS

- Following a push from the National Academy of Sciences, as well as pushes within states and in general, more and more laboratories have or are working for accreditation.

Slide 9-41

A. Accreditations.

1. Following a push from the National Academy of Sciences, as well as pushes within states and in general, more and more laboratories have or are working for accreditation.

ACCREDITATIONS (cont'd)

- The primary accrediting organizations — the American Society of Crime Laboratory Directors (ASCLD) and the Forensic Quality Service (FQS) — are currently based exclusively on the International Standards Organization 17025 standards for laboratories.

Slide 9-42

2. The primary accrediting organizations — the American Society of Crime Laboratory Directors (ASCLD) and the Forensic Quality Service (FQS) — are currently based exclusively on the International Standards Organization 17025 standards for laboratories.

INTERNATIONAL STANDARDS ORGANIZATION REPORTING

- Under International Standards Organization 17025, there are several aspects from which laboratory reports will have to be considered.
- Among these are document and records control, authorization, review and amendments.

Slide 9-43

B. International Standards Organization reporting.

1. Under International Standards Organization 17025, there are several aspects from which laboratory reports will have to be considered.
2. Among these are document and records control, authorization, review and amendments.

INTERNATIONAL STANDARDS ORGANIZATION REPORTING (cont'd)

- Another requirement is the use of a customer survey to determine the level of customer satisfaction.
- Does your laboratory contact you to determine your opinion of the quality of its services?

Slide 9-44

3. Another requirement is the use of a customer survey to determine the level of customer satisfaction.
4. Does your laboratory contact you to determine your opinion of the quality of its services?

INTERNATIONAL STANDARDS
ORGANIZATION REPORTING (cont'd)

- The reporting of results is specifically referenced in International Standards Organization 17025 documents as Section 5.10 of the Quality Manual.

Slide 9-45

5. The reporting of results is specifically referenced in International Standards Organization 17025 documents as Section 5.10 of the Quality Manual.

INTERNATIONAL STANDARDS
ORGANIZATION REPORTING (cont'd)

- General requirements.
 - The results are to be reported accurately, clearly, unambiguously and objectively, and in accordance with any specific instructions in the test methods.
 - In other words, the laboratory's test methods must be sufficiently restrictive to ensure accuracy and objectivity but sufficiently broad to allow some flexibility in choosing the tests to be performed.

Slide 9-46

6. General requirements.
- a. The results are to be reported accurately, clearly, unambiguously and objectively, and in accordance with any specific instructions in the test methods.
- b. In other words, the laboratory's test methods must be sufficiently restrictive to ensure accuracy and objectivity but sufficiently broad to allow some flexibility in choosing the tests to be performed.

INTERNATIONAL STANDARDS
ORGANIZATION REPORTING (cont'd)

- The results shall include all the information requested by the customer and necessary for the interpretation of the test and all information required by the method used.

Slide 9-47

- c. The results shall include all the information requested by the customer and necessary for the interpretation of the test and all information required by the method used.

TESTING REQUIREMENTS

- Recommendations on the testing report format — the following information should be part of the report (unless the laboratory has valid and documented reasons for not doing so).
 - A title (e.g., test report or forensic lab report).

Slide 9-48

7. Testing requirements.

Recommendations on the testing report format — the following information should be part of the report (unless the laboratory has valid and documented reasons for not doing so).

- a. A title (e.g., test report or forensic lab report).

TESTING REQUIREMENTS (cont'd)

- The name and address of the laboratory and the location where the tests and/or calibrations were carried out, if different from the address of the laboratory.

Slide 9-49

- b. The name and address of the laboratory and the location where the tests and/or calibrations were carried out, if different from the address of the laboratory.

TESTING REQUIREMENTS (cont'd)

- Unique identification of the test report (such as the laboratory's assigned case number); and on each page an identification number (in order to ensure that the page is recognized as a part of the test report); and a clear identification of the end of the test report (Page 1 of 2, Page 2 of 2, etc.).
- The name and address of customer/submitting agent.

Slide 9-50

- c. Unique identification of the test report (such as the laboratory's assigned case number); and on each page an identification number (in order to ensure that the page is recognized as a part of the test report); and a clear identification of the end of the test report (Page 1 of 2, Page 2 of 2, etc.).

- d. The name and address of the customer/submitting agent.

TESTING REQUIREMENTS (cont'd)

- Identification of the method used.
- A description of the condition of and an unambiguous identification of the item(s) tested.

Slide 9-51

- e. Identification of the method used.
- f. A description of the condition of and an unambiguous identification of the item(s) tested.

TESTING REQUIREMENTS (cont'd)

- The date of receipt of the test item(s) where this is critical to the validity and application of the results (chain of custody).
- The date(s) the test was performed.

Slide 9-52

- g. The date of receipt of the test item(s) where this is critical to the validity and application of the results (chain of custody).
- h. The date(s) the test was performed.

TESTING REQUIREMENTS (cont'd)

- Reference to the laboratory's requirements for sampling the item(s) submitted.
- The test with, where appropriate, any units of measurement.

Slide 9-53

- Reference to the laboratory's requirements for sampling the item(s) submitted.
- The test with, where appropriate, any units of measurement.

TESTING REQUIREMENTS (cont'd)

- The name(s), function(s), and signature(s) or equivalent identification of person(s) authorizing the test report.
- Where relevant, a statement to the effect that the results relate only to the items tested (the positive and/or negative disclaimers discussed earlier).

Slide 9-54

- The name(s), function(s), and signature(s) or equivalent identification of person(s) authorizing the test report.
- Where relevant, a statement to the effect that the results relate only to the items tested (the positive and/or negative disclaimers discussed earlier).

TESTING INTERPRETATION

- Testing report interpretation — these are in addition to the requirements listed earlier.
 - Any deviations from, additions to, or exclusions from the test method, as well as information on specific test conditions (e.g., environmental conditions) as required.
 - Where relevant, a statement of compliance/noncompliance with requirements and/or specifications.

Slide 9-55

C. Testing interpretation.

Testing report interpretation — these are in addition to the requirements listed earlier.

1. Any deviations from, additions to, or exclusions from the test method, as well as information on specific test conditions (e.g., environmental conditions) as required.
2. Where relevant, a statement of compliance/noncompliance with requirements and/or specifications.

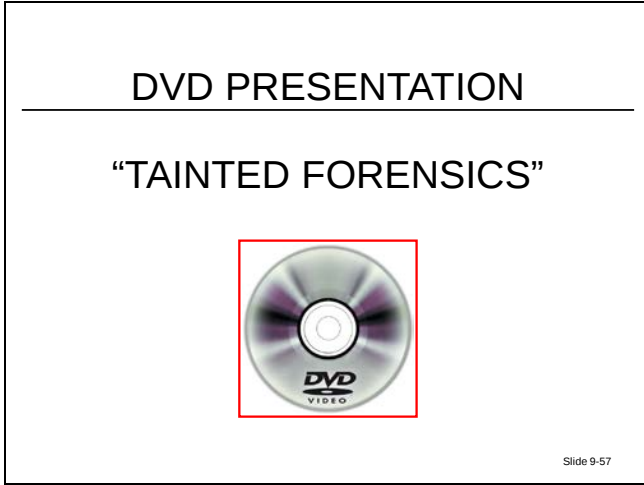
TESTING INTERPRETATION (cont'd)

- Where applicable, a statement on the estimated uncertainty of measurement.
- Where appropriate and needed, opinions and interpretations.
- Any additional information that may be required by specific methods, customers or groups of customers.

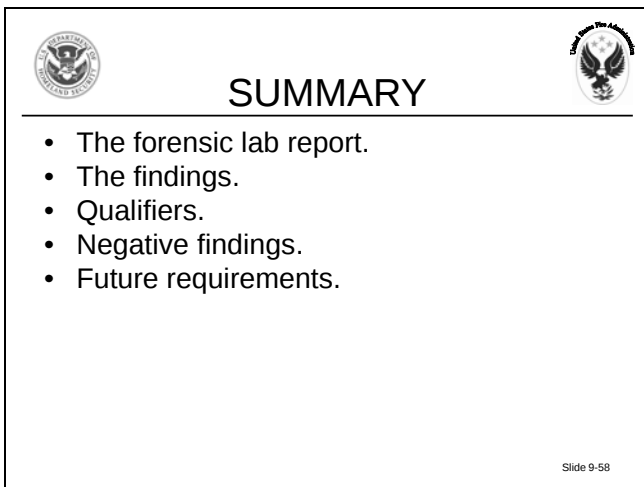
Slide 9-56

3. Where applicable, a statement on the estimated uncertainty of measurement.
4. Where appropriate and needed, opinions and interpretations.

5. Any additional information that may be required by specific methods, customers or groups of customers.



VI. SUMMARY



APPENDIX A

This page intentionally left blank.







Fingerprint

The term fingerprint is used to describe the impression of the arrangement of friction ridge skin on the underside of the fingers, left on an object; specifically, a fingerprint deals with the friction ridge detail at the end joint of the fingers.

Fingerprint Patterns

ARCH



LOOP



WHORL



Why Use Fingerprints?

☐ Permanence

- Fingerprints will remain unchanged throughout a person's lifetime, barring a serious injury that leaves a permanent scar.



☐ Unique

- No two people have the same arrangement of friction ridges - not even identical twins.

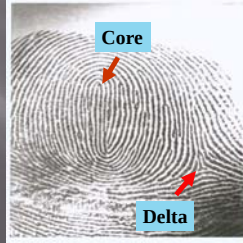


Levels of Friction Ridge Detail

LEVEL 1: RIDGE FLOW

- Focal areas (delta, core)
- Classification (arch, loop, whorl)
- Ridge Count (tracing)
- Orientation

**Individualization can
NOT occur at this level**



WHORL PATTERN

Level of Friction Ridge Detail

LEVEL 2: RIDGE CHARACTERISTICS

- Ending Ridge
- Dividing Ridge
- Dot

**Individualization CAN
occur at this level.**



Levels of Friction Ridge Detail

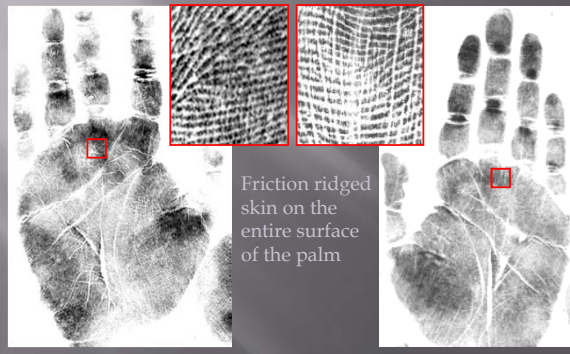
LEVEL 3: RIDGE FEATURES

- Pores
- Edge Shapes
- Width
- Relationships

**Individualization CAN
occur at this level**



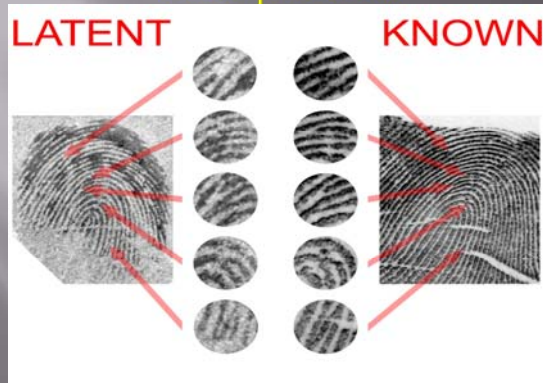
But, not just at the ends of the fingers



...and not just the hands



Comparison

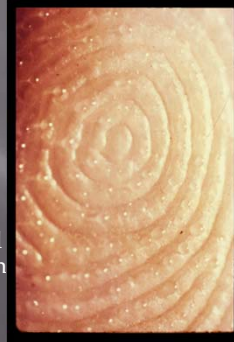


Latent Fingerprint

A *latent* or *unknown fingerprint*, involves the reproduction of the friction ridges of the finger in perspiration, oil, or other contaminants (dirt, blood) that cover the surface of the ridges. When an object is touched, this material will transfer from the ridges to that object.

Depositing Latent Prints

- ❑ Ridges must bear transfer medium
 - Perspiration
 - Oils
 - Blood
- ❑ Environmental factors
 - Weather conditions
 - Immersion in, or limited contact, of evidence with water does not necessarily destroy latent prints



Inked Fingerprint

An *inked* or what is commonly referred to as a *known fingerprint*, is the intentional reproduction of an outline of the friction ridges present on the palmar sides of the hands.

Known Exemplars

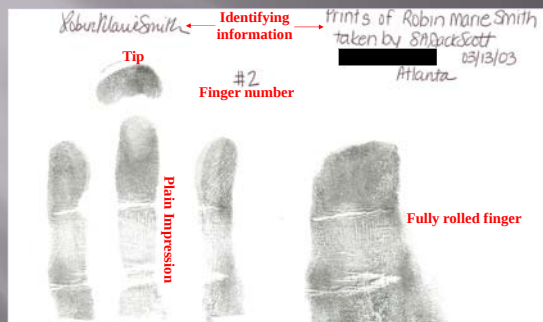


Standard fingerprint card

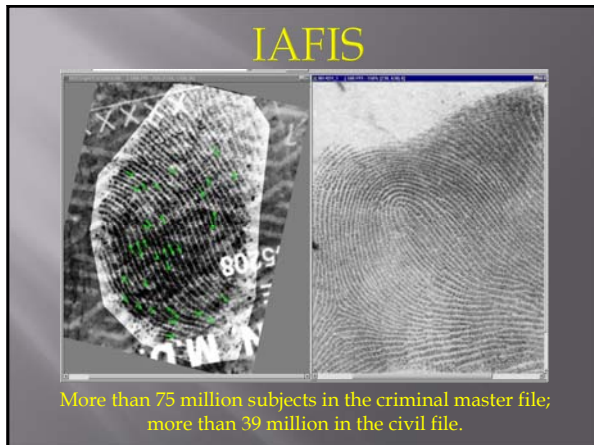
Known Exemplars



Plain (simultaneous) impressions
Ink and roll fingers and thumbs to their tips.







Surface Types

- Porous
 - Paper materials
 - Fingerprint residue is absorbed.
 - Stable
- Non-porous
 - Metal, glass, plastic, etc.
 - Fingerprint residue remains on the surface of the item.
 - VERY fragile

Latent Print Examples



Steel pipe



Glass bottle

Latent Print Examples



Shotgun Barrel

Latent Print Examples



Envelope

Tape

- ▣ Tape can be a good surface for developing latent prints.
- ▣ DO NOT remove tape from evidence or attempt to separate tape!
 - If it is necessary to remove the tape, preserve the adhesive side by placing it on a clean, hard plastic surface.
 - Do not put loose tape in paper bags!

Tape (continued)



Latent prints present prior to processing.

Tape (continued)



Developed latent prints

Evidence Processing for Latent Fingerprints

Field Processing Technique

Utilizing Superglue® to Develop Latent Prints

Theory

- ❑ By placing a small amount of Superglue® inside a sealed enclosure, along with a heat source, fumes from the glue will surround non-porous surfaces
- ❑ The fumes attach to moisture and form a polymer coating over the latent prints
- ❑ In this case the moisture would be in the form of latent finger or palm prints
- ❑ Basically, the latent prints would have a thin plastic coating

Theory

Why process non-porous evidence in the field?

- ❑ Latent prints are mostly comprised of water
- ❑ Field processing of latent prints utilizing the glue method has increased the number of identifiable latent prints recovered on non-porous evidence
- ❑ Latent prints are extremely fragile and easily lost by over handling and evaporation (time and heat sensitive)

Disposable Equipment

- ❑ 18" X 18" X 18" cardboard box
 - DNA considerations
- ❑ Wide Adhesive Tape
 - Duct
 - Masking
 - Plastic
- ❑ Lynn Peavey HotShot® glue fuming kit

Equipment



Tapes and HotShot®



Sealed Processing Box

Safety

- ❑ Superglue® processing should be performed in a well-ventilated area
- ❑ Agents must not leave the processing box unattended when processing post-blast evidence
- ❑ Do not move the box during processing
- ❑ Agents must use gloves

HotShot processing guidelines

- ▣ Average time is 30 – 45 minutes.
 - Time will vary with the size of the box used and weather conditions.
- ▣ Arrange items so the maximum amount of *outer* surface area is exposed to the fumes.
 - If possible, elevate or suspend the items
- ▣ Do not leave items unattended.
 - Overglued (coated with a white, flaky substance) items cannot be fixed



Processing



Superglue fumes attach to the moisture of a latent print. The fumes polymerize the print.

Completion of Processing

- ❑ Carefully open the box in a well ventilated area
- ❑ Prevent fumes from stinging your eyes or inhalation of fumes
- ❑ Allow several minutes for the box to air-out



Do not use the same box for multiple crime scenes.

Powdering

- ❑ What is Powdering?
 - Powdering is the application of finely ground, colored powder to a **non-porous** object for the purpose of making latent prints visible. Powder clings to moisture, oil or other residue (to include superglue) left when friction ridges touch an object.
- ❑ Types of Powder
 - Non-magnetic
 - Magnetic

Powdering

- ❑ How to choose a Powder
 - Choose a powder that has a high contrast with the object (for example: white/gray powder on a black item)
 - DO NOT use magnetic powder on a metal item
 - Fluorescent powders are not recommended
 - Don't use powder on wet or tacky items

Applying Powder

- ☐ Choose the correct brush
 - Magnetic wand for magnetic powder
 - Camel hair/squirrel hair or fiberglass brush for non-magnetic powder
 - Use a different brush for every color.
- ☐ Remove a small amount of powder from its container
 - Don't put the brush into the container.

Applying Powder

- ☐ Dip the end of the brush lightly into the non-magnetic powder then tap off the excess.
 - Brush away from your face with a light twirling motion
 - Follow the direction of the ridge flow as the latents develop

Applying Powder

- ☐ Put the magnetic wand into the powder – there should be a “bristle” effect as the magnet picks up the powder.
 - Take care to prevent the wand from coming into contact with the evidence.
 - To disengage the magnet, lift up on the end of the wand.

Powder and DNA

- ▣ *New powder and brushes MUST be used on each individual piece of evidence to prevent cross-contamination.*
- ▣ *DO NOT breathe on the evidence to enhance powder development!*

Lifts

- ▣ What is a Lift?
 - A lift is usually tape or a similar type surface which contains the correct amount of adhesiveness to remove enough of the fingerprint powder without destroying the original item.
- ▣ Types of Lifters
 - Transparent tape on a backing card
 - Hinge lifters
 - Rubber lifts
 - Gelatin lifts

Labeling a Lift

- ▣ Must include the following information on the back of the lift:
 - Source of the lift (description of the lift location)
 - Date the lift was created
 - Initials of individual who took the lift

Packaging

- ❑ Porous evidence
 - Envelopes, paper bags, plastic bags, etc.
- ❑ Non-porous evidence
 - Avoid paper bags, if possible.
 - Reduce evidence movement during shipping.
 - Separate as much debris as possible from the evidence before shipping.

Improvise



Molotov Cocktail packaged
for Arson and Fingerprint
Examinations



Improvise



Packaging Mistakes



Packaging should not rub against the surface of the evidence.

Packaging Mistakes



Packaging should not rub against the surface of the evidence.

Packaging Mistakes



Do NOT place tape in paper containers.

Packaging Mistakes

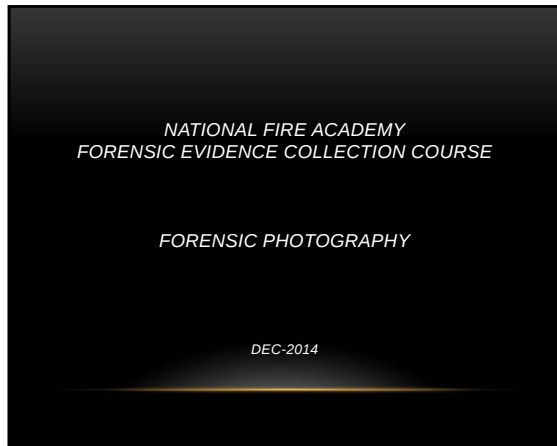


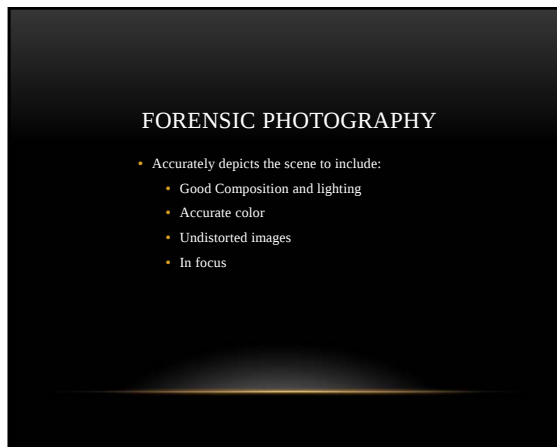
Do NOT tape evidence together!

