Nederlands Forensisch Instituut
*Ministerie van Justitie en Veiligheid*

Factsheet

# Danger assessment of flash bangers up to 5 grams

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# 1. Factsheet in general

The Netherlands Forensic Institute (NFI) conducts a wide variety of investigations. An investigation report from the NFI may be accompanied by a factsheet. This serves as (additional) background information and is of an informative character.

# 2. Introduction

The expert area of Explosions and Explosives at the NFI frequently receives questions about the dangers of fireworks. A dangerous firework article that frequently appears in the Netherlands is the flash banger. This firework article and its effects have been investigated by the NFI. This factsheet summarizes the research results with the aim of providing a general overview of the dangers of an exploding flash banger containing up to 5 grams of main charge.

# 3. Description of flash bangers

## 3.1. Definition of a flash banger in this factsheet

In this factsheet, a "flash banger" is defined as a pyrotechnic article[1] that:
– consists of a cardboard tube containing a main charge of more than 0.5 and less than 5.0 grams of flash powder[2];
– includes a firework fuse as an igniter;
– may optionally contain one or more effect charges (though not required).
For flash bangers containing more than 5 grams of main charge you can consult our factsheets on the 'Super COBRA 6' or 'COBRA 8'.

There are many different brands and types of flash bangers. Several examples are shown in photos 1 through 3.


Photos 1 t/m 3. Examples of flash bangers.

## 3.2. External characteristics and internal structure of flash bangers without effect charge

A flash banger without effect charge consists of a cardboard tube with a (typically green) fuse protruding from it. A paper label is often present on the cardboard tube. If present, the colors, language, fonts, and images on the label can vary greatly.

The most common internal structure of a flash banger without effect charge is shown in photo 4 and is schematically illustrated in figure 5. The construction of the flash banger always involves a cardboard tube containing flash powder which is sealed at both ends, usually with a (plastic) cap or a clay plug (the colors of the various components may differ). A fuse runs from the inside to the outside of the tube. If there is uncertainty about whether a specific pyrotechnic article qualifies as a flash banger, you can contact your forensic explosives expert.

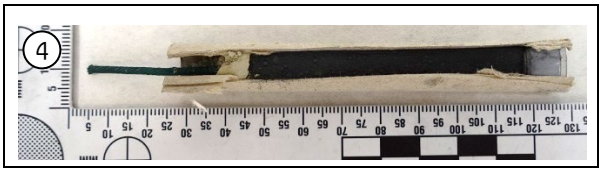
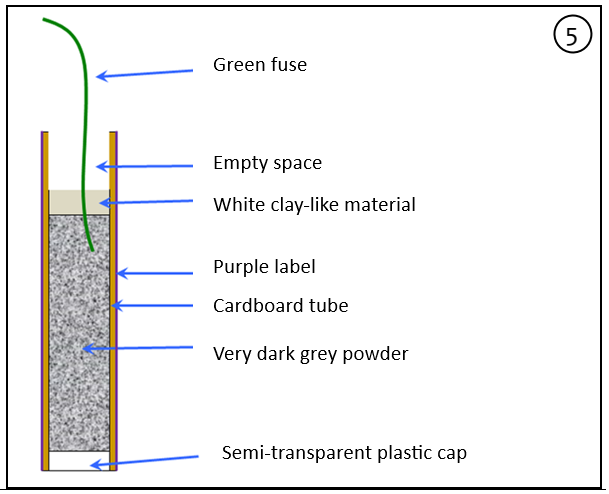



Photo 4. Example of the inside of a flash banger without effect charge (this is the flash banger from photo 2).




[1] A pyrotechnic article is a device containing a pyrotechnic charge. A pyrotechnic charge is a single substance or - in almost all cases - a mixture of two or more substances which together form an (explosive) flammable material. Pyrotechnic mixtures can for example be used in fireworks and firearms. Mixtures of this kind comprise at least one substance which serves as fuel (reductor) and one substance that serves as oxygen supplier (oxidizer).

[2] In this factsheet, flash powder refers to a pyrotechnic mixture consisting of potassium perchlorate (oxidizer) with a metal powder (fuel) which may or may not be mixed with sulphur (fuel). In most cases, the flash banger contains a mixture of potassium perchlorate and aluminium, but there are other compositions of flash powder. The precise composition of the flash powder in a flash banger has no significant influence on the hazards in the event of an explosion

Figure 5. Example of schematic overview of a flash banger without effect charge (this is the flash banger shown in photo 2).

### 3.3. External characteristics and internal structure of a flash banger with effect charge

The external appearance of a flash banger with effect charge is the same as that of a flash banger without effect charge (see §3.2). The difference lies in the internal structure (explained further in this paragraph) and in the resulting effects (see §4.1).

