

## **Electric Detonator Examinations**

### **1 Scope**

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

### **2 Introduction**

An electric detonator is a small explosive component whose general purpose is to initiate a detonator-sensitive explosive into which it is inserted. Electric detonators generally consist of wires attached to a match element or bridge wire embedded in very sensitive explosives. The match element, or bridge wire, and explosives are contained within a cylindrical metal shell that is sealed on one end with a closure plug. The proper application of current to the wires causes the match element or bridge wire to heat up, causing the explosives within the detonator to explode. Electric detonators are generally utilized in commercial blasting operations to initiate larger quantities of detonator-sensitive explosives. Electric detonators can be used in the fabrication of improvised explosive devices (IEDs) to initiate other explosives or they can be used as the only explosive component within the device. Depending on the amount of explosive into which the detonator is inserted and its exact use within the IED, it may be possible to recover detonator fragments in a post-blast environment. Through an examination of an electric detonator, 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 electric detonators and their 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, full face shield, gloves)
- Hand tools (e.g., tweezers, pliers, cutters, wire strippers, utility knife)
- Cleaning materials and disinfectants (e.g., cloths, bleach, rubbing alcohol)
- Stereomicroscope (various magnifications)
- Ruler (e.g., standard 12 inch length)
- Micrometer
- Caliper
- X-ray machine
- Detonator inerting machine

- 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(s), as well as its container(s) and packaging, 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 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 detonator 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
- Explosives present
- 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 database, Explosive reference files, manufacturers' literature, and/or reference or known materials collection. Identifications or associations are made by comparison of observable/measurable physical characteristics with those provided in the above reference/literature materials.

## **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** Electric detonators should be protected from sources of heat, shock, friction, and extraneous current. Should a detonator be initiated accidentally, it has the capability of inflicting personal injury or death; therefore, it should be handled with care. Personnel will follow the below guidance regarding the handling of electric detonators:

**10.1.1** When not under examination detonators will be stored in approved, explosion-proof containers (e.g., MK663 container, explosives magazine).

**10.1.2** Detonators will be shipped in Department of Transportation (DOT) approved containers (e.g., MK663 containers).

**10.1.3** Detonators will be rendered safe, or inert, by using specialized equipment (e.g., detonator inerting machine)

**10.1.4** Appropriate facial protection (e.g., eye protection, full face shield) will be worn when handling live detonators.

**10.1.5** Detonators and other types of explosive materials and components will not be examined at the same time or placed in close proximity to each other.

**10.1.6** The leg wires of an electric detonator will be “shunted” to prevent extraneous current from initiating the detonator.

**10.1.7** Unless the detonator is being purposely exploded, the leg wires will never be placed in a location where they could come in contact with a source of electrical energy.

**10.2** Protective gloves (e.g., latex, nitrile) 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 bodily fluids will be cleaned in a 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, 3<sup>rd</sup> Edition, Trans Tech Publications, 1984

International Society of Explosives Engineers, Blasters' Handbook, 18<sup>th</sup> Edition, 2011

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

Thurman, J.T., Practical Bomb Scene Investigation, 2<sup>nd</sup> Edition, CRC Press, 2011

Rev. #	Issue Date	History
0	07/07/2006	Original Issue to follow QATU formatting and ASCLD/LAB- <i>International</i> 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

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