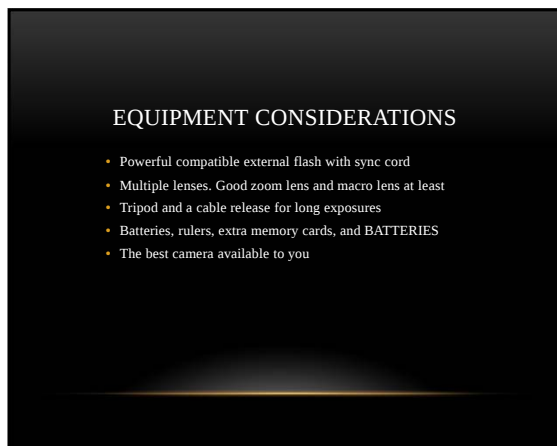


APPENDIX B

This page intentionally left blank.







LENSES

- Zoom lens that covers a wide range
 - Wide angle
 - Normal view
 - Telephoto
- Macro lens capable of 1:1 focusing
- Wide aperture for lowlight shooting, f/2.8 lens or better

FLASH

- Powerful flash
- Sync cord enabling off-camera flash
- Infrared sensor helps with lowlight focusing
- Swivel head can be very useful
- TTL - Through The Lens Metering

CAMERA

- Professional cameras are best
 - Strong durable body
 - Interchangeable lenses
 - Ability to set camera automatically and manually
 - Hot shoe and flash sync
 - Allows external flash and off-camera operation
 - Various focus options
 - Lowlight focusing

FAMILIARITY AND ROUTINE

- Practice shooting with your equipment prior to shooting a crime scene
- Check all camera settings prior to shooting a crime scene
- Ensure that equipment is working properly
- Select proper ISO for the situation you are photographing
 - Low light - Higher ISO (400, 800, 1000, 1600)
 - Bright Sunlight - Lower ISO (100, 200)

EXPOSURE

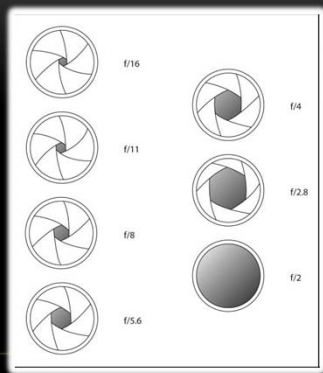
- The amount of light allowed to reach the camera sensor
 - Shutter speed
 - Aperture
 - ISO

SHUTTER SPEED

- Time
- Most common shutter speeds are between $1/60^{\text{th}}$ and $1/1000^{\text{th}}$ of a second.
- Expressed in fractions $1/30$, $1/60$, $1/125$, $1/250$, $1/500$, $1/1000$

APERTURE

- Controls the "Volume" of light passing through the lens
- Most common apertures are between 2.8 and 22
- F-stops represent fractions
- $f/1.4$, $f/2$, $f/2.8$, $f/4$, $f/5.6$, $f/8$, $f/11$, $f/16$, $f/22$, $f/32$



ISO

- AKA - Film Speed
- Controls the sensitivity of the chip to light
- Most common ISOs - 100, 200, 400, 800, 1000

CAMERA "STOPS"

- *f/stops, Apertures and ISOs are ALL expressed in terms of "Stops"*
 - 1-stop represents either, $\frac{1}{2}$ or $2\times$ the amount of light
 - Opening your aperture 1-stop allows twice the light
 - I.e. $f/8$ to $f/5.6$, or $f/4$ to $f/2$
 - Slowing your shutter speed 1 stop allows twice the light
 - I.e. $1/250^{th}$ to $1/125^{th}$, or $1/60^{th}$ to $1/30^{th}$
 - Changing ISO from 200 to 400 will allow twice the exposure. ISO 400 is twice as sensitive to light as ISO 200.

WHAT DO THESE COMBINATIONS HAVE IN COMMON?

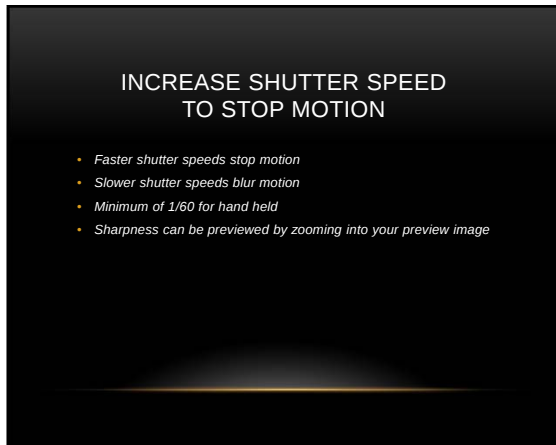


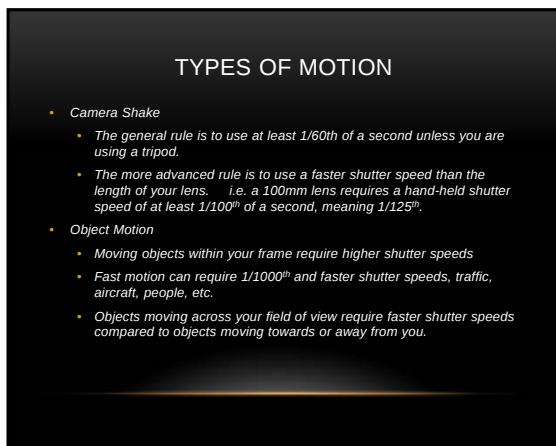
APERTURE ALSO CONTROLS DEPTH OF FIELD

- The near-to-far distance within a photograph that is in focus
- A smaller aperture (i.e. $f/22$) creates a larger depth of field
- A larger aperture (i.e. $f/2.8$) creates a small depth of field

FIRE INVESTIGATION: FORENSIC EVIDENCE







ISO

- As ISO increases, image noise also increases.
- A digital camera's lowest ISO setting is optimum
- ISO 400 is a good middle ground
- Newer technology can give very acceptable results even very high ISO settings
- Test your camera's ISO capabilities

PHOTOS TOO DARK

- Open up aperture
 - F/11 to F/8 will allow twice the light
- Increase exposure time
 - 1/500 – 1/250 will allow twice the light
- Raise ISO
 - 200 – 400 will increase exposure by 2 times

PHOTOS TOO LIGHT

- Close aperture
 - F/8 - F/11
- Decrease exposure time
 - 1/250 - 1/500
- Lower ISO
 - 400 - 200

NOT ENOUGH DEPTH OF FIELD

- Close aperture
 - $f/4 - f/8$ will increase depth of field, but will also reduce the amount of light by two stops. $f/4$ to $f/5.6$ to $f/8$ is 2 $f/stops$
 - Compensate for the loss in light by increasing exposure time, increasing the ISO, or a combination of both.

WHAT IS DIFFERENT?



CRIME SCENE PHOTOGRAPHY

- Close-up Photography and Latent Fingerprint Photography
 - Depth of Field
 - F4



FIRE INVESTIGATION: FORENSIC EVIDENCE

CRIME SCENE PHOTOGRAPHY

- Close-up Photography and Latent Fingerprint Photography
 - Depth of Field
 - F8



CRIME SCENE PHOTOGRAPHY

- Close-up Photography and Latent Fingerprint Photography
 - Depth of Field
 - F16



CRIME SCENE PHOTOGRAPHY

F4 Shot at an angle. Note the out of focus top



CRIME SCENE PHOTOGRAPHY

F16 Shot at
an angle.
Note the
sharp top
and bottom



AUTOMATIC EXPOSURE

- Camera will average the entire scene
- Dark scenes result in the highlight areas being overexposed
- Lighter scenes result in shadow areas being underexposed
- TIP: Expose for your highlights to make sure you don't "blow-out" your highlights. Shadow areas can be lightened in PhotoShop, white areas cannot be darkened. Err on the side of underexposure. When in doubt, bracket or shoot multiple exposures.

ISO SETTINGS

- All cameras allow you to select ISO settings
 - Higher ISO settings will cause your camera to shoot at a higher shutter speed to reduce blurry images
 - Test your camera to determine a maximum ISO for low light situation

DIGITAL NOISE

- Low light or underexposed images
- Long exposure times
- Heat
- High ISO setting

DIGITAL NOISE



PLAN AND ORGANIZE

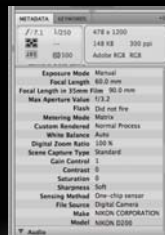
- When were the photographs taken
- The sequence in which they were taken
- The orientation and/or location of the items in the photographs

METADATA

- Make sure camera(s) have the correct date and time set
- Metadata records everything!

ARCHIVING

- Camera Metadata



METADATA	
f / 1.1	1/250
478 x 3200	
148 MP	300 ppi
ISO 100	Active NCS
Exposure Mode: Manual	
Focal Length: 88.0 mm	
Focal Length in 35mm Film: 88.0 mm	
Max Aperture Value: 1/3.2	
Flash: Did not fire	
Metering Mode: Matrix	
Custom Rendered: Normal Process	
White Balance: Auto	
Digital Zoom Ratio: 100%	
Image Capture Type: Standard	
Gain Control: 1	
Contrast: 0	
Saturation: 0	
Sharpness: Soft	
Sensing Method: One-chip sensor	
File Source: Digital Camera	
Make: NIKON CORPORATION	
Model: NIKON D200	

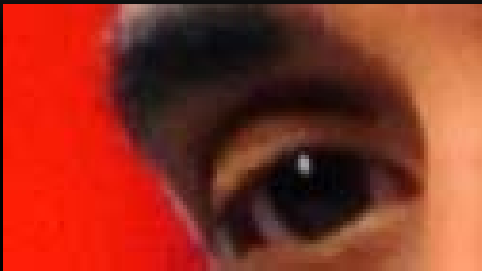
FILE FORMATS

- The most common file formats are
 - JPEG (Compresses data)
 - Raw (Uncompressed)
 - TIFF
 - BMP (Bitmap)

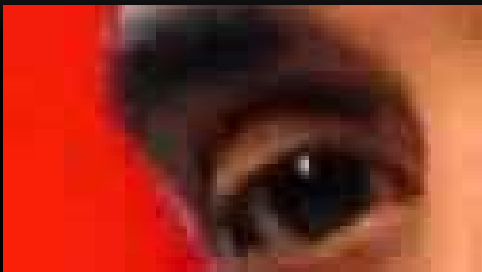
FILE FORMATS

- For forensics, little or no compression should be used as it throws away original information from the image
- Generally it is recommended that compression may be used for general forensic photographs unless the photographs are going to be used for comparisons, such as fingerprints, shoe/tire impressions or tool marks

LOW COMPRESSION



HIGH COMPRESSION



STANDARD OPERATING PROCEDURES

- Save original out-of-camera images in their original file format to CD or some other write-only media
- CD/DVD markers are recommended
- Make duplicate images for any image processing or enhancement
- Back up original images to some other storage device

SOP'S

- Treat digital images and the media that they are saved on according to your agency's guidelines
- As with film, the photographs presented in court are expected to be true and accurate representations of the scene depicted

SOP'S

- **Don't delete bad images from the camera**
 - You leave yourself open to questions should an attorney notice a gap in the numbering of the photos
 - Its easier to explain how you took a photo of your foot than why there are photos missing
 - Why are there missing photos from this sequence?
 - If you never delete photos from the camera, you'll never accidentally delete photos from your camera.

SOP'S

- Read the manual and keep it handy
- All equipment should be properly maintained and calibrated if possible to maintain consistency
 - Firmware updates
 - Custom white balances
 - Repairs

EDITING/ENHANCING IMAGES

- Are you improving image quality or altering the image?
- Care must be taken and operating procedures followed when making adjustments to an image
- Maintain original image
- If advanced techniques are used, document the procedures and resave enhanced image as an additional file

BASIC IMAGE ENHANCEMENT

- Brightness and Contrast adjustments, including dodging and burning
- Resizing
- Cropping
- Positive to negative inversion (b&w images)
- Image rotation
- Conversion to gray scale
- White balance and color balancing/correction
- Sharpening

FIRE INVESTIGATION: FORENSIC EVIDENCE

- Resizing
 - Changing the actual pixel dimensions of an image
 - Upsizing is NOT recommended and will result in loss of image quality
- Cropping
 - Removing parts of the image
 - This should only be done when printing
 - The original should not be cropped and resaved unless it is noted and the original file is backed-up/saved.

- White Balance/Color Balancing
 - Adjusting color in an image for accurate color
 - Adjusting for different lighting conditions
- Sharpening
 - Basic sharpening of an image to improve print quality
 - Over-sharpening will result in poorer quality
 - View image at 100 percent for accurate view of sharpening

- Techniques to AVOID
 - Spotting
 - Erasing
 - Rubberstamping
 - Cloning

CRIME SCENE PHOTOGRAPHY

- Identifiers
 - An identifying photograph should be taken at the beginning of a scene telling vital information such as:
 - Date and time
 - Case Number
 - Investigator
 - Location

CRIME SCENE PHOTOGRAPHY

- Photograph some point of reference in the scene that will assist later in identifying where the scene was located
 - Street signs
 - Addresses on houses
 - Any other permanent point of reference



FIRE INVESTIGATION: FORENSIC EVIDENCE

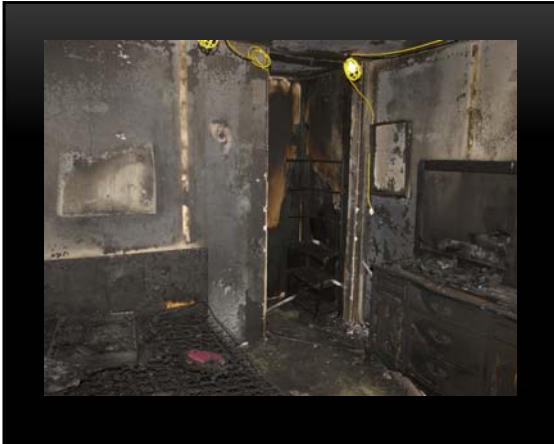
CRIME SCENE PHOTOGRAPHY

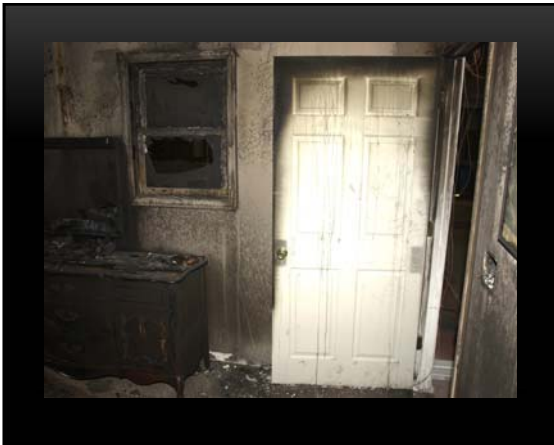
- Overall photographs
- Overall photographs should be taken depicting an entire area of the scene as it was when you arrived. If the scene is too big take a series of overlapping photographs
- Photographs should be taken from four sides of the scene if possible
- Try to exclude people from photos
- Use numbered or lettered markers to show where important areas are in the scene





FIRE INVESTIGATION: FORENSIC EVIDENCE

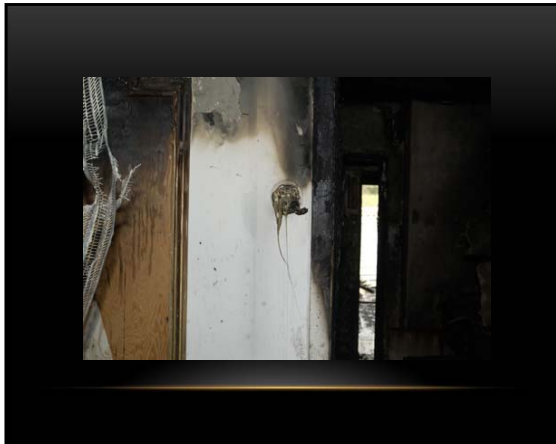




CRIME SCENE PHOTOGRAPHY

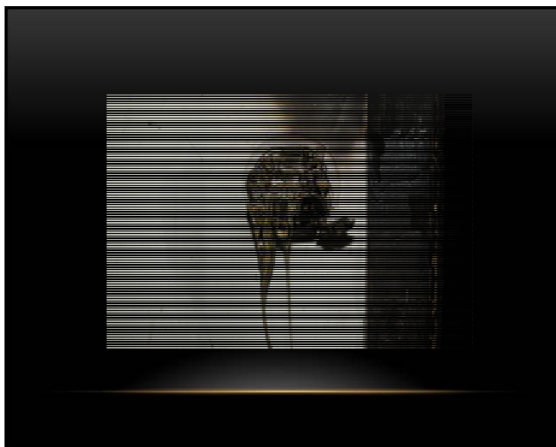
- Medium shot
 - Shot of a particular area of interest taken with a normal lens (50mm if possible) that shows all items of interest.
 - These shots will be used to help show where close-up items of evidence are located relative to the rest of the scene

FIRE INVESTIGATION: FORENSIC EVIDENCE



CRIME SCENE PHOTOGRAPHY

- Close Up
 - After taking your medium shot move in close and photograph small items of detail. Include a scale whenever possible. Macro lenses are needed when details are smaller and sometimes need to be photographed 1:1.
 - When using a scale be sure to photograph perpendicular to the scale so it can be reproduced accurately if needed



CRIME SCENE PHOTOGRAPHY

- Always photograph all areas of the scene, regardless of whether they may not seem to be important to the scene
- Details may emerge later which make these photographs important

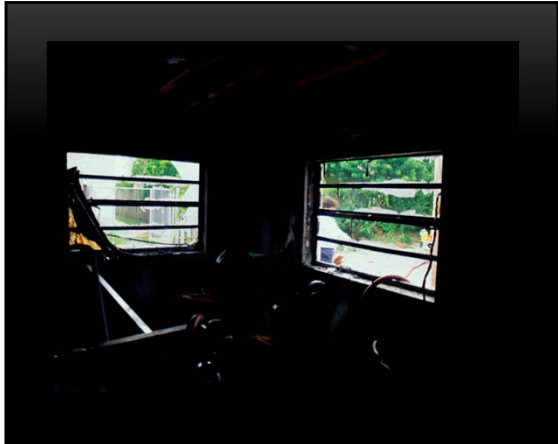
CRIME SCENE PHOTOGRAPHY

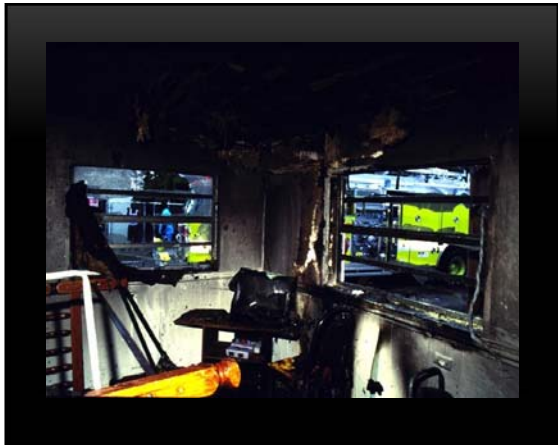
- Work in methodically so that photos are shot in a logical sequence
- Make sure all necessary photographs are taken before moving objects to get better photos or using specialized techniques that may damage evidence

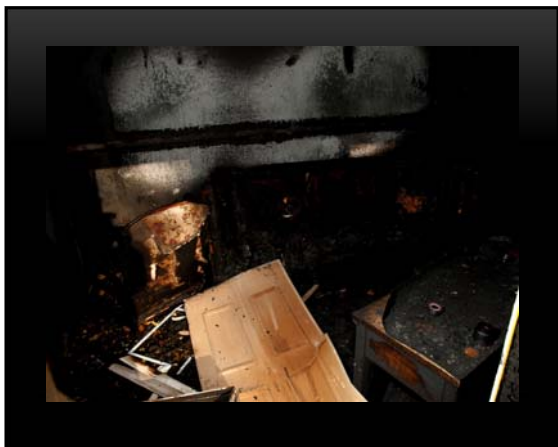
USING FLASH

- When to use an electronic on-camera flash
 - Indoor and/or backlit photographs
 - Outdoor fill flash for shadowed areas
 - Night photography

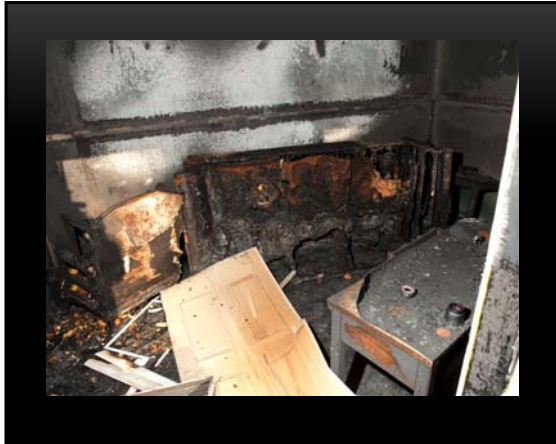
FIRE INVESTIGATION: FORENSIC EVIDENCE

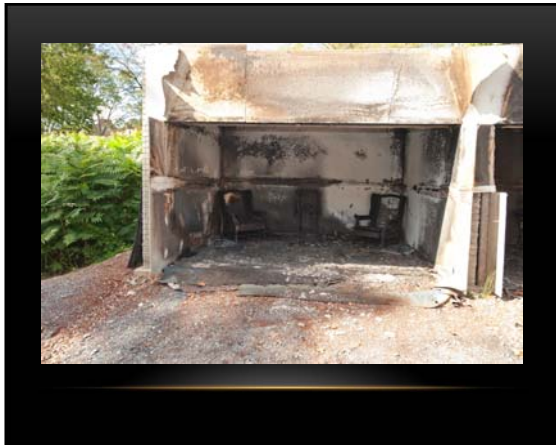






FIRE INVESTIGATION: FORENSIC EVIDENCE





FLASH SYNC CORD

- Allows you to remove the flash from the camera
 - To shoot at reflective surfaces or objects without getting hotspots
 - To shoot at an oblique angle in order to show textures such as shoe, tire or fingerprint impressions
 - To shoot close-up photographs

