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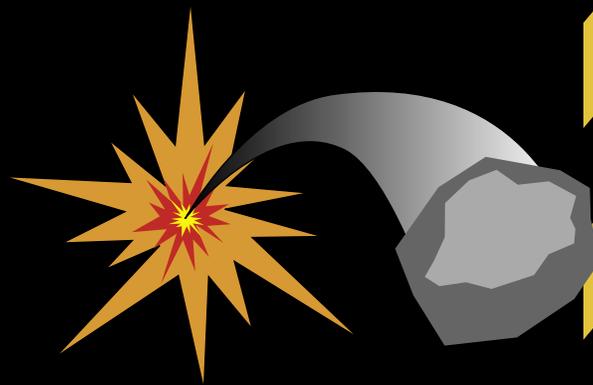


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Worker's Hazard Alert

# **DANGER:** **Blast Area**



**FLYROCK**  
awareness  
**NIOSH**

National Institute for Occupational Safety and Health

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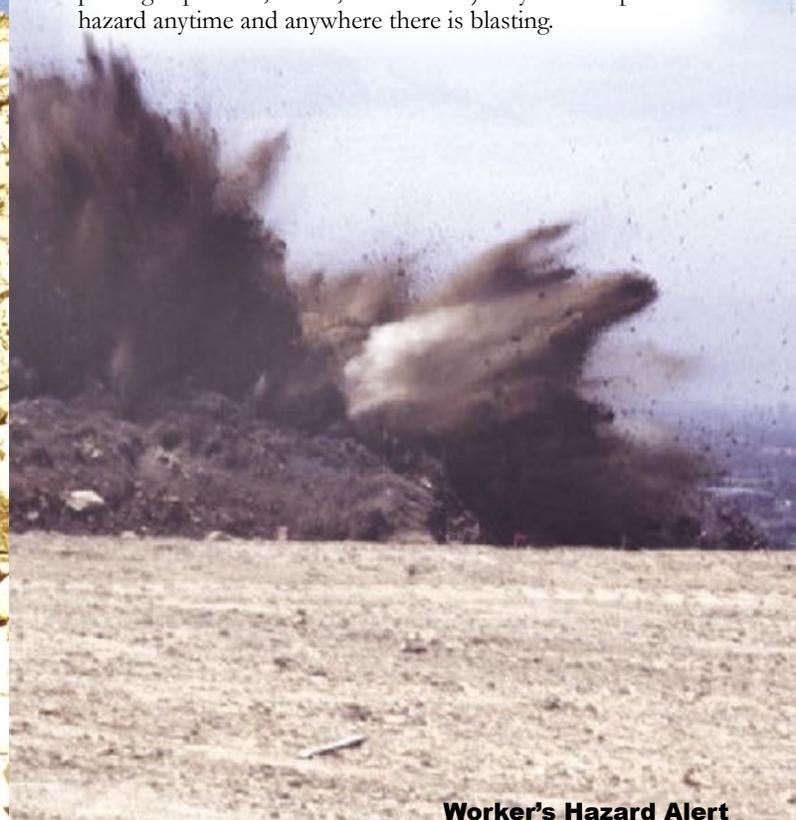
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**Why do you need to read this?**

**Flyrock has killed and injured people.** Flying material, both within the blast area and outside it, is responsible for over half of all blasting-related injuries and fatalities. MSHA (Mine Safety and Health Administration) records from 1994 - 2001 show that in surface mining, 32 people were killed or badly hurt because the blast area was not cleared. Another 17 people were injured or killed by rocks that were thrown outside of the blast area. This total (49 people) is greater than the combined total of the other blast accident causes in mining (premature blast, transporting explosives, fumes, and misfires). Flyrock is a potential hazard anytime and anywhere there is blasting.



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## What is flyrock?

In order to move rock, we must blast. Blasting is the best way to shatter rock. In a blast, a number of holes are drilled into the ground and loaded with explosives. The *BLASTER-IN-CHARGE* computes the ideal distance between these holes, the depth of the holes, and their slant or angle.

As a professional, the blaster carefully figures the right amount of explosives needed to break the rock. To ensure your safety, he or she figures the zone in which some rocks may fly into the air. This area is called the *BLAST AREA*. If a rock or any material goes beyond the area that the blaster has blocked off (beyond the blast area), that material is called *FLYROCK*.

Flyrock can be as small as marbles or as large as a car. It is propelled with great force. Flyrock may come from high in the air, roll down a hillside, or come straight at you like a bullet. That is why the blaster places guards at entry roads around the area where rocks might fly – to keep people out and protect workers from death or injury. Yet people have still been killed inside the blast area. No one should be in the blast area during a blast.

