

Safety Fuse Examinations

1 Scope

These procedures describe the process for safety fuse examinations and apply to explosives and hazardous devices caseworking personnel who examine safety fuses and their post-blast remains to determine identifying and functionality information.

2 Introduction

Safety fuse is an explosive component in the shape of a cord that generally consists of a center core of low explosive, usually black powder, contained within various textile wrappings and waterproofing materials to protect it from the environment. Safety fuse is typically initiated with a flame and is utilized in commercial blasting operations to transmit a burning reaction through the length of the core, thereby producing an intense spit of flame from its end that initiates a non-electric detonator. The burning reaction travels at a constant rate, hence different lengths of safety fuse provide different time delays. Safety fuse properly connected to a non-electric detonator can be used in the fabrication of improvised explosive devices (IEDs) to initiate a detonator-sensitive high-explosive. Safety fuse can also be used in the fabrication of IEDs to initiate low explosives. Depending on its exact use in an IED, it may be possible to recover fuse fragments in a post-blast environment. Through an examination of safety fuse, or its fragmented remains, its functionality within the IED and manufacturing information can sometimes be determined. This data can provide the investigator lead information which can facilitate the identification of the subject(s) and/or group responsible for constructing the device.

3 Equipment/Material/Reagents

Below is a list of items that can be used to examine safety fuse and its post-blast remains. Explosives and hazardous devices personnel should choose the most appropriate items based on the nature of the evidence.

- Personal Protective Equipment (e.g., lab coat, eye protection, gloves)
- Hand tools (e.g., tweezers, pliers, utility knife)
- Cleaning materials and disinfectants (e.g., cloths, bleach, rubbing alcohol)
- Stereomicroscope (various magnifications)
- Ruler (e.g., standard 12 inch length)
- Micrometer
- Caliper
- Pillboxes, glass containers, static-proof plastic bags
- FBI Laboratory Explosives Reference Tool (EXPeRT) Database
- Reference texts, manuals, manufacturers' literature, and known materials are maintained in the Explosives library. Additional reference information can be obtained from direct contact with manufacturers and distributors.

4 Standards and Controls

Not applicable.

5 Sampling or Sample Selection

Not applicable.

6 Procedures

These procedures are implemented as part of the overall examination process outlined in the Device Examinations Standard Operating Procedure (SOP). Refer to the Safety section of this SOP before starting any examinations.

Explosives and hazardous devices personnel will:

6.1 Before any examination is conducted, ensure that the item, as well as its containers, have been appropriately marked in accordance with the *FBI Laboratory Operations Manual (LOM)* (i.e., item number, initials, and full Laboratory number, when practicable).

6.2 Ensure care is taken not to obliterate any identifying marks which have been previously placed on the item(s), or obliterate any microscopic marks of value.

6.3 Visually examine the item(s) for any trace evidence and end-matches that could be of value. This evidence could include, but not limited to the following: hairs, fibers, blood, paint, or other particles.

6.3.1 If trace evidence is to be examined or preserved, contact the appropriate unit and determine if the material should be removed. Record the material by means of notes, sketches, or photographs before it is removed.

6.4 Note the physical characteristics of the fuse through visual/microscopic examination. Physical measurements should be taken to aid in determining as many of the following attributes as possible:

- Construction characteristics
- Manufacturer
- Brand
- Type
- Special properties (e.g., physical condition, functionality, modifications made for use in IED)

6.5 If possible, determine the manufacturer, brand, and type by searching the EXPeRT data base, explosive reference files, manufacturers' literature, and/or reference or known materials

collection. Identifications are made by comparison of observable/measurable physical characteristics with those provided in the above reference/literature materials.

6.6 When appropriate, conduct examinations for the detonator in accordance with the Non-Electric Detonator Examinations SOP should the remains of a detonator be found adhering to the end of a length of burned safety fuse.

7 Calculations

Not applicable.

8 Measurement Uncertainty

Not applicable.

9 Limitations

Refer to the Limitations section in the Device Examinations SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP.

10 Safety

Safety protocols, contained within the FBI Laboratory Safety Manual, will be observed at all times.

10.1 Unburned safety fuse is a fire hazard and should be protected from heat, shock, and friction by placing it in an appropriate box and properly securing it.

10.1.1 Intact detonators submitted with safety fuse for examination will be removed from the fuse and afforded safety and examination considerations as detailed in the Non-Electric Detonators Examination SOP.

10.2 Protective gloves (e.g., nitrile, latex) must be worn when handling items that have been possibly exposed to blood, tissue, or other bodily fluids. Gloves will prevent exposure of personnel to possible hazardous material on the items and prevent DNA from being transferred to the items.

10.3 Items potentially containing blood or other body fluids will be soaked in 2.5% bleach solution or other suitable disinfectant following discussions with personnel that may conduct other examinations of the items.

11 References

FBI Laboratory Division

FBI Laboratory Quality Assurance Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Operations Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

FBI Laboratory Safety Manual, Federal Bureau of Investigation, Laboratory Division, latest revision.

Explosive Devices SOPs, Federal Bureau of Investigation, Laboratory Division, latest revisions.

Other

Atlas Powder Company, Explosives and Rock Blasting, Atlas Powder Company, 1987

Gregory, C.E., Explosives for North American Engineers, 3rd Edition, Trans Tech Publications, 1984

International Society of Explosives Engineers, Blasters' Handbook, 18th Edition, 2011

Persson, P.A., Rock Blasting and Explosives Engineering, CRC Press, 1994

Thurman, J.T., Practical Bomb Scene Investigation, 2nd Edition, CRC Press, 2011

Rev. #	Issue Date	History
0	07/07/2006	Original Issue to follow QATU formatting and ASCLD/LAB-International requirements
1	10/02/2017	Administrative changes for grammar, clarity, and conformance to revised QAM and LOM. Removed references to the Explosives Unit to applicability to those conducting explosives and hazardous devices related examinations. Deleted Calibration section since it is not required. Updated Limitations section to refer the reader to the Device Examination SOP and Appendix B of the Explosives and Hazardous Devices Report Writing Guidelines SOP. Updated references.

Approval

Redacted - Signatures on File

Explosives Unit Chief

Date: 10/02/2017

TL Approval

Explosives and Hazardous
Devices Technical Leader

Date: 10/02/2017

QA Approval

Quality Manager

Date: 10/02/2017