FIRE INVESTIGATION: FORENSIC EVIDENCE



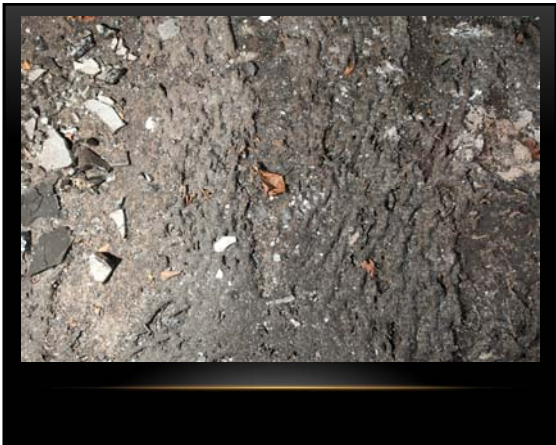


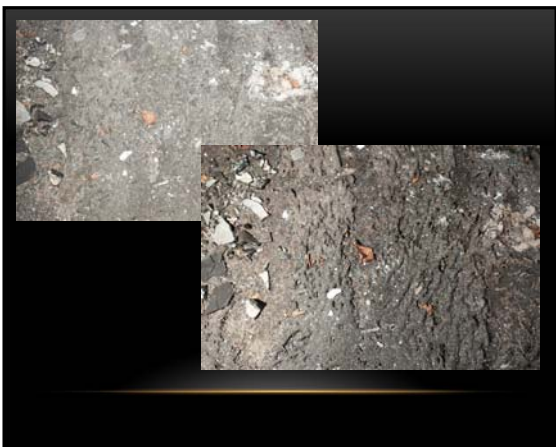
PHOTOGRAPHING TEXTURES

- Shoot perpendicular to impression
- Use oblique lighting to bring out surface detail
- Fill the frame for maximum resolution
- Do NOT place the scale on top of the impression, as you may damage impression

FIRE INVESTIGATION: FORENSIC EVIDENCE



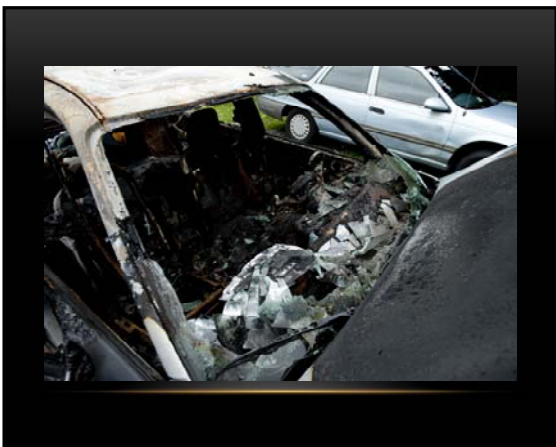




FIRE INVESTIGATION: FORENSIC EVIDENCE







FIRE INVESTIGATION: FORENSIC EVIDENCE



NIGHT PHOTOGRAPHY

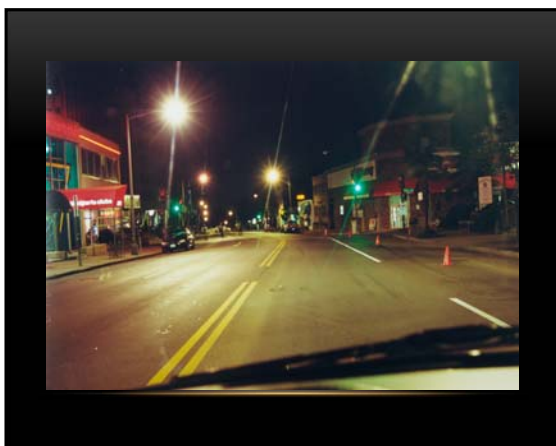
- Multiple flashes or "painting with light"
 - Adds more light if the scene is too large to be lit by a single flash
 - Works well in areas where there are no streetlights or other light sources





CRIME SCENE PHOTOGRAPHY

- Time exposure
 - Opening the shutter for a long period of time and allowing other light sources such as street lights to illuminate your scene
 - Requires a sturdy tripod
 - Allows jury to see the scene with natural lighting



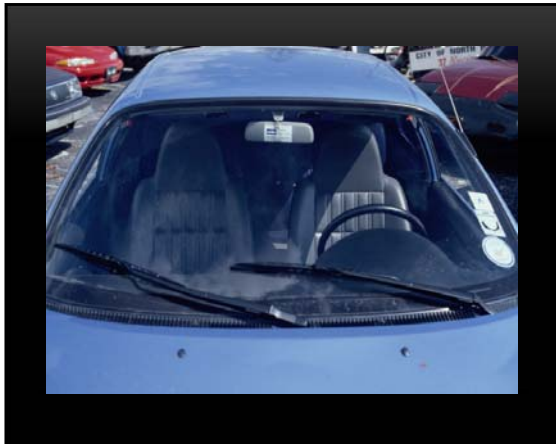
CLOSE-UP PHOTOGRAPHY

- Depth of Field
 - Smaller aperture means greater depth of field
 - Depth of field gets smaller as you zoom in so depth of field becomes more important in close-up photography

CRIME SCENE PHOTOGRAPHY

- Circular Polarizer
 - A polarizing filter can reduce the glare from glass and help see details that are on the other side



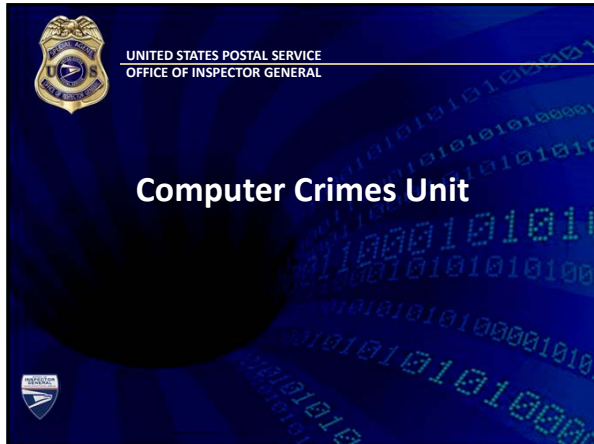


USEFUL WEBSITES

- Theiai.org
 - International Association for Identification
 - Scientific Working Group on Imaging Technology (SWGIT), www.swgit.org - forensic photography guidelines are in subheadings
- dpreview.com
 - Digital photography reviews
- Forensicpage.com
 - Lots of forensic links

APPENDIX C

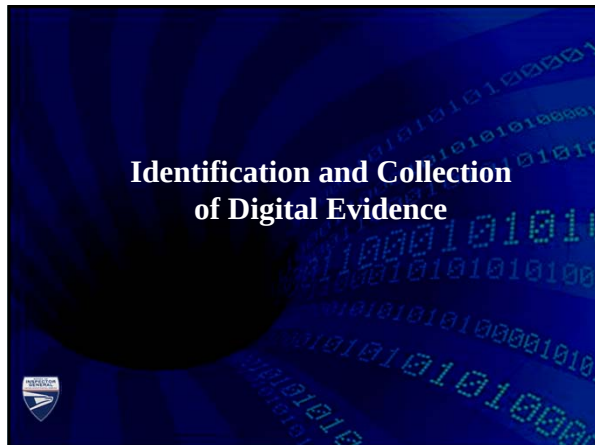
This page intentionally left blank.

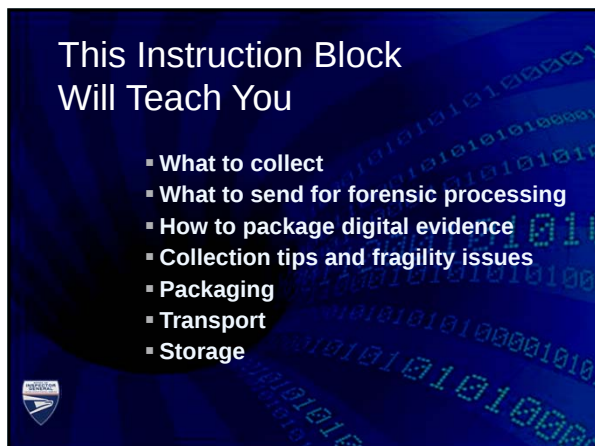












This Instruction Block Will NOT Teach You

- How to conduct basic, intermediate, or advanced media analysis examinations
- How to conduct any part of a computer intrusion investigation
- How to collect enterprise level equipment
 - Servers
 - RAID configured storage
 - Enterprise level back-up solutions (tapes, etc)



Determining Scope

- Review your warrant or consent for the types of evidence you are authorized to collect.
- This presentation is not legal instruction and I am not a ~~liar~~-lawyer, but courts have held that a description of items sought needs to be spelled out in the warrant in reference to the format in which they are stored.
 - IE: *documents* can be stored on printed pages, in books, on cocktail napkins, or **in computer files**
 - Warrant language for documents should include **"...in whatever form they may be found..."**
 - Photographs can be printed on paper, developed or undeveloped film or **in computer files**
- In all cases, be guided by the advice of your prosecutor.



What to Collect???

The Problem... Demonstrated in a Quiz









FIRE INVESTIGATION: FORENSIC EVIDENCE



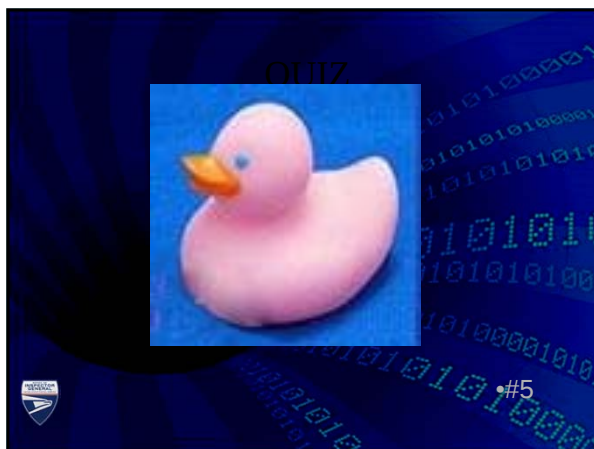




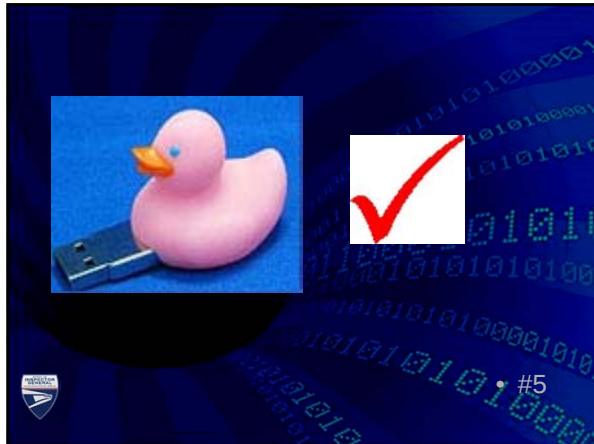
FIRE INVESTIGATION: FORENSIC EVIDENCE







FIRE INVESTIGATION: FORENSIC EVIDENCE







FIRE INVESTIGATION: FORENSIC EVIDENCE











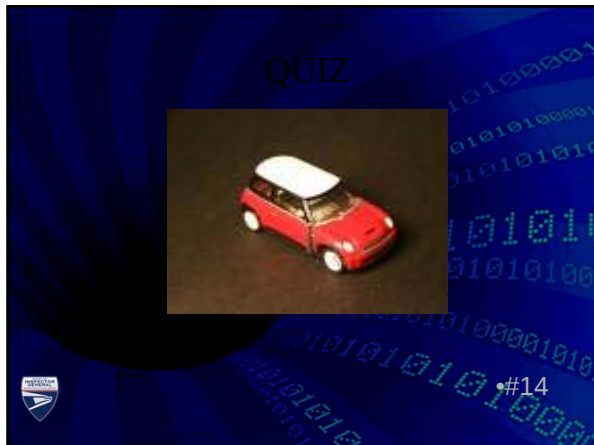










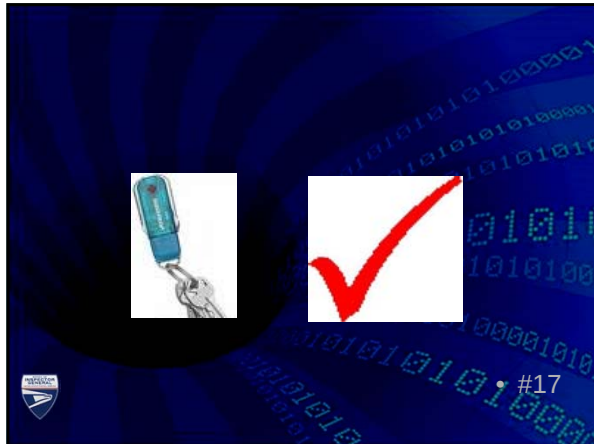










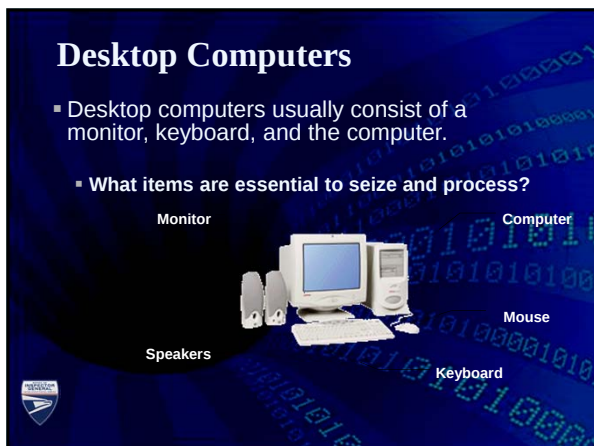












Monitors

- Consider case needs before collection
 - Need to fingerprint?
 - Process for trace / fluid evidence?
- Don't send for electronic processing. Do add manufacturer info in agents notes and send them.



LOOK CLOSELY!!!





iMac



Mac Mini



Keyboards

- Identify keyboards with one-touch controls. Programmed keys can be programmed into a memory chip in the keyboard itself.
 - These keyboards can be heavier than normal boards and will have a battery housing





PC Hard Disks

External Magnetic Media Laptop / Micro Hard Disks

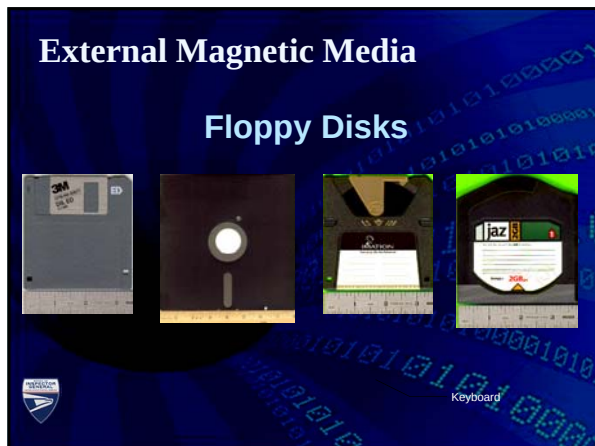


If you find one of these...

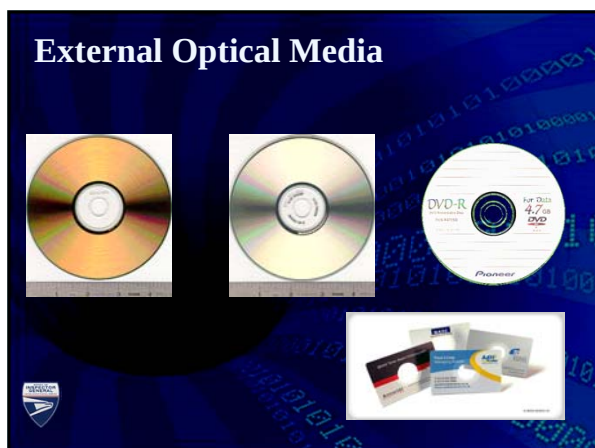


Look for one of these!









Optical Media

Take

- Any CDRs or DVD-Rs
- Any Software
 - Especially finance related like Quicken, Money, Versacheck
 - Operating System Disks
 - Anything you're not familiar with

Consider NOT Taking

- Music CDs or Movie DVDs that are obviously factory made (in cases etc.)

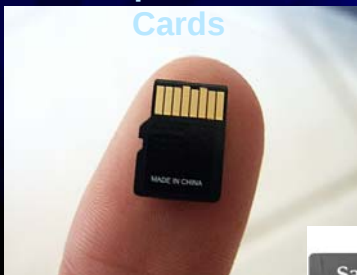


External Flash Media

Compact Flash Cards



Compact Flash Cards



- 4 feature length DVD Movies
- Or
- 20 Music CDs
- Or
- 5000 High Quality Digital Pictures
- Or
- 15,647,408 Printed Pages of Text ~4000 copies of the Bible (KJV)



External Flash Media

USB Thumb Drives



Memory (RAM)

- Volatile Memory loses content when it loses power
- No need to Seize



Pagers



- Make sure either you or evidence custodian addresses power concerns



PDA's



Evolution of Cell Phones



Four Cell Phone Examination Categories

- Object Only (Predominate number of exams)
- Logical - File System
- Physical - Non Invasive
- Physical - Invasive



Object Only

- Simple / Easy (Think Cellebrite)
- Neat and Organized - WYSIWYG

Examination Report Page 1 of 5

#	Type	Number	Name	Date & Time	Duration
1	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00
2	Outgoing	8004444444	Paul	10/10/10 10:00:00	00:00:00
3	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00
4	Outgoing	7310100000	Paul	10/10/10 10:00:00	00:00:00
5	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00
6	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00
7	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00
8	Outgoing	161000000000	Paul	10/10/10 10:00:00	00:00:00



Logical File System & Physical – Non Invasive

- More Interactive
- More Advanced Analysis
- Requires Experienced Examiners
- Examiner may be able to parse out data
- Binary File is extracted
- Examiner uses other forensic tools to conduct forensic analysis

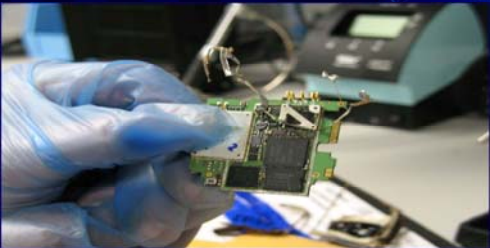


Physical Invasive

- EXTREMELY High Level of Skill and Expertise is Required



Physical Invasive



Physical Invasive



Best Practices

•Seizure

1. If off, leave off and remove battery
2. If on, check for password, place in AIRPLANE mode, place in USB DEBUGGING MODE, power off, remove battery
3. If you cannot remove battery
 - Check for password
 - Power down
 - Place in a shielding container
4. Seize all power / data cables



Best Practices

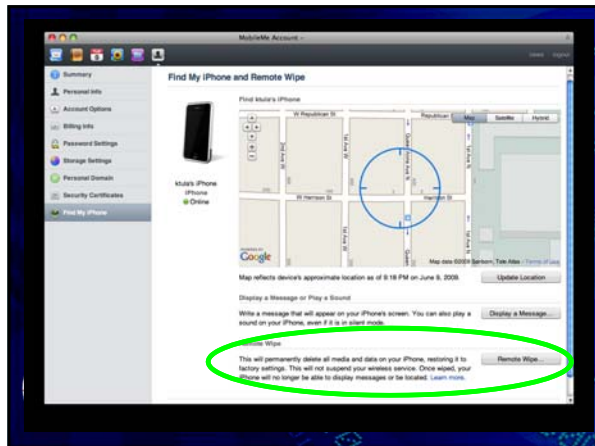
Shielding (Post Seizure)– What and Why?

- Isolate the phone from network

1. Location / cell tower info will change if connected to network
2. Incoming calls will modify call logs
3. Text messages can be overwritten by incoming texts
4. REMOTE WIPING!!
5. Smart phones are computers – deleted items will be overwritten







Best Practices

Passwords

- Forensic tools rely on open communication with the device
- USB Debugging Mode
- Password circumvention support is limited
- Conduct a "GOOD" interview – get the password!!!