## What causes flyrock?

Sometimes problems occur during blasting. There may be a hidden crack below ground that the blaster fills with too much explosive. The blaster may think that he or she has to break a lot of tough granite, when really there is soft dirt from old diggings. The blast crew may have made a mistake and not loaded enough stemming. A mud seam below ground may not have been reported by the driller. These things seldom happen. But when they do, there is going to be flyrock – debris that travels beyond the guarded area. If that happens,

**you need  
to be protected!**



## THINK!

**What** do the blast warnings sound like for *this site*? Is the signal a truck horn or an electric horn? One signal? A series of sounds? Long? Short?

**What** *are* the blast warning signal patterns *on this site*? Is the final warning a 5-minute warning? Or just a 1-minute?

**Where** is today's working blast area, and what time will they shoot?

**Will** you be outside the blast area when they signal?

**Where** are you supposed to report during the blast?

**What** will you do if you find yourself inside the blast area during a shot?

**How** safe is the area outside the blast area?

**While** you are outside the blast area, what can you use for shelter?

At the worksite, stay on the side of safety. Every day is different. ***Don't take blasting for granted!***



## Typical shot scene

Here is an *example* of a typical shot scene. Please consult your company for details at *your* worksite.

The drillers come on site and drill holes – 30 holes, 100 holes, or more. The blaster-in-charge has planned where and how many holes must be drilled.

Explosives trucks bring in explosives to load in the holes. The loaders fill the holes with the amount of explosives that the blaster has determined. When they leave, the blasting crew connects the holes.

Once the holes are connected, the blaster asks to have the blast area cleared of all people and equipment that might be damaged. Then the blast crew leaves the area and go to their posts to guard the roads. They will stop all entry into the blast area. Using a radio, the blaster will check with the entry guards and with the spotters to make sure they have seen no movement in the blast area.

There may be a signal at about 5 or 10 minutes before the blast, which means that the holes have been loaded and connected. The shot has been set to fire as soon as a firing button is pushed. There is often a 1-minute warning signal. By the time of the final signal, everyone, including the blast crew, is out of the blast area. Only then is the blast fired.

The signals and the timing of the signals vary from site to site. What are the signals in your worksite? Is there a 10-minute warning? A 5-minute warning? A 1-minute warning? What is the pattern of signals? What does “all-clear” sound like?



## What is the danger from flyrock?

Flyrock can come at you from any direction. Flyrock can be thrown high like a fly ball, fly straight like a fastball, roll along the ground, or ricochet from any direction. Flyrock can be gravel, rocks, tree trunks, construction materials, mud — even water. But there are three things you should know about all flyrock.

**Flyrock is totally unexpected.** “I had shot a dozen of these. Each of them went ‘poof.’ The ground rose up and fell down. Just ‘poof.’ One of the regulars was standing by his door, just inside the blast area. I told him he had to go inside. He said, ‘don’t worry, nothing will happen.’ I said, ‘I know that, but you will have to go inside anyhow.’ He fussed and we discussed, but in the end he went inside. We shot it, and it blew all over the place. There had been a water line there beside the hole, must have been decades ago. So the earth was not the hard rock that we expected. And it blew. Rocks landed right beside the door where the man had been standing. Had he stayed there, he would have been hurt.”

— J.E., a Kentucky blaster.

**Flyrock is fast.** On a Friday evening in 1994, two blast crew members were 236 feet away from the blast. The crew saw the flyrock coming toward them as soon as they set off the shot. They turned and ran to a pickup truck that was just 10 feet away. They did not make it. The survivor heard the flyrock hit the pickup truck and the ground. Then he saw his partner beside the truck lying face down with blood coming out of his nose and ear. His hardhat was dented by the flyrock. He never regained consciousness.

## How can you protect yourself from flyrock?

**Flyrock can travel beyond the blast area.** It can travel far and high. In July 2002 in West Virginia, rocks traveled one-half mile. One rock the size of a football smashed into the cab of a contractor's truck. It went through the front windshield, between a trucker and his supervisor and out the back. They were outside the blast area and thought they were "safely" watching. They were lucky -- they were not hurt.



### To protect yourself from flyrock you should:

**KNOW** that *no one* is permitted in the blast area during the blast.

**KNOW** *where* they are blasting! How far is your work area from the blast? If you are asked to clear out during a blast, where are you supposed to go?

**KNOW** *when* they are blasting!

**KNOW** *which areas* have been hit before. Have you noticed small rocks on the ground in your work area? Are they from blasting? Are the tree limbs broken from blasts? If rocks have fallen there before, they may fall there again.

**KNOW** what you can use for shelter during the shot.

**KNOW** all of the blast warning signals! Each site has its own signal pattern. Each signal announces how long before the shot.

**KNOW** what to do when the blast signals sound!

Be alert during blasts. Follow the instructions of the blaster and the blast crew, even if the instructions are different than usual. The instructions are for your safety. If you are in the blast area, make your presence known. Do *not* try to view a blast without permission. A 19 year-old left his work area that was 470 feet away from the blast and walked about 250 feet closer to watch it. He saw the

flyrock coming and tried to run but was struck from behind and killed.



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