The most common internal structure of a flash banger with effect charge is shown in photo 6 and is schematically illustrated in figure 7. The clay plug may also be a plastic cap, and the colors of the components may vary. The only significant difference compared to a flash banger without effect charge is the presence of a disc or compressed lump of pyrotechnic material (sometimes multiple layers) through which the fuse passes. If there is any doubt whether a specific pyrotechnic article qualifies as a flash banger, you can contact your forensic explosives expert.

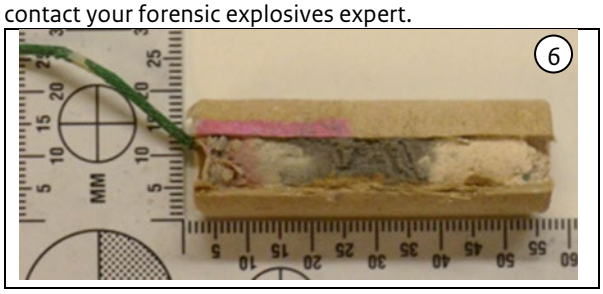



Photo 6. Example of the inside of a flash banger with effect charge (this is the flash banger from photo 1).

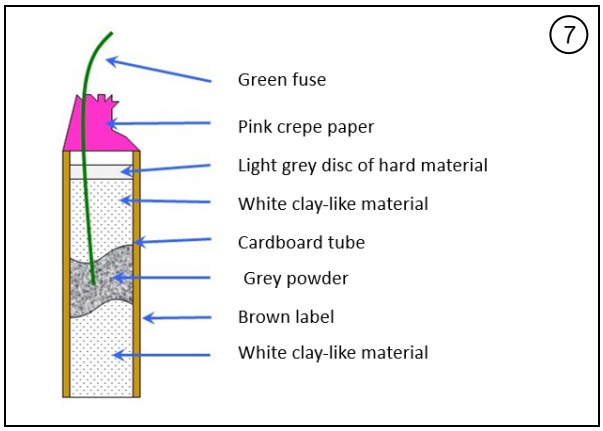



Figure 7. Example of schematic overview of a flash banger with effect charge (this is the flash banger shown in photo 1).

### 3.4. Legal aspects

Flash bangers are factory produced as commercial fireworks in category F3. Similar articles can also be manufactured as 'other pyrotechnic articles' in categories P1 or P2. According to the Dutch Fireworks Decree, fireworks are defined as: "pyrotechnic articles intended for entertainment." The Dutch Fireworks Decree also applies to pyrotechnic articles in categories P1 and P2 that are used as, or clearly intended to be used as, fireworks.

A pyrotechnic article such as a flash banger can only be considered fireworks if it is used for entertainment purposes. Whether a flash banger meets this definition depends on the specific situation and circumstances in a case. This is ultimately for the court to decide. Depending on the apparent intended use by the user, the NFI can, upon request, conduct an assessment against the Dutch Fireworks Decree and the RAC[3], or, for example, the Dutch Weapons and Ammunition Act.

Assuming a flash banger is deemed a firework, it will always be considered a professional firework according to the Fireworks Decree[4]. As a result, flash bangers are exclusively intended for use by persons with specialized knowledge (in accordance with Article 1.1.2a of the Dutch Fireworks Decree). Therefore, flash bangers should never be made available to the general public.

## 4. Dangers of flash bangers

### 4.1. Functioning and effects

The intended operation of a flash banger without effect charge (see figure 5) is as follows: the green firework fuse is ignited and burns until the flame front reaches the flash powder inside the tube. The total burn time of the fuse depends on its length and is usually between approximately 3 and 8 seconds. Once the flame front reaches the flash powder, the flash powder explodes instantly with a loud bang and flash of light. This produces heat, fire effects, and a pressure wave. The flash banger is ripped apart, and the hot cardboard and clay fragments are propelled outward.

[3] RAC = Regulation on the Designation of Consumer Fireworks pursuant to Article 1.1.1 and Article 2.1.1 of the Dutch Fireworks Decree.

[4] Upon request, the NFI can provide full substantiation in the form of an assessment according to the Dutch Fireworks Decree.

The intended operation of a flash banger with effect charge (see figure 7) is as follows: the flame front from the fuse first ignites the compressed disc (or multiple discs or lump) of effect charge. This effect charge produces a colored flame (typically green, orange, or red), while the fuse continues to burn internally. Once the flame front reaches the flash powder, the flash powder explodes in the same way as a flash banger without effect charge (see previous paragraph).