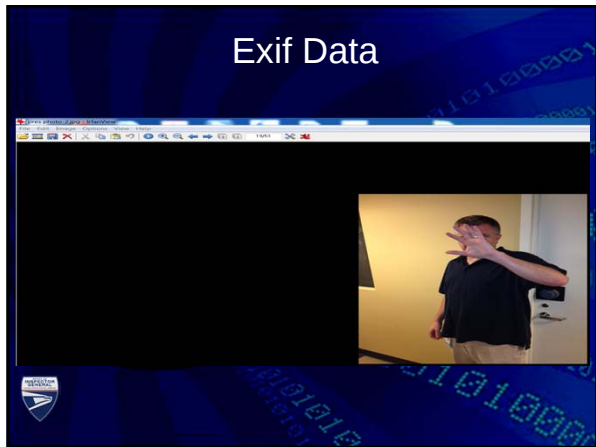


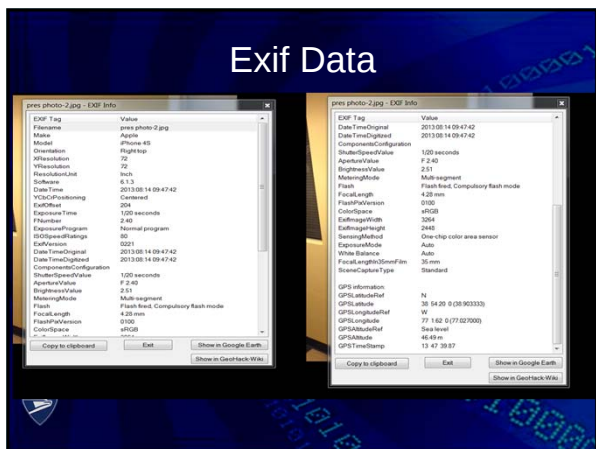
Exif Data

Excellent source of evidence

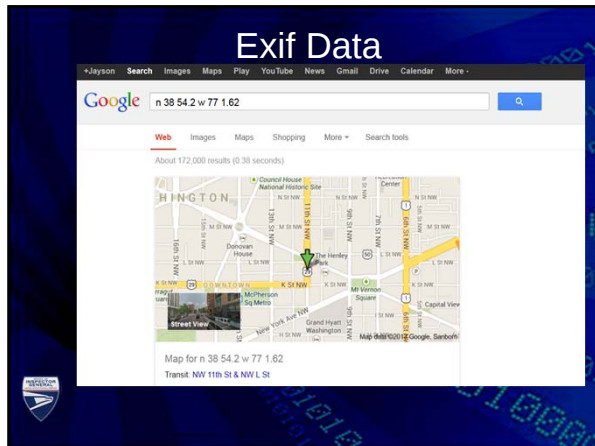
WWW.IRFANVIEW.COM



[illegible]



FIRE INVESTIGATION: FORENSIC EVIDENCE

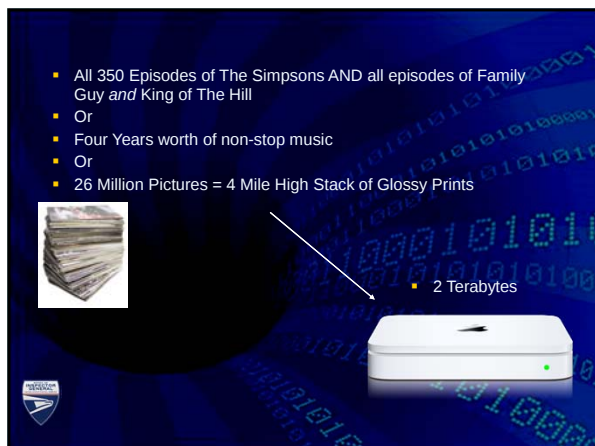












Gaming Consoles

- All Modern Gaming Consoles have Internet connectivity and onboard storage (usually *hundreds* of gigabytes), most are easily hackable.



DVRs

- TiVo and other DVRs run on an embedded OS and can be hacked and used for storing data and accessing the internet.



Phase II

- Now we know *what* to collect and send for processing
- Lets look at *how* to collect it

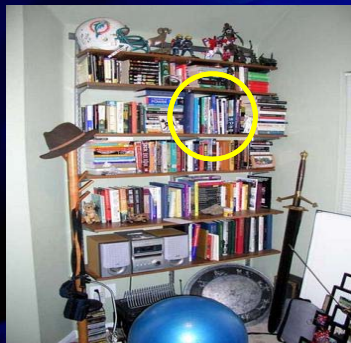


First Responder Considerations

- Is there a computer in the room?
- Is the computer ON?
- IF IT'S OFF, LEAVE IT OFF
- Is evidence destruction in progress?
 - Deleting, formatting, wiping
 - If I find destructive activity, what do I do?
- Do I need to call in an SME?

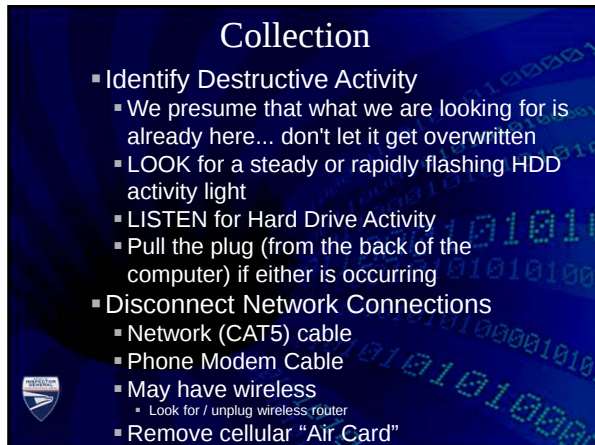


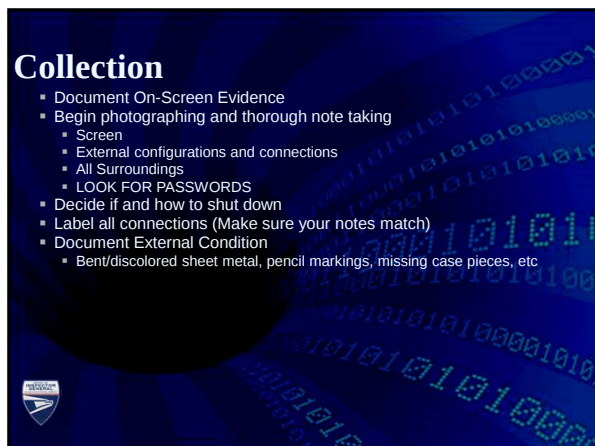
Clues





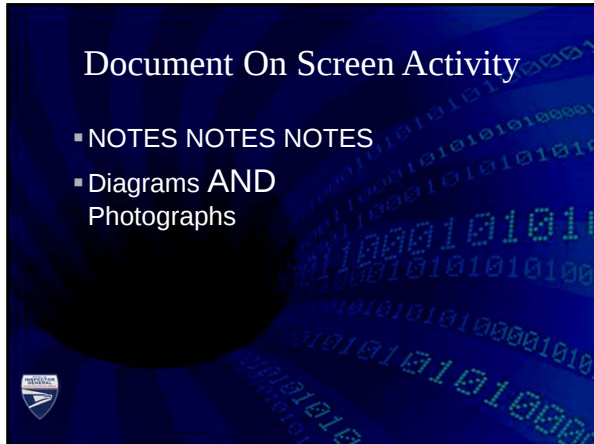




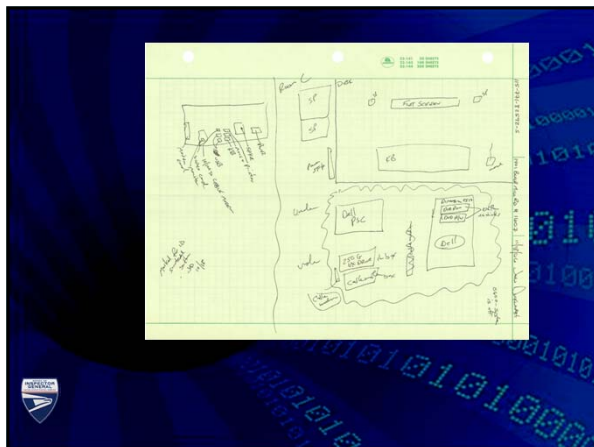


Document On Screen Activity

- **NOTES NOTES NOTES**
- **Diagrams AND Photographs**







Advanced Collection

- As long as you are within the scope of your authority, can articulate a good reason, and DOCUMENT YOUR ACTIONS, (NOTES NOTES NOTES) there is little you can do to jeopardize the validity of computer evidence.



Advanced Collection – Computer On

- Wiggle the mouse or press the TAB key to wake the screen saver
- Hover over items in the system tray and taskbar
- Do NOT open any files.
 - This will change the file Modified, Access or Changed times for the files.
 - This information, once lost can not be recovered and may be of vital importance to the case.
- It is OK to click on open windows in the task bar to maximize them for photographing.



Advanced Collection – Computer On

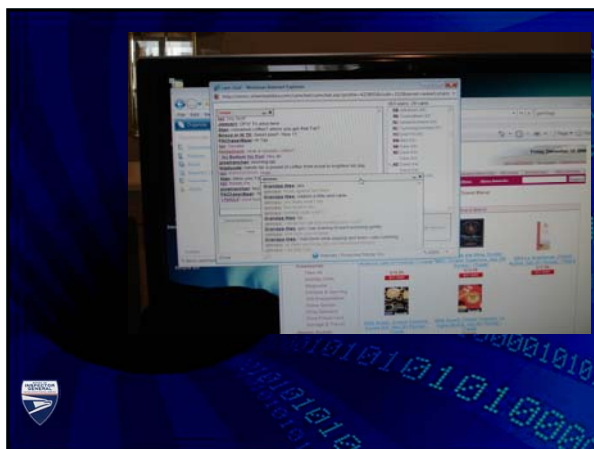
- Scroll up and down in open windows to see everything. Take photos, draw sketches
- If you find open relevant documents, pictures, etc. Document what you find with photos, sketches and notes. If you have sterile media available, (freshly formatted floppies, forensically prepared thumb drive) consider saving (File>SaveAs) a copy off of the system.
- Document **every** click, **every** action!

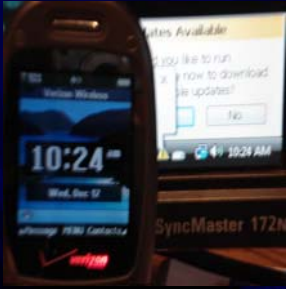


FIRE INVESTIGATION: FORENSIC EVIDENCE









Document the Time

Your cell phone is a good source of "Known Good Local Time"

The time on the computer may be important later in the investigation especially if its wrong, or set to the wrong time zone.



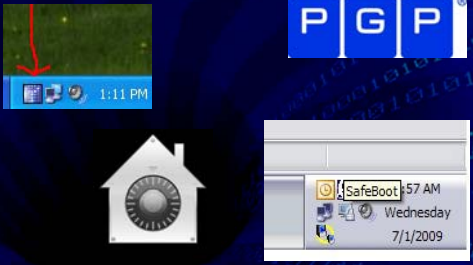
Know When to Call for Help



You Need A Geek!

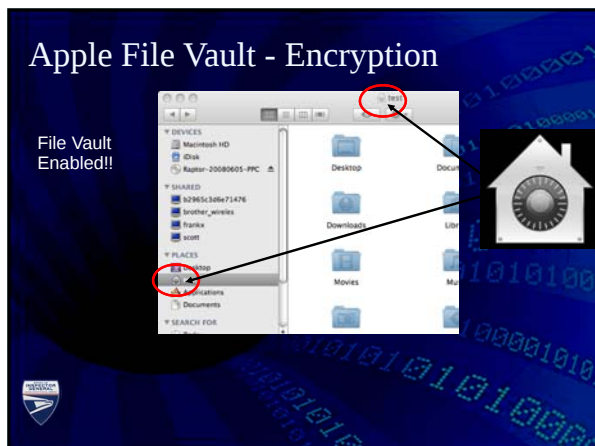


Encryption!!









Collection

- Biggest decision you will make is whether or not to power down
 - WHY?
- As you decide to Power down and proceed with collection consider the following:
 - Is it hooked to the printer and is the printer flashing?
 - Is there something on the screen?
 - Is this an operating system I'm familiar with?



Why Pull The Plug??

- Shutdown Scripts
 - Easily programmable commands to "clean up the HDD" such as defrag, disk cleanup can automatically overwrite evidence
 - Malicious users can set to overwrite evidence
- Preserves Page File
 - Virtual Memory
- Pull the plug from the back of the computer
 - Here's why >





Maintain Communication with
Interviewer / Suspect

- Ask for Passwords, Account Names, NICs
- Ask about encryption
- Ask about other evidence / computers...



Maintain Communication with
Interviewer / Suspect

**ASK FOR
PASSWORDS!**



Collection

- Record:
 - Serial Number
 - Manufacturer, make, model
 - Location, orientation
 - Peripheral configuration (cords, etc.)



Digital Evidence Fragility Quiz

Which of the following do you not have to worry about??

- Heat
- Electro-Static Discharge
- Solar Flares
- Magnets
- Water
- CD Eating Fungus
- Impact Forces



CD-eating fungus discovered

Science and discovery **Science**

CD-eating fungus discovered

A Spanish scientist has discovered a fungus which eats CDs.

Geologist Victor Cardenas says he stumbled across the microscopic creature while visiting Belize.

The discovery came after friends complained that one of their CDs had developed an odd discoloration that left parts of it mysteriously transparent.

Using an electron microscope, Cardenas and colleagues at the Madrid-based Superior Council for Scientific Research later observed that fungi had burrowed into the CD from the outer edge.

It had then devoured the thin aluminium reflecting layer and some of the data-storing polycarbonate resin.

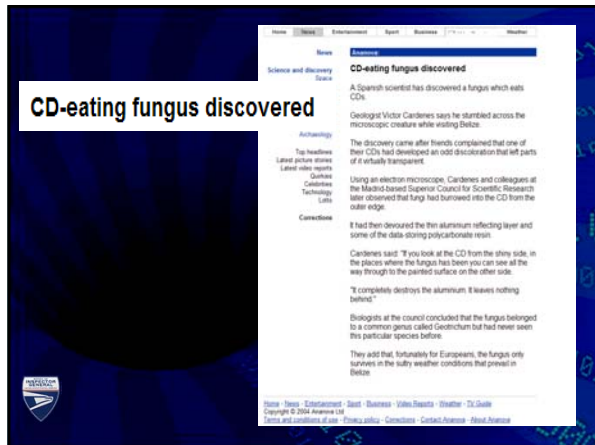
Cardenas said: "If you look at the CD from the shiny side, in the places where the fungus has been you can see all the way through to the painted surface on the other side."

"It completely destroys the aluminium. It leaves nothing behind."

Biologists at the council concluded that the fungus belonged to a common genus called *Gerdium* but had never seen this particular species before.

They add that, fortunately for Europeans, the fungus only survives in the sultry weather conditions that prevail in Belize.

Home News Entertainment Sport Business Video/Photos Weather TV Guide
Copyright © 2004 America Online
Terms and conditions Home News Entertainment Sport Business Video/Photos Weather TV Guide



Digital Evidence Fragility

- Heat
- Electro-Static Discharge
- Solar Flares
- Magnets
- Water
- CD Eating Fungus (if in Belize)
- Impact Forces



Packaging

- Anti static wrap or bags
- Sturdy boxes
- Paper OR Plastic Bags
- Foil / Faraday Bags for Cell Phones
 - Only needed if phone is on..
 - Get to examiner quickly, battery will drain fast, power off may initiate password lock
- DO NOT USE:
 - Styrofoam peanuts, shredded paper, regular plastic
 - Causes static, messy



Packaging

- No need to cover every port with evidence tape
 - Covering case opening latches and power supply inputs is usually sufficient
- Check for floppy disks and CDs
 - If found, replace in drive, apply tape, initial, and note on inventory
- Remove batteries from laptops
 - One piece of Evidence tape over battery compartment



Transport

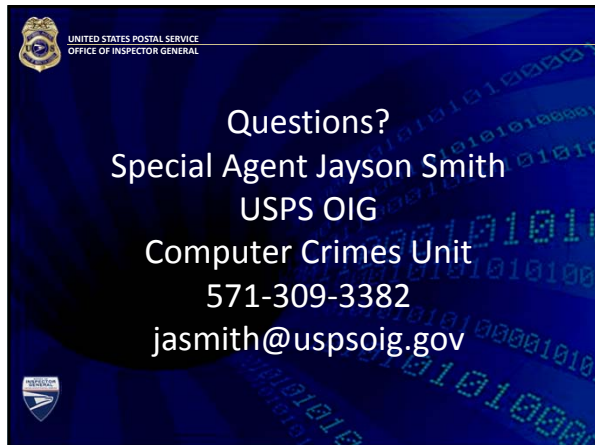
- Chain of custody starts as soon as you depart the seizure location
 - First line on chain of custody history should be transport from seizure location to field office.
- Cars and car trunks get hot quickly
 - Over 200 degrees in a matter of hours
- Keep evidence away from radio transmitters, amplifiers, speakers
 - Electro-magnetic fields can damage sensitive electronics





Storage

- Store off the floor if possible
- Climate controlled
- Secure



Questions?
Special Agent Jayson Smith
USPS OIG
Computer Crimes Unit
571-309-3382
jasmith@uspsoig.gov

This page intentionally left blank

Appendix C Handouts

ELECTRONIC DEVICE SEARCH WARRANT AFFIDAVIT

THIS DRAFT IS CURRENT AS OF AUGUST 2011. GET THE MOST CURRENT VERSION OF THIS GO-BY FROM CCIPS ONLINE:

<http://dojnet.doj.gov/criminal/ccips/warrants.htm>

For help with any issues involving ECPA or computer searches, call the Computer Crime and Intellectual Property Section ("CCIPS"), Criminal Division, United States Department of Justice, at (202) 514-1026.

USAGE NOTES:

- This form should be used whenever a warrant is sought to allow agents to search a cell phone, computer, personal digital assistant, or similar electronic device that is lawfully in their possession as a result of a prior search. For a go-by for a warrant to enter and search a premises such as a house, apartment, or business office use the "premises" search warrant go-by, which is also available on CCIPS Online
- Obtain the warrant in the district where the device is currently located.
- Use [Form AO93](#) to create the warrant itself.
 - Under "In the matter of the search of," copy the caption from the affidavit.
 - Under "identify the person or describe the property to be searched and give its location," write "See Attachment A (incorporated by reference)."
 - Under "identify the person or describe the property to be seized," write "See Attachment B (incorporated by reference)."
 - Check "at any time in the day or night as I find reasonable cause has been established"
- To avoid potential problems with the "14-day rule," make sure forensic examiners take some step (such as imaging) within the first fourteen days after you obtain the warrant.
- For more information about searching and seizing computers with warrants, see Chapter 2 of "Searching and Seizing Computers and Obtaining Electronic Evidence in Criminal Investigations," available on CCIPS Online and <http://www.cybercrime.gov/>.

IN THE UNITED STATES DISTRICT COURT
FOR _____

IN THE MATTER OF THE SEARCH OF
[[DEVICE DESCRIPTION]], CURRENTLY
LOCATED AT [[EVIDENCE LOCKER
ADDRESS]]

Case No. _____

**AFFIDAVIT IN SUPPORT OF AN
APPLICATION UNDER RULE 41 FOR A
WARRANT TO SEARCH AND SEIZE**

I, [[AGENT NAME]], being first duly sworn, hereby depose and state as follows:

INTRODUCTION AND AGENT BACKGROUND

1. I make this affidavit in support of an application under Rule 41 of the Federal Rules of Criminal Procedure for a search warrant authorizing the examination of property—an electronic device—which is currently in law enforcement possession, and the extraction from that property of electronically stored information described in Attachment B.

2. I am a [[TITLE]] with the [[AGENCY]], and have been since [[DATE]].
[[DESCRIBE TRAINING AND EXPERIENCE INCLUDING EXPERTISE WITH
COMPUTERS]].

3. This affidavit is intended to show only that there is sufficient probable cause for the requested warrant and does not set forth all of my knowledge about this matter.

IDENTIFICATION OF THE DEVICE TO BE EXAMINED

4. The property to be searched is a [[MAKE MODEL AND DESCRIPTION, e.g. “a Dell Latitude E6520 Laptop computer” or “Apple iPhone 4”]], serial number [[XXXXXXXXXX]],

hereinafter the “Device.” The Device is currently located at **[[EVIDENCE LOCKER ADDRESS]]**.

5. The applied-for warrant would authorize the forensic examination of the Device for the purpose of identifying electronically stored data particularly described in Attachment B.

PROBABLE CAUSE

6. [[Give facts that establish probable cause to believe that the electronically stored information described in Attachment B is recorded on the device described in Attachment A. Typically, this involves a narration of facts about the person known to use the device, and a small amount of facts establishing that a device of this type continues to hold the electronically stored information desired.]]

7. The Device is currently in the lawful possession of the **[[AGENCY]]**. It came into the **[[AGENCY]]**’s possession in the following way: [[Describe how the agency got the device. Possible scenarios include: seized incident to arrest; seized with consent; taken during the execution of a warrant]]. Therefore, while the **[[AGENCY]]** might already have all necessary authority to examine the Device, I seek this additional warrant out of an abundance of caution to be certain that an examination of the Device will comply with the Fourth Amendment and other applicable laws.

8. The Device is currently in storage at **[[EVIDENCE LOCKER ADDRESS]]**. In my training and experience, I know that the Device has been stored in a manner in which its contents are, to the extent material to this investigation, in substantially the same state as they were when the Device first came into the possession of the **[[AGENCY]]**.

