

**IME White Paper for Electronic Devices on Blast Patterns and
in Magazines**

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The purpose of this White Paper is to discuss the use of personal electronic devices on blast sites and in explosive magazines where commercial explosives are stored; their potential risks, and best practices for mitigation of those risks to personnel. Equipment normally used in blasting operations which has been approved by the manufacturer for blasting purposes, such as firing devices, are not addressed in this paper.

The information provided herein is ***not intended*** to cover all hazards that may, potentially, be associated with the use of personal electronic devices on blast sites and in explosive magazines. Use of such devices should be evaluated on a case-by-case basis before being permitted on blast sites and/or in magazines.

In the current technology-driven world, electronic devices that are used throughout society are also used by personnel working in the explosives industry and, accordingly, may be used by persons working on blast sites and in magazines. These devices may include: hearing aids, medical implants (e.g. pacemakers), watches, battery operated tools (e.g., calipers), scanning devices, barcode readers, flashlights, cell phones, cameras, driver monitoring systems, E-cigarettes, and drones.

After reviewing the above list, IME concludes that there are two potential hazards posed by these devices.

(1) IME considered the potential for the leads of an electric detonator to come into contact with the battery terminals of the device and provide sufficient current to initiate the electric detonator.

This risk is only related to electric detonators; neither nonelectric nor electronic detonators are susceptible to this potential hazard from the above devices. This risk is greatly mitigated by the limited current of some devices like hearing aids, pacemakers and other medical implants/devices, and the very low probability that the two leads of a detonator could conceivably contact the two terminals on a device at precisely the same time. As an example,

typical hearing aid batteries run in the 1.45 volt range with milliamp-hour (mAh) ratings of 100 to 630 (Sizes 10 to 675). The minimum amperage required to initiate an electric detonator is 0.25 amps, with a typical amperage of 0.5 amps. Since the battery amperages for hearing aids are rated over an hour time frame it would be extremely unlikely that such batteries would initiate a standard electric detonator.

In addition, pacemakers typically use 2.8 volts and have a 10 micro amp control current drain. This is well below the amps needed to initiate an electric detonator. Moreover, there is no direct path to a detonator from a pacemaker device. Based on these comparisons, it is highly unlikely that a pacemaker would initiate a detonation. Consequently, this route to initiation has been deemed a remote risk for all medically implanted devices.

In the case of E-cigarettes, both the battery and any included heating element should be considered. IME recommends that these devices not be permitted on blast sites or in storage magazines and that E-cigarettes should be treated as normal cigarettes (prohibited items) in the context of risk reduction.

(2) IME considered the potential for initiation of an electric detonator via induced current from radio frequency (RF) energy.

IME's Safety Library Publication (SLP) 20 *Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps)* discusses this risk: "The function of this pamphlet is to suggest guidelines for the safe use of commercial electric detonators in locations near to RF energy sources." Table 3 in SLP 20 shows that a 1 watt power transmitter such as a cellular telephone should be kept at least 8 feet from an electric detonator. Higher wattages require larger distances.

The leads of an electric detonator typically need to be stretched out in order to be susceptible to RF energy. Since it is not possible to list and evaluate every type of RF transmitting device that may be brought onto a blast site where electric detonator leads are typically strung out, IME recommends that all such devices be prohibited from the blast site, or that the transmitting capability of these devices be disabled prior to entering a blast area. IME also recommends implementation of a mandatory requirement that all radio communications systems (e.g., OnStar, cellular mounted telephones, mobile equipment, tracking systems, and CB radios) be turned to the "off" position and remain so when near a blast site.

In accordance with IME SLP 20, bar code readers or other RF conducting devices that do not transmit data by a wireless means do not pose a threat to packaged electric detonators providing the construction of the bar code reader or other device meets the electrical requirements for use in areas containing explosives. Bar code readers that transmit inventory

data to a workstation by wireless means should not be used for magazine inventory or in receiving or shipping facilities where electric detonators are present.

The use of drones, cell phones, barcode readers, or any of the devices included in the scope of this document that can transmit RF energy should be evaluated per SLP 20 before use.

IME recommends the following best practices to avoid hazards from electronic devices on blast sites and in magazines used to store commercial explosives:

- Always prohibit the use of E-cigarettes on blast sites and in magazines.
- Always evaluate RF producing devices per IME SLP 20 before using them on a blast site or in a magazine and ensure that the device emits only acceptable levels of RF energy.
- Always check the surrounding area near the blast site for the presence of fixed and mobile sources of RF fields, such as cellular phones, handheld transceivers, and driver monitoring systems, etc., and comply with the recommended safe distance tables in IME SLP 20.
- To most definitively avoid RF hazard, turn off any RF transmitting device or turn any RF transmitting device to non-transmitting mode before entering a blast area or a magazine.
- Always perform a risk analysis on any battery powered device that is brought onto a blast site or into a magazine to ensure that the battery terminals are sealed or covered to prevent contact with electric detonator leads.
- Always keep the electric detonator lead wires shunted until the connection is ready to be made.
- Never allow the battery terminals of an electronic device to be exposed to the electric wire leads of an electric detonator.
- Always keep drones away from electric detonators due to both battery and RF producing concerns.