### 4.2. Mass explosivity

According to the ADR, packages containing cardboard tubes with at least 2 grams of flash powder per tube must be classified for transport as 1.1G. This classification means that flash powder exhibit mass explosive behavior under certain conditions. This means that a flash banger containing at least 2 grams of flash powder may explode simultaneously with one or more other flash powder-containing articles when they are located in close proximity. In this case, the flash powder in the other articles does not explodes because a fuse has been lit, but because another flash banger explodes. A sufficiently powerful explosion in the immediate vicinity of one or more flash bangers can also cause them to explode (simultaneously). This aspect contributes to a higher danger level and is relevant in cases involving more than one flash banger with at least 2 grams of flash powder, or where such a flash banger is located near other articles containing flash powder (for example, in a storage facility or a backpack).

### 4.3. Dangers during the explosion of a flash banger

The dangers posed by an exploding flash banger depends on many factors.[5]. It is not possible to include all scenarios in this factsheet. Therefore, this paragraph provides a general danger assessment. If more specific information is required (in a criminal case), a forensic explosives expert should be consulted.

In the case of a flash banger with an effect charge, there is an initial danger of fire and burns caused by the flame. In addition, the flame or other decorative effects may cause people to underestimate the danger of the article (thinking it only burns and does not explode), resulting in direct contact with or close proximity to the article at the moment of explosion. For example, there are documented cases of individuals kicking a burning piece of firework with effect charge, picking it up, or holding it in their hand when it explodes.

When a flash banger (with or without effect charge) explodes, it poses a danger to nearby people and objects. If a flash banger explodes directly against an object, that object may be damaged depending on the amount of flash powder and the material from which it is made.

The level of injury for individuals depends in part on their position relative to the explosion. For example, physical contact with a single flash banger at the moment of explosion will almost always result in severe to very severe injury[6] from the pressure wave and heat, depending on the body part affected. If the explosion occurs in the hand, injuries from approximately 2 grams of flash powder can be severe enough to render the hand permanently non-functional. The pressure wave may also cause hearing damage, permanent or not, up to several meters away from the explosion. The occurrence and severity of hearing damage depends on specific environmental factors and the condition of the individuals concerned.

In addition to injuries caused by the pressure wave and heat of the explosion, injuries may also result from the impact of fragments and shards, depending on the amount of flash powder. At relatively short distances, hot cardboard, plastic, and clay fragments from the flash banger itself may cause skin injuries. If the explosion damages nearby objects, shards and fragments of these objects can be propelled at high speeds. If these fragments are made of hard materials such as glass,

5 Dangers are only described in broad terms in this factsheet given that a specific description of the location where the explosion occurs is not provided. Objects present at a location can contribute to more or less danger for bystanders. The position of a person's body is not taken into account either (upright or squatting, for instance), nor the height at which the explosive device explodes, in relation to that person (at eye or on the ground, for example). The number and the position of bystanders at a location also play a role in assessing the dangers. Generally, more tests must be performed in order to precisely determine the dangers for one specifically described scenario.

6 The Explosives and Explosions department at the NFI uses the following series for the level of injury (in ascending order):

- Physical injury: minor injuries requiring doctor's treatment and/or reversible injuries (ears – no deafness, eyes – no blindness).
- Severe physical injury: irreversible injuries (in the case of ears - deafness, eyes – blindness) or injuries which will have serious consequences if untreated.
- Very severe physical injury: permanent disfigurements which could lead to death, if untreated.
- Fatal injury: injury which results in almost instantaneous death.

metal, or stone, they can cause injuries at distances of several meters, depending on local circumstances.

In the specific scenario in which a flash banger is thrown at professional emergency responders or law enforcement officers, the danger described above applies when they are not wearing protective clothing or hearing protection and/or are struck on an unprotected part of the body. The NFI cannot make a general statement about the effect of an exploding flash banger on a person wearing protective gear without further investigation, due to the wide variability in the properties of such clothing.

As explained at the beginning of this section, the dangers posed by an exploding flash banger depend on many factors. If this factsheet does not provide sufficient insight into the dangers posed in a specific case, it is recommended to contact your forensic explosives expert. This also applies if a case involves more than one flash banger or a single flash banger in combination with other fireworks (see also §4.2). Contacting a forensic explosives expert is also recommended if any modifications have been made to the flash banger (such as the addition of an spray can, nails, a bottle of gasoline, etc.).

For general questions, you can contact the NFI by phone +31(70) 888 68 88.

Netherlands Forensic Institute
Ministry of Justice and Security
PO box 24044 | 2490 AA The Hague

telephone +31(70) 888 66 66
www.forensischinstituut.nl