TECHNICAL TERMS

9. **[[Define only technical terms that are relevant to this Device; DELETE IRRELEVANT TERMS. In paragraph 10, you will explain how these terms are relevant to the Device you wish to search.]]** Based on my training and experience, I use the following technical terms to convey the following meanings:

- a. Wireless telephone: A wireless telephone (or mobile telephone, or cellular telephone) is a handheld wireless device used for voice and data communication through radio signals. These telephones send signals through networks of transmitter/receivers, enabling communication with other wireless telephones or traditional “land line” telephones. A wireless telephone usually contains a “call log,” which records the telephone number, date, and time of calls made to and from the phone. In addition to enabling voice communications, wireless telephones offer a broad range of capabilities. These capabilities include: storing names and phone numbers in electronic “address books;” sending, receiving, and storing text messages and e-mail; taking, sending, receiving, and storing still photographs and moving video; storing and playing back audio files; storing dates, appointments, and other information on personal calendars; and accessing and downloading information from the Internet. Wireless telephones may also include global positioning system (“GPS”) technology for determining the location of the device.
- b. Digital camera: A digital camera is a camera that records pictures as digital picture files, rather than by using photographic film. Digital cameras use a

variety of fixed and removable storage media to store their recorded images.

Images can usually be retrieved by connecting the camera to a computer or by connecting the removable storage medium to a separate reader. Removable storage media include various types of flash memory cards or miniature hard drives. Most digital cameras also include a screen for viewing the stored images. This storage media can contain any digital data, including data unrelated to photographs or videos.

- c. **Portable media player:** A portable media player (or “MP3 Player” or iPod) is a handheld digital storage device designed primarily to store and play audio, video, or photographic files. However, a portable media player can also store other digital data. Some portable media players can use removable storage media. Removable storage media include various types of flash memory cards or miniature hard drives. This removable storage media can also store any digital data. Depending on the model, a portable media player may have the ability to store very large amounts of electronic data and may offer additional features such as a calendar, contact list, clock, or games.
- d. **GPS:** A GPS navigation device uses the Global Positioning System to display its current location. It often contains records of the locations where it has been. Some GPS navigation devices can give a user driving or walking directions to another location. These devices can contain records of the addresses or locations involved in such navigation. The Global Positioning System (generally abbreviated “GPS”) consists of 24 NAVSTAR satellites orbiting the Earth. Each satellite contains an extremely accurate clock. Each satellite repeatedly transmits

by radio a mathematical representation of the current time, combined with a special sequence of numbers. These signals are sent by radio, using specifications that are publicly available. A GPS antenna on Earth can receive those signals. When a GPS antenna receives signals from at least four satellites, a computer connected to that antenna can mathematically calculate the antenna's latitude, longitude, and sometimes altitude with a high level of precision.

- e. PDA: A personal digital assistant, or PDA, is a handheld electronic device used for storing data (such as names, addresses, appointments or notes) and utilizing computer programs. Some PDAs also function as wireless communication devices and are used to access the Internet and send and receive e-mail. PDAs usually include a memory card or other removable storage media for storing data and a keyboard and/or touch screen for entering data. Removable storage media include various types of flash memory cards or miniature hard drives. This removable storage media can store any digital data. Most PDAs run computer software, giving them many of the same capabilities as personal computers. For example, PDA users can work with word-processing documents, spreadsheets, and presentations. PDAs may also include global positioning system ("GPS") technology for determining the location of the device.
- f. Tablet: A tablet is a mobile computer, typically larger than a phone yet smaller than a notebook, that is primarily operated by touching the screen. Tablets function as wireless communication devices and can be used to access the Internet through cellular networks, 802.11 "wi-fi" networks, or otherwise. Tablets typically contain programs called apps, which, like programs on a personal

computer, perform different functions and save data associated with those functions. Apps can, for example, permit accessing the Web, sending and receiving e-mail, and participating in Internet social networks.

- g. **Pager:** A pager is a handheld wireless electronic device used to contact an individual through an alert, or a numeric or text message sent over a telecommunications network. Some pagers enable the user to send, as well as receive, text messages.
- h. **IP Address:** An Internet Protocol address (or simply “IP address”) is a unique numeric address used by computers on the Internet. An IP address is a series of four numbers, each in the range 0-255, separated by periods (e.g., 121.56.97.178). Every computer attached to the Internet computer must be assigned an IP address so that Internet traffic sent from and directed to that computer may be directed properly from its source to its destination. Most Internet service providers control a range of IP addresses. Some computers have static—that is, long-term—IP addresses, while other computers have dynamic—that is, frequently changed—IP addresses.
- i. **Internet:** The Internet is a global network of computers and other electronic devices that communicate with each other. Due to the structure of the Internet, connections between devices on the Internet often cross state and international borders, even when the devices communicating with each other are in the same state.

10. Based on my training, experience, and research, [[and from consulting the manufacturer's advertisements and product technical specifications available online at <http://xxxxx>,]] I know that the Device has capabilities that allow it to serve as **[[list here the capabilities defined above that apply to this device, to the extent that they support probable cause. For example, for an iPhone, list "a wireless telephone, digital camera, portable media player, GPS navigation device, and PDA."]]** In my training and experience, examining data stored on devices of this type can uncover, among other things, evidence that reveals or suggests who possessed or used the device.

ELECTRONIC STORAGE AND FORENSIC ANALYSIS

11. Based on my knowledge, training, and experience, I know that electronic devices can store information for long periods of time. **[[IF DEVICE ACCESSES THE INTERNET]]** Similarly, things that have been viewed via the Internet are typically stored for some period of time on the device. This information can sometimes be recovered with forensics tools.

12. **[[INCLUDE THE FOLLOWING PARAGRAPH AND SUBPARAGRAPHS ONLY IF THE DEVICE IS A LAPTOP, DESKTOP, OR OTHER TRADITIONAL COMPUTER]]** There is probable cause to believe that things that were once stored on the Device may still be stored there, for at least the following reasons:

- a. Based on my knowledge, training, and experience, I know that computer files or remnants of such files can be recovered months or even years after they have been downloaded onto a storage medium, deleted, or viewed via the Internet.

Electronic files downloaded to a storage medium can be stored for years at little or no cost. Even when files have been deleted, they can be recovered months or

years later using forensic tools. This is so because when a person “deletes” a file on a computer, the data contained in the file does not actually disappear; rather, that data remains on the storage medium until it is overwritten by new data.

- b. Therefore, deleted files, or remnants of deleted files, may reside in free space or slack space—that is, in space on the storage medium that is not currently being used by an active file—for long periods of time before they are overwritten. In addition, a computer’s operating system may also keep a record of deleted data in a “swap” or “recovery” file.
- c. Wholly apart from user-generated files, computer storage media—in particular, computers’ internal hard drives—contain electronic evidence of how a computer has been used, what it has been used for, and who has used it. To give a few examples, this forensic evidence can take the form of operating system configurations, artifacts from operating system or application operation, file system data structures, and virtual memory “swap” or paging files. Computer users typically do not erase or delete this evidence, because special software is typically required for that task. However, it is technically possible to delete this information.
- d. Similarly, files that have been viewed via the Internet are sometimes automatically downloaded into a temporary Internet directory or “cache.”

13. *Forensic evidence.* As further described in Attachment B, this application seeks permission to locate not only electronically stored information that might serve as direct evidence of the crimes described on the warrant, but also forensic evidence that establishes how

the Device was used, the purpose of its use, who used it, and when. There is probable cause to believe that this forensic electronic evidence might be on the Device because:

- a. Data on the storage medium can provide evidence of a file that was once on the storage medium but has since been deleted or edited, or of a deleted portion of a file (such as a paragraph that has been deleted from a word processing file).

[[INCLUDE REST OF PARAGRAPH ONLY IF DEVICE IS A

TRADITIONAL COMPUTER, SUCH AS A LAPTOP]] Virtual memory

paging systems can leave traces of information on the storage medium that show what tasks and processes were recently active. Web browsers, e-mail programs, and chat programs store configuration information on the storage medium that can reveal information such as online nicknames and passwords. Operating systems can record additional information, such as the attachment of peripherals, the attachment of USB flash storage devices or other external storage media, and the times the computer was in use. Computer file systems can record information about the dates files were created and the sequence in which they were created.

- b. Forensic evidence on a device can also indicate who has used or controlled the device. This “user attribution” evidence is analogous to the search for “indicia of occupancy” while executing a search warrant at a residence.
- c. A person with appropriate familiarity with how an electronic device works may, after examining this forensic evidence in its proper context, be able to draw conclusions about how electronic devices were used, the purpose of their use, who used them, and when.

- d. The process of identifying the exact electronically stored information on a storage medium that are necessary to draw an accurate conclusion is a dynamic process. Electronic evidence is not always data that can be merely reviewed by a review team and passed along to investigators. Whether data stored on a computer is evidence may depend on other information stored on the computer and the application of knowledge about how a computer behaves. Therefore, contextual information necessary to understand other evidence also falls within the scope of the warrant.
- e. Further, in finding evidence of how a device was used, the purpose of its use, who used it, and when, sometimes it is necessary to establish that a particular thing is not present on a storage medium.
- f. **[[FOR HACKING OR OTHER INSTRUMENTALITY CASES]]** I know that when an individual uses an electronic device to **[[obtain unauthorized access to a victim electronic device over the Internet]]**, the individual's electronic device will generally serve both as an instrumentality for committing the crime, and also as a storage medium for evidence of the crime. The electronic device is an instrumentality of the crime because it is used as a means of committing the criminal offense. The electronic device is also likely to be a storage medium for evidence of crime. From my training and experience, I believe that an electronic device used to commit a crime of this type may contain: data that is evidence of how the electronic device was used; data that was sent or received; and other records that indicate the nature of the offense.

14. *Nature of examination.* Based on the foregoing, and consistent with Rule 41(e)(2)(B), the warrant I am applying for would permit the examination of the device consistent with the warrant. The examination may require authorities to employ techniques, including but not limited to computer-assisted scans of the entire medium, that might expose many parts of the device to human inspection in order to determine whether it is evidence described by the warrant.

15. *Manner of execution.* Because this warrant seeks only permission to examine a device already in law enforcement's possession, the execution of this warrant does not involve the physical intrusion onto a premises. Consequently, I submit there is reasonable cause for the Court to authorize execution of the warrant at any time in the day or night.

CONCLUSION

16. I submit that this affidavit supports probable cause for a search warrant authorizing the examination of the Device described in Attachment A to seek the items described in Attachment B.

REQUEST FOR SEALING

17. **[[IF APPROPRIATE: It is respectfully requested that this Court issue an order sealing, until further order of the Court, all papers submitted in support of this application, including the application and search warrant. I believe that sealing this document is necessary because the warrant is relevant to an ongoing investigation into the criminal organizations as not all of the targets of this investigation will be searched at this time. Based upon my training and experience, I have learned that, online criminals actively search for criminal affidavits and search warrants via the internet, and disseminate them to other online criminals as they deem appropriate, i.e., post them**

publicly online through the carding forums. Premature disclosure of the contents of this affidavit and related documents may have a significant and negative impact on the continuing investigation and may severely jeopardize its effectiveness.]]

Respectfully submitted,

[AGENT NAME]
Special Agent
[AGENCY]

Subscribed and sworn to before me
on July 5, 2016:

UNITED STATES MAGISTRATE JUDGE

ATTACHMENT A

The property to be searched is a [[MAKE MODEL AND DESCRIPTION, e.g. “a Dell Latitude E6520 Laptop computer” or “Apple iPhone 4”]], serial number [[XXXXXXXX]], hereinafter the “Device.” The Device is currently located at [[**EVIDENCE LOCKER ADDRESS**]].

[[NOTE: THE ABOVE PARAGRAPH IS MEANT TO BE IDENTICAL TO PARAGRAPH 4. IN MICROSOFT WORD, RIGHT-CLICK ON THE PARAGRAPH AND CHOOSE “UPDATE FIELD.”]]

This warrant authorizes the forensic examination of the Device for the purpose of identifying the electronically stored information described in Attachment B.

ATTACHMENT B

1. All records on the Device described in Attachment A that relate to violations of **[[STATUTES]]** and involve **[[SUSPECT]]** since **[[DATE]]**, including:
 - a. **[[IDENTIFY RECORDS SOUGHT WITH PARTICULARITY; EXAMPLES FOR A DRUG CASE FOLLOW]]**
 - b. lists of customers and related identifying information;
 - c. types, amounts, and prices of drugs trafficked as well as dates, places, and amounts of specific transactions;
 - d. any information related to sources of drugs (including names, addresses, phone numbers, or any other identifying information);
 - e. any information recording **[[SUSPECT]]**'s schedule or travel from **[[DATE]]** to the present;
 - f. all bank records, checks, credit card bills, account information, and other financial records.
2. Evidence of user attribution showing who used or owned the Device at the time the things described in this warrant were created, edited, or deleted, such as logs, phonebooks, saved usernames and passwords, documents, and browsing history;
3. **[[IF CASE INVOLVED THE INTERNET]]** Records evidencing the use of the Internet Protocol address **[[10.19.74.69]]** to communicate with **[[Yahoo! mail servers or University of Virginia mathematics department computers]]**, including:

- a. records of Internet Protocol addresses used;
- b. records of Internet activity, including firewall logs, caches, browser history and cookies, “bookmarked” or “favorite” web pages, search terms that the user entered into any Internet search engine, and records of user-typed web addresses.

As used above, the terms “records” and “information” include all of the foregoing items of evidence in whatever form and by whatever means they may have been created or stored, including any form of computer or electronic storage (such as flash memory or other media that can store data) and any photographic form.



U.S. DEPARTMENT OF HOMELAND SECURITY
UNITED STATES SECRET SERVICE

Washington Field Office
1100 L St NW
Washington, DC 20005
202-406-8500

2/15/13

Custodian of Records
Google, Inc.
1600 Amphitheatre Parkway
Mountain View, CA 94043
Fax: 650-649-2939
Attn: Custodian of Records

Preservation Request Letter

Custodian of Records,
The below listed accounts are the subject of an ongoing criminal investigation by United States Secret Service. It is requested that any and all Google Inc. records (including; Real name, Screen names, Status of Account, detailed billing logs, date account opened and closed, method of payment, contents and detailed billing records, IP logins) regarding the identification of the following account be preserved pending the issuance of a subpoena for those records. You are also requested not to disclose the existence of this request to the subscriber or any other person, other than as necessary to comply with this request.

Account: chrystahall@gmail.com

If you have any questions, please contact Special Agent Jayson Smith at 202-406-8051.

Very Truly Yours,

David Beach
Special Agent in Charge
Washington Field Office

This page intentionally left blank

Option #1

- C.) Seize, open, and search all computers, monitors, keyboards, printers, cables, modems, software, hardware, instruction manuals, password documents, encryption and password codes and other computer equipment and accessories, and their stored information, and to remove said computer equipment from its location for a thorough examination at a controlled site, that are found in the residence and / or the vehicles, and;

Option #2

7. Computer hardware, software, documentation, passwords, data security items and electronically stored data as described below:
- a. Computer hardware consists of any and all computer equipment that can collect, analyze, create, display, convert, store, conceal, or transmit electronic, magnetic, optical, or similar computer impulses or data. This includes, but is not limited to, any data processing devices, self contained "laptop" or "notebook" computers, internal and peripheral storage devices such as fixed disks, external storage devices, and other memory devices; peripheral input/output devices such as keyboards, printers, scanners, video display monitors, optical readers, magnetic strip decoding and encoding devices; related communications devices including modems and cables; personal digital assistants, personal data storage devices, wireless messaging devices, wireless telephones, programmable telephones; as well as any devices or mechanisms that can be used to restrict access to any of the items identified above.
 - b. Computer software that is stored electronically, magnetically, optically, or digitally, including operating systems, applications, utilities, compilers, interpreters, and communications programs.
 - c. Computer documentation including written, recorded, printed, or electronically stored material, which explains how to configure or use computer hardware, computer software, or related items.
 - d. Computer password and data security devices designed to restrict access or hide computer software, documentation, or data. Data security devices may consist of hardware, software, or other programming codes.

Option #3

- A. Records

1. All records belonging to or related to Shango TAYLOR aka Harold ANDERSON.

The term “records” includes records in all forms, such as those on paper or stored in electronic or magnetic form on hard drives, compact disks, zip disks, magnetic tapes or floppy disks.

2. All records relating to attempts to access, obtain, alter or destroy records or information belonging to Shango TAYLOR aka Harold ANDERSON.
3. Logging or other records related to accesses to the Shango TAYLOR aka Harold ANDERSON computer system.

B. Hardware

1. Computer hardware, which can collect, analyze, create, display, convert, store, conceal or transmit electronic, magnetic, optical or similar computer impulses or data. Hardware includes any data-processing devices (such as central processing units, memory typewriters, and self contained “laptop” or “Notebook” computers); internal and peripheral storage devices (such as fixed disks, external hard drives, floppy disk drives and diskettes, removable magnetic disk storage drives and disks, tape drives and tapes, and other memory storage devices); peripheral input/output devices (such as keyboards and video display monitors); and related communications devices (such as modems, cables and connections, and RAM or ROM units,); as well as any devices, mechanisms, or parts that can be used to restrict access to computer hardware (such as physical keys or locks).

C. Software

1. Computer software consisting of digital information which can be interpreted by a computer and any of its related components to direct the way they work; in whatever form it may be found, to include: electronic, magnetic, optical or other digital form, in addition to printed source code. Software includes, but is not limited to: any programs to run operating systems, control peripheral equipment, applications, utilities, scripts, compilers, interpreters, communications programs; any programs, whether functional or not, to assist in the defeat of security/protective features in place to prevent the unauthorized copying, distribution, and/or activation of software; along with any and all programs necessary for the proper functioning of this software.

D. Documentation

1. Computer related documentation consisting of written, recorded, printed or electronically stored material which explains or illustrates how to configure or use the computer hardware, software or other related items.

E. Passwords and Data Security Devices

1. Computer passwords and other data security devices that are designed to restrict access to or hide computer software, documentation or data. Data security devices may consist of hardware, software or other programming code. A Password (a string of alphanumeric characters) usually operates as a sort of a digital key to “unlock” particular data security devices. Data security hardware may include encryption devices, chips and circuit boards. Data security software or digital codes may includes programming codes that creates “test” keys or “hot”

keys, which perform user designed security-related functions when activated.

Data security software or code which might also encrypt, compress, hide or “booby trap” protected data to make it inaccessible or unreadable as well as reverse the process to restore the data.



U.S. DEPARTMENT OF HOMELAND SECURITY
UNITED STATES SECRET SERVICE

Washington Field Office
1100 L St NW
Washington, DC 20005

2/13/13

Matt Mahvi
Staminus Communications
502 S. Harbor Blvd.
Fullerton, CA. 92832
Fax: 949-419-3456
Attn: Compliance and Investigation Unit

Preservation Request Letter

Custodian of Records,

The below listed accounts are the subject of an ongoing criminal investigation by the United States Secret Service. It is requested that any and all Staminus Communications records (including; Real name, Screen names, Status of Account, detailed billing logs, date account opened and closed, method of payment, and detailed billing records) regarding the identification of the following account be preserved pending the issuance of a subpoena for those records. You are also requested not to disclose the existence of this request to the subscriber or any other person, other than as necessary to comply with this request.

It is further requested that subscriber information pertaining to the identity of the member who used the below listed IP addresses at the below listed time be preserved pending the issuance of a subpoena.

72.20.36.200	2013/01/19 @ 17:22:08 UTC
72.20.18.246	2013/01/29 @ 16:28:24 UTC
72.20.36.150	2013/01/31 @ 17:12:37 UTC
72.20.18.232	2013/02/01 @ 02:05:39 UTC

If you have any questions, please contact Special Agent Jayson Smith at 202-406-8051.

Very Truly Yours,

David Beach
Special Agent in Charge
Washington Field Office

This page intentionally left blank

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MARYLAND

IN RE:

Hewlett Packard Mini
Serial Number CNU8460HTS

Tom Tom GPS
Serial Number N14644

Mio Moov M400 GPS
Serial Number BVS9AM07413

*
*
*
*
*
*
*
*
*

CASE NO.

AFFIDAVIT IN SUPPORT OF SEARCH AND SEIZURE WARRANTS

I, Philip Soto, being duly sworn, depose and say that:

Introduction

1. I am a Special Agent with the United States Secret Service (USSS) and have been employed in that capacity since April 2005 and am currently assigned to the United States Secret Service Metro Area Fraud Task Force. My responsibilities include the investigation of violations of United States currency laws, including counterfeiting, money laundering, financial fraud, and forgery of United States securities. My responsibilities also include the investigation of criminal violations of identity theft, access device fraud, mail and wire fraud, and advance fee schemes.

2. The information contained in this affidavit is based upon my personal observations and investigation, on information provided to me by other local police and federal agents involved in this investigation, and information provided by officers and investigators employed with other financial institutions. This affidavit does not contain every detail of every aspect of this investigation, but rather sets forth those facts that I believe are necessary to demonstrate probable cause to search the locations and seize the property described below.

3. Based upon the investigation I conducted, I believe that the facts set forth in this affidavit establish that there is probable cause to believe that within the Eastern District of Virginia and elsewhere, JOEL UZODINMA (“UZODINMA”) knowingly transferred, possessed, and used means of identification of other persons without lawful authority, in violation of 18 U.S.C. § 1028A, and knowingly and with intent to defraud conspired to produce, use and traffic in one or more counterfeit access devices and to use and effect transactions with one or more unauthorized access devices issued to another person or persons, in violation of 18 U.S.C. §§ 1029(a)(1), (a)(5) and (b)(2), and that evidence, fruits, and instrumentalities of those offenses, as more fully described in Attachment B to this affidavit, presently are located in the Hewlett Packard Mini laptop computer, serial number CNU8460HTS, the Tom Tom GPS, serial number N14644, and the Mio Moov M400 GPS, serial number BVS9AM07413 which are more fully described in Attachment A to this affidavit. The items to be searched which are listed above are all being held as evidence by the Prince George’s County Police Department under case number
XXXXXXX

Summary of Offense Conduct

4. Based on my investigation, there is probable cause to believe that UZODINMA is involved in a scheme which he purchased information (commonly referred as a “dump”) from internet forums that is necessary to create counterfeit credit cards. Dumps” usually contain credit card and debit card account numbers and personal information of the true card holders to include social security numbers, date of births, and addresses. A “dump” can be re-encoded onto a magnetic stripe on a credit card, gift card, or other card and used as a legitimate credit card would be, but transactions are charged to the person whose information was stolen and fraudulently placed on the new card.

Statements of Facts Supporting Probable Cause

5. On or about March 31, 2010, a Chase Visa card ending in 5743 was used to make a fraudulent purchase at Safeway store #1019, 1624 Belle View Boulevard, Alexandria, VA. I reviewed Safeway's store surveillance video for that date and was able to identify UZODINMA as the individual who made the purchase in question with the credit card ending in 5743.

6. On or about March 31, 2010, Chase Visa card ending in 5743 was attempted to be used to make a fraudulent purchase and a Bank of America Visa card ending in 9959 was used to make a fraudulent purchase at Safeway store #1950, 7451 Mount Vernon Square, Alexandria, VA. I reviewed Safeway's store surveillance video for that date and was able to identify UZODINMA as the individual who made the purchase with the credit card ending in 9959 and attempted purchase with credit card ending in 5743.

7. On or about March 31, 2010, an individual matching UZODINMA'S description and the clothing worn at the previous incidents listed in paragraphs 5 and 6 was observed by the store manager at a Safeway Store, located at 299 South Van Dorn Street, Alexandria, VA. An Alexandria City Police officer stopped the subject and asked for identification. The Alexandria City Police officer was provided a valid Maryland driver's license with the name Joel UZODINMA.

8. On or about May 26, 2010, UZODINMA was arrested by the University of Maryland Police Department on arrest warrants from Fairfax County Police Department related to the incidents listed in paragraph's 5, 6, and 7.

9. On or about June 1, 2010, UZODINMA was interviewed by detectives from the Fairfax County Police Department, which UZODINMA acknowledged being stopped by the Alexandria City Police officer on or about March 31, 2010.

10. On or about June 17, 2010, UZODINMA was arrested by Prince George's County Police Department for Driving on a Suspended License and Possession with the Intent to Distribute Marijuana. At the same time the passenger in the car, Dwayne MORGAN was also arrested for Possession of Marijuana. During the inventory of the vehicle driven by UZODINMA, Prince George's County Police Department recovered numerous items to include a Hewlett Packard laptop computer with a Magnetic Strip Card Reader/Writer (MSR905) attached to the computer. The following other evidence believed to be related to Access Device fraud and Identity Theft was also recovered from UZODINMA's wallet and inventoried:

- a. Two Citibank credit card embossed with Joel Uzodinma and the account numbers ending in 0675, 4653.
- b. Six Bank of America Visa Debit cards embossed with Joel Uzodinma and the account numbers ending in 9671, 4440, 0540, 0540, 6209, 5813.
- c. One Vanilla Visa gift card embossed with the account number ending in 6833.
- d. Bank of America Preferred Customer debit card embossed with the account number ending in 1805.
- e. One Western Union Gold debit card embossed with Joel Uzodinma and the account number ending in 8057.
- f. One Vanilla Visa gift card with serial number 163723587.
- g. Twelve Reload It Prepaid cards ending in the serial numbers 4633, 4641, 4666, 4625, 4617, 4609, 5733, 4658, 5725, 4682, 4674, 4690.
- h. Twenty Visa Travel Money cards embossed with the account numbers ending in 9144, 8323, 7544, 6292, 7879, 8315, 2677, 8476, 9630, 8559, 8299, 9169, 3460, 4385, 8468, 3619, 3452, 8307, 8349, 8331.

The following evidence was recovered and inventoried from MORGAN'S property:

- a. Four Citibank credit cards embossed with Dwayne Morgan and the account numbers ending in 2866, 2368, 2860, and 2867.
- b. Citibank prepaid debit card embossed with Dwayne Morgan and the account number ending in 2931.
- c. Bank of America debit card embossed with Dwayne Morgan and the account number ending in 0005.

11. Through my training and experience, a MSR is used by individuals to re-encode "dumps" onto a magnetic stripe on a credit card, gift card, or other card and used as a legitimate credit card would be, but transactions are charged to the person whose information was stolen and fraudulently placed on the new card. Individuals involved in using re-encoded cards keep re-encoded credit cards, debit cards, and gift cards on their possession either in their wallet, pocket, or vehicle. These individuals also purchase gift cards with the re-encoded cards in the attempt to "launder" the proceeds of their purchases.

Items to Be Seized

12. Based upon my training and experience, I know that these types of crimes are ongoing in nature, and the perpetrators will engage in this activity on a continuing basis. I also know these suspects will often keep evidence, such as stolen credit cards in their computers, wallets, or vehicles for months, even though this property is incriminating. I know computers, printers, scanners, memory devices, skimming devices and related equipment are often used to produce counterfeit credit cards, as well as to store information related to the fraud such as account numbers, names and identifiers for victims, and/or names of associates. Such computer

equipment represents a valuable tool to a fraud suspect and will often be kept in the suspect's wallet, computer, or vehicle for long periods of time, including for months. I also know that it is common for a perpetrator of such a crime to keep the information of such a crime on hand for further use in acquiring fraudulent credit in the name of the victim. I am aware that the names of other victims may be found since perpetrators of this type of crime "churn" or go through several victims. This is done because a financial institution may discontinue the credit on a particular victim when it discovers fraudulent activity. The perpetrator of the crime is then forced to acquire other fraudulent account information in the names of other victims. Suspects may keep this information on hand for months, because it may be used again at a later date or sold to other forgery suspects. I am aware of cases in which suspects have kept information on stolen or fraudulent accounts for over one year. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

13. Based upon my training and experience, I also know that those involved in access device fraud use electronic devices commonly referred to as "skimmers." These devices can fit in the palm of a hand and utilize a magnetic strip reader which captures and records the data contained on a credit card's magnetic strip such as the account holder's name, credit card number and other security features. This data can then be downloaded onto a computer where the data can be viewed, printed, transmitted electronically to another location, or otherwise manipulated. The data can also be uploaded onto a blank credit card's magnetic strip with a magnetic strip writer. The new card can then be used in the same fashion as the original. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

14. Based on my training and experience, I also know that those involved in access device fraud may create or possess false and/or fraudulent identification documents to support

their fraudulent access device usage. I also know that, in order to support their access device scheme, they may possess equipment for producing false and/or fraudulent identification documents, credit cards, debit cards, and stored-value cards. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

15. Based on my training and experience, I also know that those involved in access device fraud may use personal data obtained from stolen credit card numbers to access financial records of the original cardholders, including credit reports, bank statements, and credit card account information. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

16. Based on my training and experience, I also know that those involved in access device fraud often set up financial relationships with banks, businesses, and other individuals to dispose of, transfer, or hide the proceeds of the access-device fraud. Records of these transactions include, but are not limited to, wire transfers receipts, bank statements, check books and registers, bank checks and receipts, and money order and/or cashier's checks and receipts. I also know that those involved in financial crimes often use safes or lock boxes to store documents and sensitive information related to the fraud. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

17. Based on my training and experience, I also know that co-conspirators involved in access device fraud use cellular telephones, answering machines, pagers, and/or fax machines to contact one another for purposes of conducting activities related to the conspiracy. Accordingly, I seek authorization to seize such items, as more fully described in Attachment B.

18. Based upon my training and experience, I know that those who fraudulently purchase merchandise from stores and sell the items often ask for cash or gift cards in return to

avoid a trail of financial paper regarding their activities. Accordingly, I seek authorization to seize United States currency and gift cards.

Search of Computers

19. I have spoken with Special Agents assigned to the USSS Electronic Crimes Special Agent Program (ECSAP). The USSS ECSAP is responsible for handling computer forensic examinations. Agents assigned to ECSAP investigate fraud-related activities perpetrated through the use of a computer. Agents assigned to ECSAP receive training in the manufacturing of counterfeit obligations and securities of the United States. They also received intensive training in the field of computer forensics from the United States Customs Service Cyber Smuggling Center in Fairfax, Virginia, the Federal Law Enforcement Training Center (FLETC) in Glynco, Georgia, and private companies that specialize in various software programs.

20. ECSAP Agents know that computer hardware, software, documentation, passwords, and data security devices may be important to a criminal investigation in two distinct and important respects: (1) the objects themselves may be instrumentalities, fruits, or evidence of crime, and /or (2) the objects may have been used to collect and store information about crimes (in the form of electronic data).

21. Computer hardware consists of all equipment which can collect, analyze, create, display, convert, store, conceal, or transmit electronic, magnetic, optical, or similar computer impulses or data. Hardware includes any data-processing devices (such as central processing units, memory typewriters, personal digital assistants (PDAs), and self-contained "laptop" or "notebook" computers; internal and peripheral storage devices (such as fixed disks, external hard disks, floppy disk drives and diskettes, compact disks (CDs), tape drives and tapes, optical storage devices, transistor-like binary devices, and other memory storage devices); peripheral

input/output devices (such as keyboards, printers, scanners, plotters, video display monitors, and optical readers); and related communications devices (such as modems, cables and connections, recording equipment, RAM, ROM units, acoustic couplers, automatic dialers, speed dialers, programmable telephone dialing or signaling devices, and electronic tone-generating devices); as well as any devices, mechanisms, or parts that can be used to restrict access to computer hardware (such as physical keys and locks).

22. Computer software is digital information, which can be interpreted by a computer and any of its related components to direct the way they work. Software is stored in electronic, magnetic, optical, or other digital form. It commonly includes programs to run operating systems, applications (such as word-processing, graphics, or spreadsheet programs), utility compilers, interpreters, and communication programs.

23. Computer-related documentation consists of written, recorded, printed, or electronically stored material, which explains or illustrates how to configure or use computer hardware, software, or other related items.

24. Computer passwords and other data security devices are designed to restrict access to or hide computer software, documentation, or data. Data security devices may consist of hardware, software, or other programming code. A password (a string of alphanumeric characters) usually operates as a sort of digital key to “unlock” particular data security devices. Data security hardware may include encryption devices, chips, and circuit boards. Data security software or digital code may include programming code that creates “test” keys or “hot” keys, which perform certain pre-set security functions when touched. Data security software or code may also encrypt, compress, hide, or “booby-trap” protected data to make it inaccessible or unusable, as well as reverse the process to restore it.

25. Based upon my knowledge, training and experience, and based upon conversations with Agents assigned to the USSS ECSAP, I know that searching computerized information for evidence, fruits, or instrumentalities of crime commonly requires agents to seize most or all of a computer system's input/output peripheral devices, related software, documentation and data security devices (including passwords) so that a qualified computer expert can accurately retrieve the system's data in a laboratory or other controlled environment. This is true because the peripheral devices, which allow users to enter or retrieve data from the storage devices, vary widely in their compatibility with other hardware and software. Many system storage devices require particular input/output (or "I/O") devices in order to read the data on the system. It is important that the analyst be able to properly re-configure the system as it now operates in order to accurately retrieve the evidence listed above. In addition, the analyst needs the relevant system software (operating system, interfaces, and hardware drivers) and any applications software which may have been used to create the data (whether stored on hard drives or an external media), as well as all related instruction manuals or other documentation and data security devices.

26. Based on the knowledge and experience of the USSS, searching and seizing information from computers often requires agents to seize most or all electronic storage devices (along with related peripherals) to be searched later by a qualified computer expert in a laboratory or other controlled environment. This is true because of the following:

a. Volume of evidence. Computer storage devices (such as hard disks, diskettes, tapes, laser disks) can store the equivalent of millions of pieces of paper containing information. Additionally, a suspect may try to conceal criminal evidence; he or she might store it in random order with deceptive file names. This may require searching authorities to examine

all of the stored data to determine which particular files are evidence or instrumentalities of crime. The sorting process can take weeks or months, depending on the volume of data stored, and it would be impractical and invasive to attempt this kind of data search on-site.

b. Technical Requirements. Searching computer systems for criminal evidence is a highly technical process requiring expert skill and a properly controlled environment. The vast array of computer hardware and software available requires even computer experts to specialize in some systems and applications, so it is difficult to know before a search which expert is qualified to analyze a system and its data. In any event, however, data search protocols are exacting scientific procedures designed to protect the integrity of the evidence and to recover even “hidden,” erased, compressed, password-protected, or encrypted files. Because computer evidence is vulnerable to inadvertent and intentional modification or destruction (both from external sources or from destructive code embedded in the system as a “booby trap”), a controlled environment may be necessary to complete an accurate analysis. Further, such searches often require the seizure of most or all of the computer system’s input/output peripheral devices, related software, documentation, and data security devices (including passwords) so that a qualified computer expert can accurately retrieve the system’s data in a laboratory or other controlled environment.

Conclusion

27. Based upon the foregoing, I believe that there is probable cause to believe that the properties described in Attachment A, which are, the Hewlett Packard Mini laptop computer, serial number CNU8460HTS, the Tom Tom GPS, serial number N14644, and the Mio Moov M400 GPS, serial number BVS9AM07413 contain evidence, contraband, fruits and instrumentalities pertaining to violations of Title 18 U.S.C. §§ 1028A (identity theft) and 1029

(access device fraud), as described in Attachment B. I therefore request that search and seizure warrants be issued for the properties described in Attachment A.

28. I request that this affidavit and the accompanying application be placed under seal. This is necessary to protect the integrity of the ongoing investigation. Premature disclosure of the contents of this affidavit would frustrate this investigation by immediately alerting the subjects of the investigation to the nature of the probe, the techniques employed and the evidence developed to date, and the identities of those providing information.

Philip Soto
Special Agent, U.S. Secret Service

Sworn and Subscribed before me this _____ day of August 2010.

United States Magistrate Judge

ATTACHMENT A
PROPERTY TO BE SEARCHED

1. 1361 Potomac Heights Drive, Fort Washington, Maryland 20744.

1361 Potomac Heights Drive is a town house located in Fort Washington, Prince George's County, Maryland. The town house is a two story building with a red brick front with maroon colored shutters flanking the windows on the front side of the town house. The front door is dark in color; also there is a glass storm door that has white trim and white security bars. The house is clearly marked "1361" above the front door.

2. 1023 Elmcroft Boulevard, Rockville, Maryland 20850.

1023 Elmcroft Boulevard is a condominium located in Rockville, Montgomery County, Maryland. The condominium is a three story building with a light colored aluminum siding. The front door is blue with white trim around the door. The condominium is clearly marked "1023" above the door on a white sign with black numbering.

3. 2002 white Denali, Maryland license plate 28R747, VIN 1GKEK63U82J109552, registered to Joseph A. Bush. [DESCRIPTION]

4. 2006 white Lexus, Maryland license plate 8EGD79, VIN JTHBN96SX65000220 registered to Guisela Deering. [DESCRIPTION]

ATTACHMENT B
ITEMS TO BE SEIZED

All fruits, instrumentalities and evidence of identity theft and access device fraud, in violation 18 U.S.C. §§ 1028A and 1029, for the time period November 2007 through the present, including but not limited to:

1. Information and/or data stored in the form of magnetic or electronic coding on computer media or on media capable of being read by a computer or with the aid of computer related equipment. This media includes, but is not limited to computers, computer diskettes, hard drives, computer components and peripherals, encryption circuit boards, removable cartridges, and other computer related electronic devices, system RAM, tapes, laser and compact disks, video cassettes, thumb drives, removable hard drives and or Universal Serial Bus (USB) drives, cellular telephones, computer software, tapes, disks, digital media, audio tapes and the contents therein, containing the information generated by the aforementioned electronic equipment;
2. Electronic devices which are capable of analyzing, creating, displaying, converting, receiving, or transmitting electronic and or magnetic computer impulses or data. These devices include, but are not limited to printers, plotters and/or optical scanners;
3. Instructions or programs stored in the form of electronic or magnetic media, which are capable of being interpreted by a computer or related components. The items to be seized could include, but would not be limited to, operating systems, application software, utility programs, compilers, interpreters, and any other programs or software used to communicate with computer hardware or peripherals, either directly or indirectly, via telephone lines, radio signal, or other means of transmission;

4. Written or printed material, which provides instructions or examples concerning the operation of a computer system, computer software, and or any related device;
5. Fraudulent identification cards including driver's license and social security cards, counterfeit credit cards;
6. Photocopiers, typewriters, computer disks, cutting boards, laminating machines, laminate sheets, colored ink and blank card stock which could be used to produce counterfeit credit cards and fraudulent identifications;
7. Address and or telephone notebooks, rolodex indices, and any papers, including any computerized or electronic records, reflecting names, addresses and telephone or cellular numbers, pager numbers, fax numbers and telex numbers of financial institutions, and other individuals or businesses with whom a financial relationship exists;
8. Mail, books, records, receipts, notes, ledgers, bank statements and related records, stored value cards, payment device numbers or account numbers of any kind, letters of credit, wire transfers, driver's licenses, identification cards, any computerized or electronic records, relating to financial crimes such as, but not limited to identity theft and access device fraud committed by the individuals identified in the Affidavit;
9. Electronic equipment used to generate, transfer, record, and or store transaction information, such as telex machines, facsimile or fax machines, currency counting machines, telephone answering machines, Personal Data Assistants (PDAs), caller ID terminals, pagers, embossing machines, encoding machines and equipment and their stored information, and related manuals, any and all of which are used in or related to the crimes outlined in the affidavit;

10. All merchandise and goods that may have been purchased with counterfeit or unauthorized credit cards, including but not limited to gift cards, electronics, as well as boxes or other packaging for any such merchandise or goods;
11. Any items immediately recognizable as contraband to include documents identifying known or potential victims, or items determined to be associated to the investigation and thus subject to seizure;
12. Any safe, lock-box, compartment, or receptacle where the evidence, fruits, or instrumentalities described in the affidavit or this attachment could be hidden;
13. Records identifying the residents and/or owners of 1361 Potomac Heights Drive, Fort Washington, Maryland 20744, 1023 Elmcroft Boulevard, Rockville, Maryland 20850, a white 2006 Lexus and a white 2002 Denali, including but not limited to utility bills, telephone bills, mail, mortgage, deed, registration, title, lien records, and keys.

APPENDIX D

This page intentionally left blank.

Bloodstain patterns in fire scenes

Amy Michaud, Leanora Bender
Forensic Chemist
Bureau of Alcohol, Tobacco,
Firearms and Explosives



Bloodstain pattern interpretation

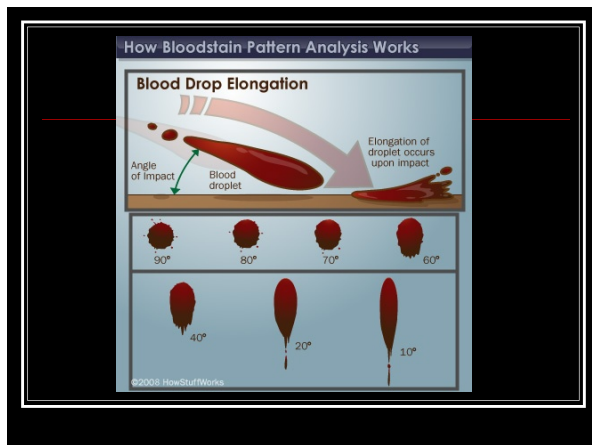
- A blood stain is simply a deposit of blood on a surface.
- Bloodstain pattern interpretation involves looking at blood drops and blood stains to assist in reconstructing a crime scene.
- There are a number of different bloodstain patterns to look for.

Types of bloodstain patterns

- Impact
- Contact or transfer patterns
- Wipes and swipes
- Cast-off
- Gun-shot
- Projected blood (arterial spurting)

Impact pattern

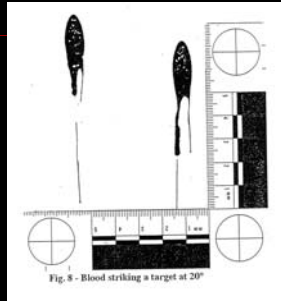
- **Impact patterns occur when there are two or more blows to a person (it always takes one blow to bring the blood to the surface if the person is not bleeding already).**
- **The blood drops will be shaped round to elliptical depending upon the angle which the blood hits the surface.**



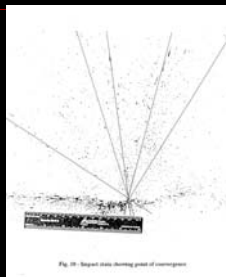
Impact pattern (con't)

- **The direction of the blood droplet can be determined by its appearance. Think of it as a tadpole 'swimming' back to the origin.**

Origin is at the top of the screen



One contact site



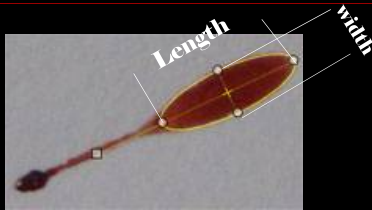
Two contact sites



How do you figure the convergence point in space?

- Trigonometry!! (did you ever think you would use it out of high school trig class??)
- Calculate the inverse sine of the width of the droplet divided by the length of the droplet.
- That gives you the angle of incidence shows you where in space the impact site was located.

W/L = Angle of Incidence



If W=0.25 and L=1.0 the inverse sine is 14.5 degrees.



....and note.....

- If there is clotted blood in the blood drops, this means that the bloodgeoning stopped for a few minutes (time in which the blood clotted) then began again, this time spattering clotted blood into the impact pattern.

Contact or transfer pattern

- This occurs when a bloody object is placed on a clean surface.

Contact or transfer pattern



Wipes

- A wipe is a pattern that occurs when an object moves through an existing stain.



Swipes

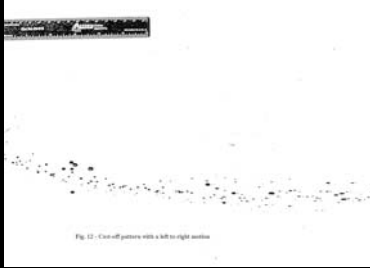


- A swipe is a pattern that occurs when a bloody moving object deposits blood onto a previously unstained surface.

Cast-off

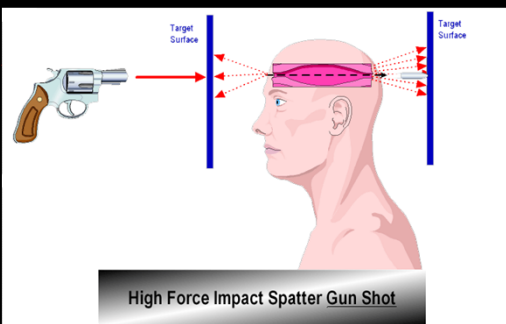
- Cast-off stains occur when blood drops are flung or cast from an object as a result of motion creating a series of stains in an arc pattern.

Cast-off



Gun-shot pattern

- **Gun-shot pattern bloodspatter is characterized by drops that look like a fine mist and that radiate out into a cone-shaped pattern.**



Gun-shot pattern

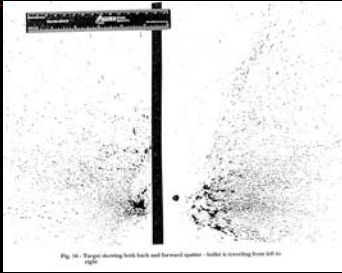


Fig. 16. Target showing both back and forward spatter - bullet is travelling from left to right.

Projected blood

- Projected blood, usually in the form of arterial spurting, results from blood exiting the body under pressure from a breached artery.

Arterial spurt



For more information:

- Useful websites for information on bloodstain patterns are:
 - www.hemospat.com
 - <http://www.ameslab.gov/mfre/rd>
 - Go to 'bloodstain pattern analysis video collection'.

BLOODSTAIN PATTERN CASE STUDIES

Case #1

- An elderly man was found dead in his house, beaten to death.
- From the bloodstain pattern analysis, the investigators could tell where the beating started, that the beating stopped then started again, and that the victim had been moved.





Conclusion

- Because the victim was rolled over and the belt was flipped, the victim's belt was examined and the suspect's fingerprint was found on the belt.
- The fingerprint belonged to the victim's caregiver.
- A window, that was broken in to make the crime look like a home invasion, had a latent impression of the caregiver's footwear on it.

Case study #2

- A stabbing took place in a residence then the building was set on fire.
- After the fire is extinguished, the fire investigator notices footwear impressions on the floor in a black substance.









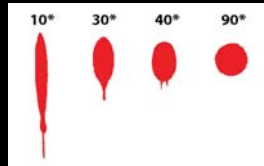
Is it blood?

- The boards were exposed to water (essentially rinsed) and the blackened footwear remained.
- The aforementioned research shows that heat and soot seem to 'set' the blood, the blackened footwear was tested for the presence of blood and it was positive.

Distinguishing possible blood from the suspect

- Since most of the blood is from the victims, is there a way to determine if any of the blood is from the suspect?
- Many times during a stabbing, the knife slips and the perpetrator cuts their own hand.
- The bloodstains from the suspect would most likely be the 90° pattern - passive drops.

- So, since the bloodstains from the suspect would likely be ~90° stains, rounded stains were found and collected for analysis.







Conclusion

- The suspect confessed to the stabbing and subsequent arson.

Chemical Enhancement Techniques of Bloodstain Patterns after Fire Exposure

Kyle Hoskins, Tani Watkins (ret.)
(Michigan State Police)
Kary Tontarski (Montgomery
County)
Amy Michaud, Lee Bender (ATF)

The Questions

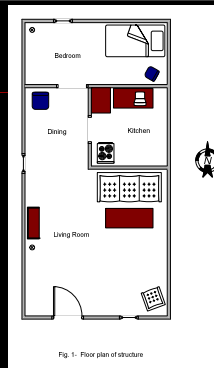
1. Can bloodstain interpretation be done after a fire?
2. Which, if any, presumptive tests for blood work in a post-fire situation?
3. Can DNA analysis be done on blood exposed to heat damage from a fire?

Types of Presumptive Tests for blood used

- **Luminol**
- **Blue Star**
- **Fluorescein with alternate light source**
- **Hemastix**
- **Phenolphthalein/Tetramethyl Benzidine**

The Scene

- **One bedroom house**

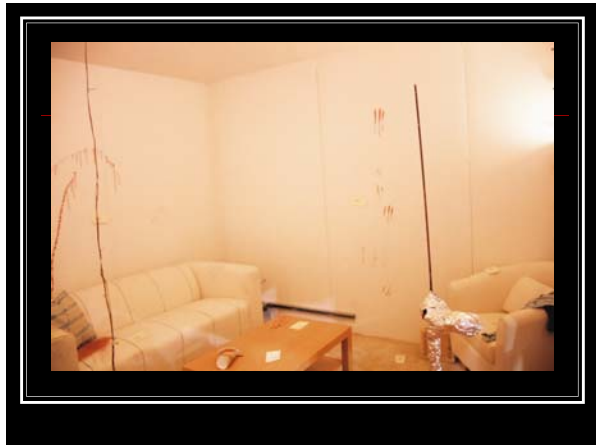


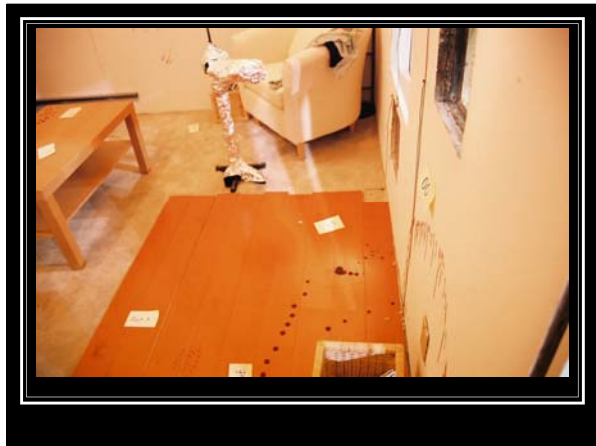
Living room



FIRE INVESTIGATION: FORENSIC EVIDENCE







Dining room

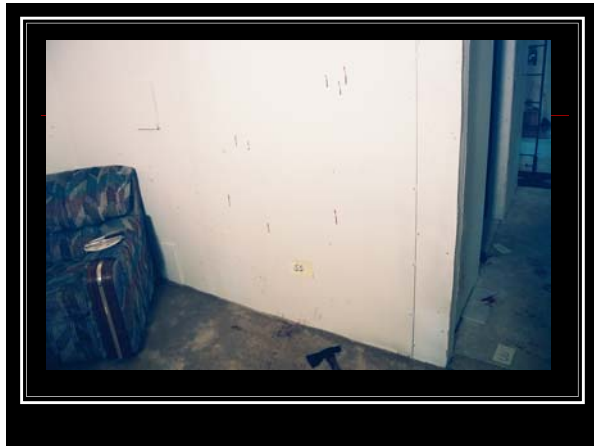




Bedroom



FIRE INVESTIGATION: FORENSIC EVIDENCE



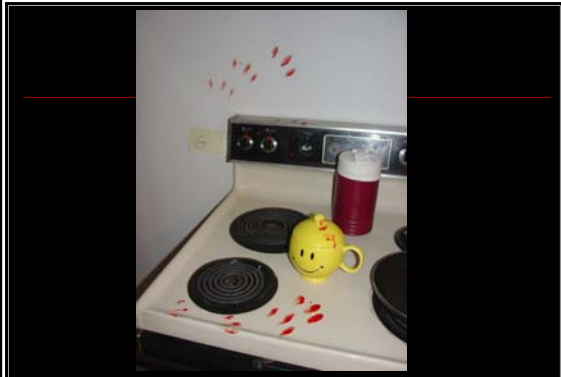




Kitchen









Burnin' down the house





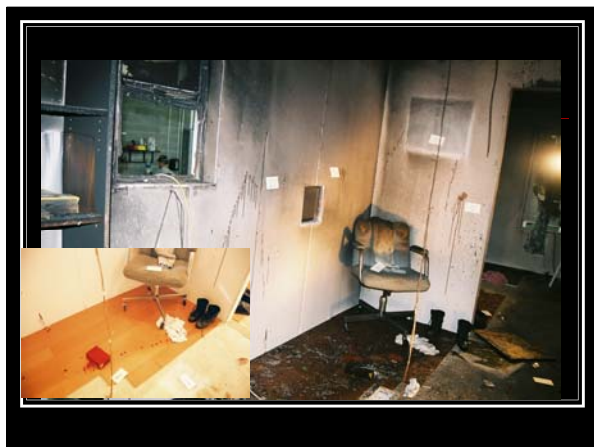
After the Burn

Living room





Dining room



FIRE INVESTIGATION: FORENSIC EVIDENCE





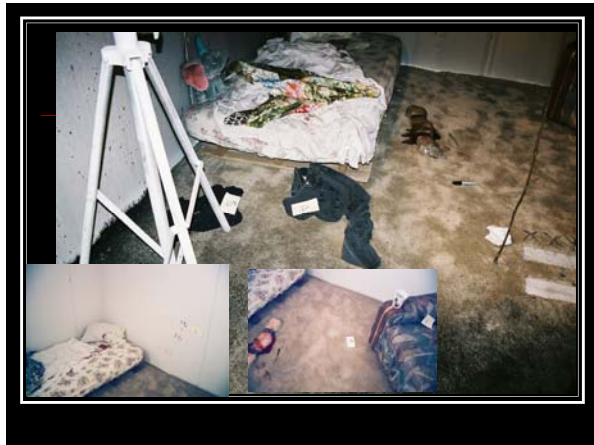


Bedroom



FIRE INVESTIGATION: FORENSIC EVIDENCE













Footwear from Bedroom



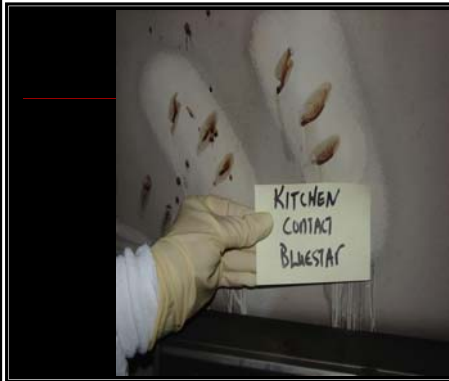


Rinsing soot off of stain with water





**Wiped soot off of
contact stain and
treated it with
Blue Star**





The Answers

Can bloodstain interpretation be done after a fire?

- Yes, but
 - 1: the surface must still be intact.
 - 2: you have to be able to find the stain.
- If the stains are fine or covered with a lot of soot, they will be easy to miss.
- Unfortunately, presumptive tests for blood that will help visualize hard-to-see stains may be inhibited by the soot because the soot will physically cover the bloodstains preventing the presumptive test from reaching the stain.

Which, if any, presumptive test for blood works in a post-fire situation?

- All seemed to work most of the time.
- The problem is the soot from the fire covers the blood and physically blocks out the application of the enhancement chemicals.
- The good news is that the heat 'sets' the blood and you can wipe it with an alcohol wipe or water then perform the presumptive test.

Can DNA analysis be done on blood exposed to heat damage from a fire?

- Yes, as long as the temperature is under ~800° C.
- Stains which you suspect are blood but test negative for a presumptive test should be cut out and submitted for DNA.
 - Some of the samples tested (-) for presumptive tests but gave a full/partial DNA profile and vice versa
- Method of collection: both cuttings and swabbings of a sample are recommended if possible.

TRACE EVIDENCE

What is trace evidence

- Paint
- Glass
- Tape
- Fibers
- Hairs
- Other unknown substances

Paint Evidence



Sawed portion of pipe bomb

- Paint comparisons are done primarily on automotive, or architectural paint; however, anything with a painted surface can be compared (e.g. tools, pipe bombs, safes).
- A Q & K paint can be compared in color, layering, chemical composition, & elemental composition.
- In rare instances, a positive association can be made with a physical match.



Hack saw from suspect residence

Paint Evidence



Spray paint

- Vandalism
- ELF/ALF cases
- Pipe bombs



Glass Evidence

- Q & K glass can be compared in color, thickness, optical properties & elemental composition.
- Positive associations may be made with a physical match.



Tear in handle with glass particles



Glass Evidence

- When glass breaks, most of the glass goes in the direction of the force, but some will fly back onto the person breaking the glass.
- Suspect shoes, clothing, and on the suspect themselves (such as their hair) are good places to find questioned glass.



Glass Breakage

- If glass was broken by impact we can determine if it was broken from the inside or outside of the window.

This is done by looking at the edges of the radial cracks.



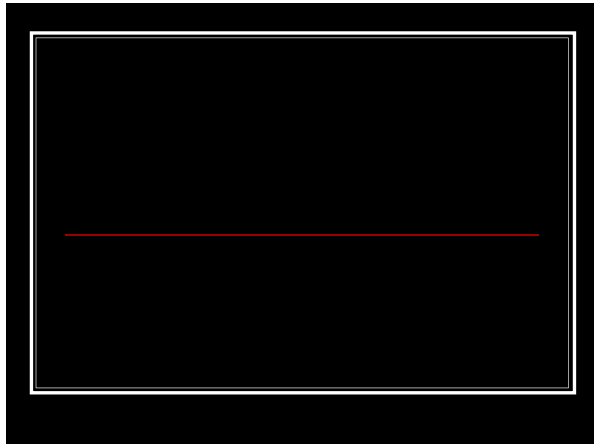
Arrow shows side of force

Tapes

- Tape is **frequently** encountered in bombing and arson cases:

- Duct tape
- Electrical tape
- Masking tape
- Scotch tape
- Packing tapes
- Fabric/medical tapes





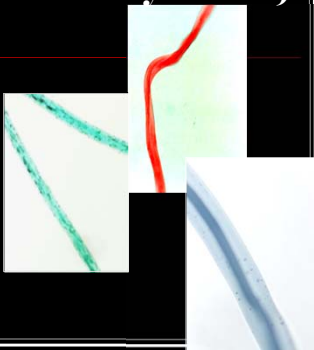
Tape Comparisons

- If a physical match is not possible then a comparison of the physical, elemental and chemical characteristics of the backing, adhesive, and fibers (if present) is done

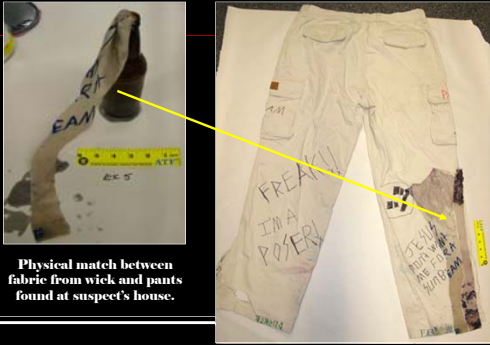


Fibers (Natural and Synthetic)

- Q & K fibers can be compared in color, cross sectional shape, microscopical properties & chemical composition.



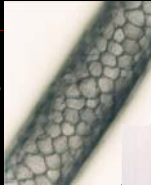
Fabric Comparisons



Physical match between fabric from wick and pants found at suspect's house.

Hair Evidence

- Hair is examined by microscopy:
- Is it a hair?
- Is it human or Animal?
- What race is the individual?
- What area of the body did it come from?
- Does it show damage, disease, or cosmetic treatment?
- Is it suitable for comparison?
- Does it match the suspect/victim?
- Is it suitable for nDNA or mtDNA?



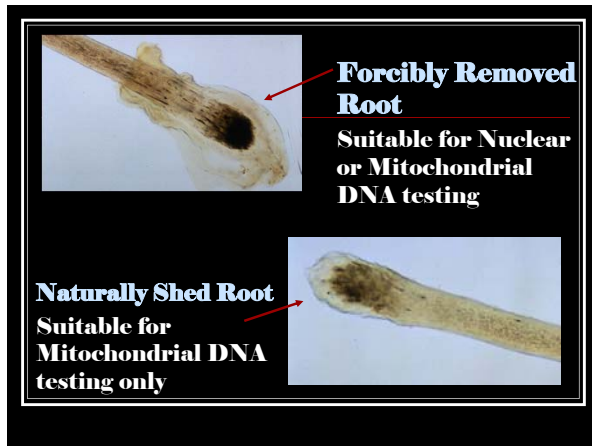
Deer

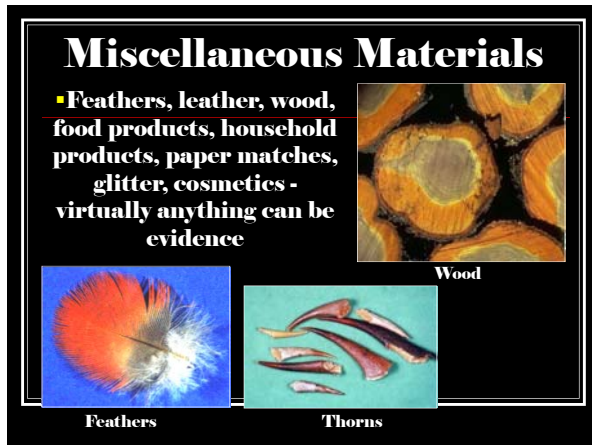


Natural Red Head

Singed Hair









Serial church fires in Texas



Dover Baptist Church, Smith County, TX

- The string of fires damaged or destroyed 10 churches across three counties in Texas, including Smith, Henderson and Van Zandt.
- The fires were set with available materials (no accelerants used).
- The investigators collected items to be examined for DNA, trace evidence, and footwear/tire track impressions.



Russell Memorial United Methodist Church,
Willis Point, Texas



- Trace evidence, including glass and paint, were submitted as evidence
- Footwear and tire track casts and photos were submitted for comparison

- The investigators thought that the arsonists used paint to try and start one of the fires.
- The known paint from the paint can lid was compared to paint recovered from one of the suspect's jacket and from vacuum sweepings from his car.





- Glass found in the suspect's clothing and shoes, and the vacuum sweepings from the car was compared to known glass from the churches.



Questioned footwear impressions consistent with the 'Sketchers' shoes were recovered from many of the fire scenes. Investigators took photos and made dental stone casts of these impressions. The 'Sketchers' belonged to Bourque. Footwear matches were made from two of the casts, positively associating the questioned impressions with the shoes.



Jason Bourque



Questioned footwear impressions consistent with the 'Red Wing' boots were also recovered from many of the fire scenes. Investigators took photos and made dental stone casts of these impressions. Although no positive footwear matches could be made with any of the questioned impressions and the Red Wing boots, the boots were consistent in tread design, size and orientation of the tread with the boots. The boots belonged to McAllister.



Daniel McAllister

A cast was made of a tire track found at one of the churches. A tire database was searched and the tread design was found to be consistent to a Goodyear Wrangler AT/S.



Other evidence submitted:



- Barbed wire with automotive paint.
- Broken headlamp housing (later identified as coming from a Ford F-series truck).
- A brick and a rock from two of the fires submitted for DNA analysis.
 - The brick contained a partial profile and the rock contained a full profile of one of the suspects.

Conclusion

- The two suspects confessed and have been sentenced.
- The footwear and the DNA were the only items of evidence linking the suspects. The paint, glass, tire impressions, barbed wire and Ford headlamp assembly turned out to be unrelated to the arsons.

Questions?



APPENDIX E

This page intentionally left blank.

Fire Related Deaths and Injuries: The Use of Toxicological Data in Fire Origin and Cause Determination

Dr. Jamie McAllister, P.E., C.F.I.

Combustion Science & Engineering, Inc.
8490 Old Annapolis Road, Suite L
Columbia, MD 21045



Outline

- Forensic Toxicology
- Key Fire Toxicants and Their Effect on Victims
- The Fire Victim as the Data Collector
- Victim Documentation & Burn Injuries
- The Autopsy Report
- Stewart-Peterson Equation
- Case Studies
- Interpretative Considerations



What is Forensic Toxicology?

Toxicology: The study of poisons; ADME



Forensic Toxicology: The application of toxicology for the purposes of the law



Three major subfields:

- Human Performance (Behavioral responses under the influence of a drug)
- Drug Testing (military, DUI/DWI, workplace, sports)
- **Postmortem**

- Samples: urine, blood, vitreous, bile, liver, and various other tissues
- Analytical methods include Spectrophotometry, Chromatography, Immunoassay, etc.



Death Investigation in the United States

Coroner	Medical Examiner
– Elected by the people or appointed by the governmental authority – Specific training or experience in medicine is not required	– Appointed by Health Department – Must be a physician (usually a pathologist) trained in forensic medicine



Key Fire Toxicant: Carbon Monoxide

- Carbon monoxide (CO) is produced in every hydrocarbon fire in varying amounts.
- 75-80 % die from carbon monoxide poisoning rather than thermal injuries



Key Toxicants of Interest: Carbon Monoxide



Carboxyhemoglobin (COHb) Levels: Carbon Monoxide Effects	
0-10 %	Normal, shortness of breath with vigorous exercise
10-20%	Headache, flushed skin, shortness of breath with moderate exercise
20-30%	Headache, throbbing temples, irritability, emotional instability, impaired judgment, memory impairment, rapid fatigue
30-40%	Dizziness, weakness, nausea, vomiting, severe headache, visual disturbances, confusion, incapacitation*
40-50%	Intensified symptoms, hallucinations
>50%	Syncope, coma, tachycardia, convulsions, loss of reflexes, respiratory paralysis, death

*Victim is unconscious but still breathing; victim is no longer capable of self-preservation

Combustion Science & Engineering, Inc.

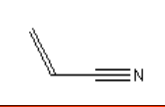
Washout of CO in the blood

- The half-life of carbon monoxide in the blood is effected by the concentration of oxygen in the air
- At 21% O₂, the half-life of O₂ is 4-5 hours
- At 100% O₂, the half-life is 45-90 minutes
- At Hyperbaric O₂, the half-life is 20-30 minutes

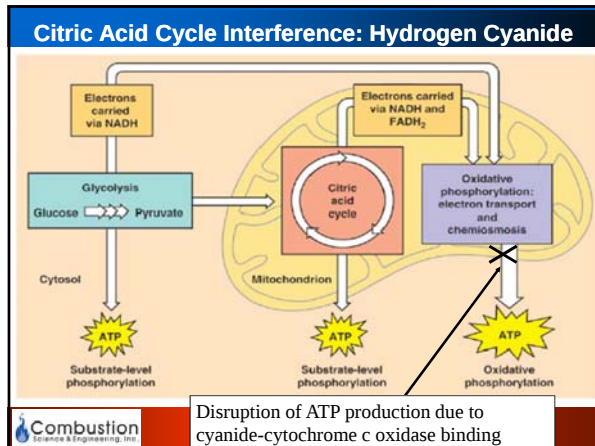
Combustion Science & Engineering, Inc.

Key Lethal Toxicant: Cyanide

- **Hydrogen Cyanide (HCN):** Produced during the combustion of nitrogen containing fuels: polyurethane, polyacrylonitrile (ABS), wool, nylon, silk, urea formaldehyde



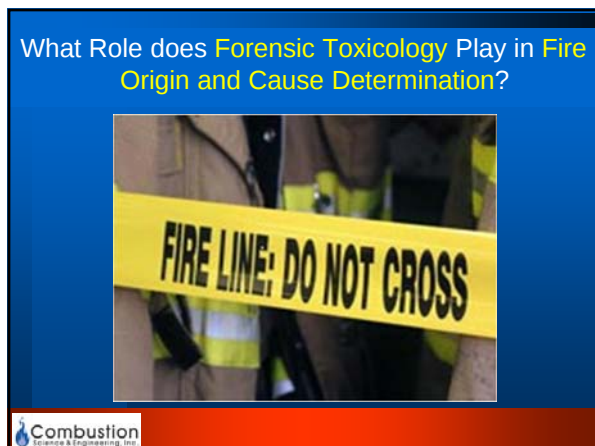
Combustion Science & Engineering, Inc.



Blood Cyanide Levels & Effects

Range (mg/L)	Effect
<0.25	Normal
0.25<CN<2	Potentially Toxic (Incapacitating)
>2-3	Potentially Lethal

- Above 180 ppm, unconsciousness occurring within a few minutes
- Above 300 ppm, death occurring rapidly

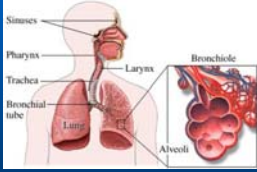


Fire Victim = Data Collector

Characterizing a fuel:
Temperature, Heat Flux, Combustion Gases



Data Collector:
Collecting products of combustion
Capturing temperature data on skin

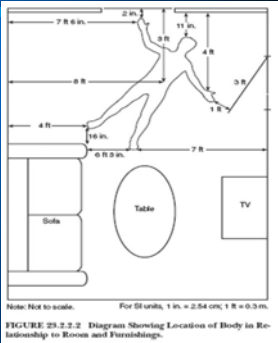


Combustion
Science & Engineering, Inc.

Documentation of the Victim

Photographic & Diagrammatic

- Location of body
 - On bed; next to doorway or window
- Position of the body
 - supine or prone
- Items found with or near the body
 - Drug paraphernalia
 - Cigarettes
 - Alcohol
 - Extinguisher



Combustion
Science & Engineering, Inc.

Documentation of the Victim

- Debris On or Underneath the Body
 - Items preserved or burned underneath the body
 - Victim passed out before drop down or other indicators of fire progression
- Clothing on the body
 - Manufacturer and material type
 - Areas of preservation
- Burn patterns on the clothing and body



FIGURE 15.2.6.9 Protected Area Where Body Was Located.

Combustion
Science & Engineering, Inc.

Documentation of the Victim

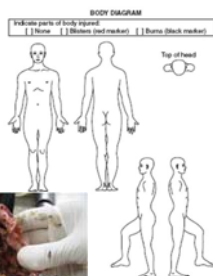
- Documentation of the victim does NOT stop at the scene
- Attend the autopsy
 - Toxicology
 - Airway and skin damage
 - Presence or absence of soot
- Remember that the pathologist is NOT a fire expert



BODY DIAGRAM

Indicate parts of body injured:

[] None [] Blister (red marker) [] Burns (black marker)



Combustion
Science & Engineering, Inc.

Burn Injuries

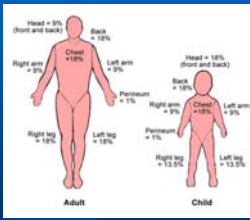
- **First Degree:** Reddening of Skin
- **Second Degree:** Blistering
- **Third Degree:** Full-Thickness
- **Fourth Degree:** Charring and underlying tissue damage




Combustion
Science & Engineering, Inc.

Estimating Burn Injuries

Rule of Nines



Adult

- Head (front and back) = 9%
- Chest = 18%
- Right arm = 9%
- Left arm = 9%
- Perineum = 1%
- Right leg = 18%
- Left leg = 18%
- Back = 18%

Child

- Head = 18% (front and back)
- Chest = 18%
- Right arm = 9%
- Left arm = 9%
- Perineum = 1%
- Right leg = 13.5%
- Left leg = 13.5%
- Back = 13.5%

Rule of Palms

Victim's palm is equal to 1% BSA.



Combustion
Science & Engineering, Inc.

Burn Injuries

- Blistering (2nd Degree)
 - 11 seconds at 10 kW/m²
 - 5 seconds at 20 kW/m²

Combustion Science & Engineering, Inc.

Burn Injuries

Combustion Science & Engineering, Inc.

Burn Injury Scenario

You investigate a fire and determine the area of origin to be the doorway of a first floor bedroom. One decedent in inside the bedroom. Laboratory results indicate the presence of a flammable liquid. Your main suspect, Mr. X, denies setting the fire. He states that he was asleep in a 2nd floor bedroom and awoke to find a fire in the first floor bedroom; Flames reached the top of the doorway according to Mr. X. He stated that he attempted to extinguish the fire and got within 4 feet of the flames. He, then, exited the house and called 9-1-1. Ambulance crews assessed Mr. X and found no evidence of burn injuries.

Combustion Science & Engineering, Inc.

Burn Injury Scenario

What information would need to be collected in order to determine if Mr. X would have received burn injuries?

- 1) Diameter of the pool fire (20 inches)
- 2) Height of the flames (78 inches)
- 3) Distance of Mr. X from the fire (4 feet)

- $Q = 389 \text{ kW}$ (X-mas Tree is about 1000 kW)
- $q = 6.25 \text{ kW/m}^2$
- **Conclusion:** Mr. X would have received 2nd degree burns in less than 20 second of exposure to the fire.



References for Burn Injuries

- SFPE Engineering Guide: Predicting 1st and 2nd Degree Skin Burns from Thermal Radiation, Society of Fire Protection Engineers, March 2000.
- D. Purser, Assessment of Hazards to Occupants from Smoke, Toxic Gases, and Heat, The SFPE Handbook of Fire Protection Engineering, Chapter 6, Section 2, 4th Edition.
- D. Icove and J. DeHaan, Forensic Fire Scene Reconstruction, Second Edition
- J. DeHaan, Kirk's Fire Investigation, Sixth Edition.
- NFPA 921: Guide to Fire and Explosion Investigation, 2011 Edition.



The Autopsy Report: Understanding Key Toxicants, Thermal Injuries, and Their Significance

PATHOLOGIC DIAGNOSES
Elderly white female resident of a health care center, a victim of a building fire:
Approximately 20% total body surface area suffering 1st to 2nd degree thermal injuries.
Large amount of soot material in the airways
Postmortem carboxyhemoglobin level 82%



The Autopsy Report: What can we learn?

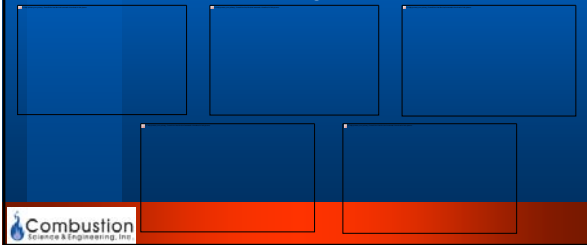
Toxicants found in the blood of victims can provide data points related to:

- Types of materials that were burning at the time the victim(s) died
- Victim's location with respect to the origin of the fire
- Stage of fire at the time the victim(s) died
- Effect of alcohol and illicit and prescription drugs on ability of victim to escape from a fire



Type of Material Burning

- Produced during the combustion of nitrogen containing fuels: polyurethane, polyacrylonitrile (ABS), wool, nylon, silk, urea formaldehyde



Victim's location with respect to the origin of the fire



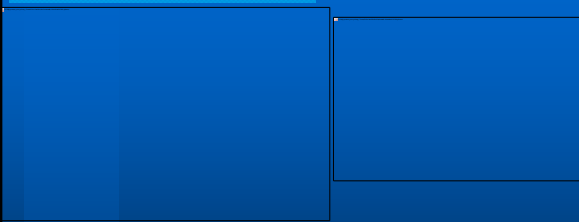
At approximately 250 seconds:

- Compartment becomes thermally untenable (~180°C)
- CO creation has not reached even 0.05% (500 ppm).

Accordingly, in an armchair fire, the thermal environment becomes untenable prior to the creation of sufficient CO to cause incapacitation.



Victim's location with respect to the origin of the fire



Compartment becomes **thermally untenable*** prior to significant production of CO

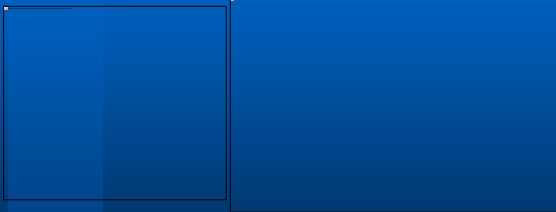
*Tenability refers to the timeframe during which the environment remains survivable

2 W/cm² (20 kW/m²) is sufficient to cause severe burns and death by thermal exposure alone



Stage of fire at the time the victim died

Carbon monoxide and hydrogen cyanide → products of incomplete combustion → ventilation dependent

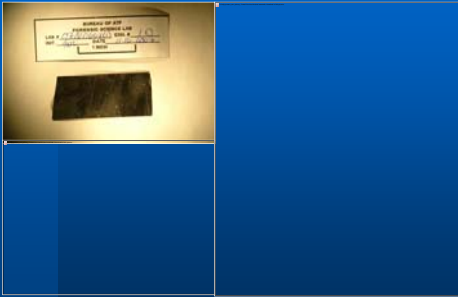


- Well-ventilated fires can produce a few hundred ppm of CO.
- Under-ventilated or post-flashover fires can produce 10,000 -100,000 ppm.



Victim's location: Locally Under-Ventilated Fires

What else can be considered a "room"?





Victim's location: Locally Under-Ventilated Fires

- Localized fire in a nightstand
- Small plastic cased heater under nightstand
- Remains of clothing were charred into the heater



*Photographs courtesy of Ross Brogan

Victim's location: Considerations

COHb = 67%



*Photographs courtesy of Ross Brogan

Physiological Model Inputs

- Emergency Medical Service (EMS) reports
 - O2 treatment history
- Emergency room records for all fire victims
 - Including toxicology and treatment history
- Autopsy reports on all victims from the fire loss
- Doctors, employment or driver's license records documenting ante-mortem weight
- Carbon monoxide production
- Exposure duration from timeline development
 - Detector response times
 - 911 call
 - FD department arrival and observations
 - Other occupants



Stewart Equation

$$\%COHb = (3.317 \times 10^{-5})(ppm\ CO)^{1.036}(RMV)(t)$$

ppm CO = CO concentration (ppm)
RMV = volume of air breather per unit time (L/min)
 8.5 L/min (resting)
 25 L/min (light work, e.g. walking)
 50 L/min (heavy work, e.g. running)
t = exposure time (min)

Limitations

- Assume linear uptake
- Good for short exposures at high concentrations (less than one hour)



CFK – Stewart Comparison

You are investigating a living room fire. There is one decedent who was located in the bedroom. Based on the location and position of the body, it appears that the victim never left her bed. After reviewing the autopsy report, you find that the decedent had a COHb level of **64%**. The medical examiner reports that the decedent had no thermal burns to posterior and non-life threatening burns on her anterior, consistent with her never having left the bed. You develop a timeline of events, and estimate that the decedent was exposed to CO for approximately **10 minutes**. What level of CO would result in the decedents COHb level?



CFK – Stewart Comparison

$$\%COHb = (3.317 \times 10^{-5})(ppmCO)^{1.036}(RMV)(t)$$

$$ppmCO = (\%COHb / (3.317 \times 10^{-5}) (RMV)(t))^{0.96525}$$

$$ppmCO = (64 \% / (3.317 \times 10^{-5})(3.5)(10))^{0.96525}$$

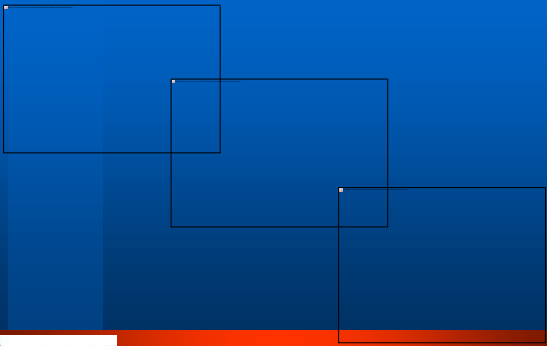
$$ppmCO = 16,000\ ppm$$


Physiological Modeling References

- D. Purser, Assessment of Hazards to Occupants from Smoke, Toxic Gases, and Heat, The SFPE Handbook of Fire Protection Engineering, Chapter 6, Section 2, 4th Edition.
- R. Coburn, Considerations of the Physiological Variables That Determine the Blood Carboxyhemoglobin Concentrations in Man, Journal of Clinical Investigation, Vol. 44, No. 11, 1965
- J. Peterson, Predicting the carboxyhemoglobin levels resulting from carbon monoxide exposure, Journal of Applied Physiology, Vol. 39, No. 4, October 1975.
- D. Icove and J. DeHaan, Forensic Fire Scene Reconstruction, Second Edition
- NFPA 921: Guide to Fire and Explosion Investigation, 2011 Edition.

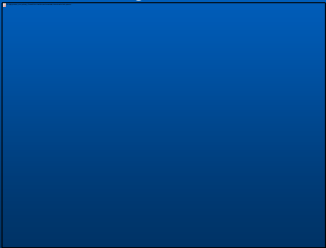


Case Study



Case Study

- Three victims of a house fire and one survivor
- Survivor in basement, alerted by a smoke detector, exits through the rear door, observes heavy smoke and orange glow in the area of the living room/bedroom
- 75% engulfed in flames when firefighters arrived



Case Study #1

- One victim (age 45) was found on the floor by firefighter in the dining room/living room area of the home
- Two victims (ages 75 and 5) were found by firefighter on floor in bedroom area of the home





Case Study

- Survivor states that mother routinely fell slept on couch
- Survivor states that mother was on couch watching television when he went to bed
- Based on witness statements and burn damage investigators develop two hypotheses:
 - Living Room: open flame from candle or overloaded circuit ignites couch
 - Bedroom: heater placed in close proximity to bedspread



Autopsy of Victims

- Victim #1 (45 Y/O/F) found in living room
 - COHb = 25 %
 - CN = 0.14 mg/L
- Victim #2 (75 Y/O/F) found in bedroom
 - COHb = 80%
 - CN = 2.5 mg/L
- Victim #3 (5 Y/O/M) found in bedroom
 - Autopsy not performed due to initial transport to hospital



Case Study : What Do We Know?

- Victims never appear to have left their respective rooms, so exposures occurred within those rooms
- Research supports that fire would have quickly transitioned to a flaming fire if heater ignited the bedding material
- Door to hallway was open so fire would not have gone under-ventilated
- The thermal environment in bedroom would have been untenable before sufficient CO was produced to raise her level of 80%
- Fire did not start in the bedroom

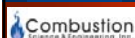


Autopsy Report Evaluation Exercise



Interpretative Considerations

- The investigator must consider the dynamics of the fire when evaluating the toxicological data.
 - Did room go to flashover, and if so, when?
 - Was fire under-ventilated or smoldering?
- Accuracy of Toxicological Analysis
 - Method used for testing
 - Condition of the sample
 - Validation techniques
- Additive effects of toxicants and other drugs such as alcohol
- Smoker (4-8% baseline) or non-smoker (1-2% baseline)
- Movement or Actions of Individual During Fire Development
- Infant, Child and Adult Respiratory Differences



Interpretative Considerations

- Carbon Monoxide is stable post-mortem
- Cyanide has been shown to decrease/increase over time in vivo and in vitro
 - Increases due to Bacteria, breakdown of sugars, Vitamin B12 (Cyanocobalamin)
 - Losses due to release from sample
 - The original value of cyanide at the time of death is not always comparable to the value at the time the blood is analyzed.



Final Thoughts

- Victim tells us a story about the fire
- Autopsy data is an essential component of the data collection phase of the Scientific Method
- The use of fire victim toxicology data **MUST** be combined with all the facts of the case



ACRONYMS

This pager intentionally left blank.

ACRONYMS

3-D	three-dimensional
AFIS	Automated Fingerprint Identification System
amu	atomic mass unit
AOAC	Association of Official Analytical Chemists
ASCLD	American Society of Crime Laboratory Directors
ASTM	American Society for Testing and Materials
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
ATP	adenosine triphosphate
CFEI	Certified Fire and Explosion Investigator
CFI	Certified Fire Investigator
CODIS	Combined DNA Index System
DUI	driving under the influence
DVR	digital video recorder
DWI	driving while intoxicated
F-ABC	Fellow of the American Board of Criminalistics
FAME	fatty acid methyl ester
FID	flame ionization detector
FI: E	“Fire Investigation: Essentials”
FQS	Forensic Quality Service
GC/MS	gas chromatography/mass spectral
GSR	gunshot residue
HCN	hydrogen cyanide

HPD	heavy petroleum distillate
IAFIS	Integrated Automated Fingerprint Identification System
IDLH	immediately dangerous to life and health
IG	Instructor Guide
IL	ignitable liquid
ILRC	Ignitable Liquids Reference Collection
lbs	pounds
LD	Lethal Dose
LFL	lower flammable limit
LPD	light petroleum distillate
MEK	methyl ethyl ketone
MPD	medium petroleum distillate
NFA	National Fire Academy
NFPA	National Fire Protection Association
NIBIN	National Integrated Ballistic Information Network
PPE	personal protective equipment
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
SM	Student Manual
SOP	standard operating procedure
SPME	Solid Phase Microextraction
STEL	short-term exposure limit

STLC	short-term lethal concentration
TLV	threshold limit value
T/SWGFEX	Technical/Scientific Working Group of Fire and Explosives
UFL	upper flammable limit
VHS	video home system

This page intentionally left blank.