

# International Hazard Datasheets on Occupation



## Shotfirer

### What is a Hazard Datasheet on Occupation?

This datasheet is one of the International Datasheets on Occupations. It is intended for those professionally concerned with health and safety at work: occupational physicians and nurses, safety engineers, hygienists, education and information specialists, inspectors, employers' representatives, workers' representatives, safety officers and other competent persons.

This datasheet lists, in a standard format, different hazards to which shotfirers may be exposed in the course of their normal work. This datasheet is a source of information rather than advice. With the knowledge of what causes injuries and diseases, it is easier to design and implement suitable measures towards prevention.

This datasheet consists of four pages:

- Page 1: Information on the most relevant hazards related to the occupation.
- Page 2: A more detailed and systematized presentation on the **different hazards** related to the job with indicators for preventive measures (marked as numbered shields and explained on the third page).
- Page 3: Suggestions for **preventive measures** for selected hazards.
- Page 4: **Specialized information**, relevant primarily to occupational safety and health professionals and including information such as a brief job description, a list of tasks, notes and references.

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### Who is a shotfirer?























A worker who fires explosives to fragment or loosen solid formations such as rock and earth, or to demolish masonry, in mining, civil engineering, construction, well blasting, etc.

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### What is dangerous about this job?

- Premature explosions may cause collapse of walls and roofs on the shotfirer.
- Shotfirers may be injured by flying rock or other projectiles.
- Handling of misfired charges may cause explosions in the immediate vicinity of the shotfirer.
- Accidental detonations may occur during the transportation or handling of explosives.
- Fumes released in explosions are dangerous to health and in some cases may cause acute poisoning.
- Walking on uneven terrain and slippery surfaces, or climbing on rocks, may cause slips, trips and falls.

**Hazards related to this job**

<b>Accident hazards</b> 	<ul style="list-style-type: none"> <li>Injuries due to explosions when transporting or handling explosives, when dealing with misfired charges, or premature explosions caused by static electricity, stray currents, lightning, RF energy, etc.</li> </ul>	  
	<ul style="list-style-type: none"> <li>Falls while walking on uneven terrain or slippery surfaces, or while ascending and descending ladders, rocks, ditches or hilly terrain</li> </ul>	
	<ul style="list-style-type: none"> <li>Struck by debris, projectiles and other flying fragments during explosions</li> </ul>	 
	<ul style="list-style-type: none"> <li>Injuries caused by the effect of shock waves</li> </ul>	
	<ul style="list-style-type: none"> <li>Injuries caused by the collapse of walls and roofs due to secondary explosions (e.g., of methane in coal-mines) or premature explosions, or by rock slides</li> </ul>	
	<ul style="list-style-type: none"> <li>Mechanical injuries during drilling operations</li> </ul>	
	<ul style="list-style-type: none"> <li>Cuts and pricks caused by sharp edges of rocks or other solids</li> </ul>	
	<ul style="list-style-type: none"> <li>Bites and stings by snakes, rodents, scorpions and other insects, etc., in open grounds or in mines</li> </ul>	
<ul style="list-style-type: none"> <li>Severe injuries, inc. hearing loss, caused by charges exploding in the near vicinity of the shotfirer, due to human error</li> </ul>	    	
<b>Physical hazards</b> 	<ul style="list-style-type: none"> <li>Sunburns when working under the sun</li> </ul>	
	<ul style="list-style-type: none"> <li>Exposure to excessive noise from mechanical equipment (e.g., drills) and during explosions</li> </ul>	
	<ul style="list-style-type: none"> <li>Exposure to ambient environmental factors (low or high air temperature, rain, snow, wind in the open, damp in mines, etc.</li> </ul>	
	<ul style="list-style-type: none"> <li>Exposure to radon in underground mines, and to radiation (e.g., in uranium or phosphates mining)</li> </ul>	
<b>Chemical hazards</b> 	<ul style="list-style-type: none"> <li>Skin exposure to nitroglycerin, trinitrotoluene, and other explosives and their vapors</li> </ul>	
	<ul style="list-style-type: none"> <li>Poisoning due to inhalation of explosive vapors during handling</li> </ul>	
	<ul style="list-style-type: none"> <li>Exposure to high concentrations of respirable dust in the atmosphere, in particular immediately after the explosions or during demolition work [See Note 1]</li> </ul>	
	<ul style="list-style-type: none"> <li>Poisoning (acute or chronic) due to inhalation of blasting fumes [See Note 2]</li> </ul>	
	<ul style="list-style-type: none"> <li>Asphyxiation as a result of the lowered oxygen content in the air of mines immediately after explosions</li> </ul>	
	<ul style="list-style-type: none"> <li>Irritation of eyes and mucous membranes by blasting fumes</li> </ul>	
<b>Biological hazards</b> 	<ul style="list-style-type: none"> <li>No specific biological hazards have been identified for shotfirers; however, such hazards may exist in some mines, e.g., because of accumulation of bat droppings in old mines or due to disease borne ticks in caves</li> </ul>	
<b>Ergonomic, psychosocial and organizational factors</b> 	<ul style="list-style-type: none"> <li>Physical strains on the upper and lower extremities due to the handling and moving of heavy loads, in particular on difficult terrain</li> </ul>	
	<ul style="list-style-type: none"> <li>Psychological problems related to prolonged states of anxiety due to work with explosives</li> </ul>	
	<ul style="list-style-type: none"> <li>Hand-arm problems, as a result of exposure to vibrations during drilling</li> </ul>	

**Preventive measures**

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- 1 Shotfirers should be properly trained, certified and experienced for the job at hand
  - 2 Do not smoke and do not allow smoking when working with explosives
  - 3 Obey all safety regulations for the storage, transportation and handling of explosives
  - 4 Always select and use personal protective equipment appropriate for the job
  - 5 Prepare an adequate shelter and use it before an explosion [See Note 3]
  - 6 Use only wooden rods for tamping; do not tamp too vigorously
  - 7 Ensure that there are no stray currents, static electricity, or strong RF radiation sources that could cause a premature explosion
  - 8 Ensure that there have been no misfires before restarting work
  - 9 Wear clothing appropriate for the weather when working in the open
  - 10 Wear respirator when exposed to bitumen fumes, dust, asbestos particles, etc.
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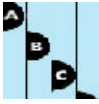
**Specialized information**


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**Synonyms** Blaster; detonator; dynamiter; firer; shooter; shotlighter.

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**Definitions and/or description** Determining strength and pattern of blast required and charges and detonates explosives in surface or underground mine, pit, or quarry to fracture or separate stone or minerals from solid formations; studies formation to determine amount, type, and location of explosive charge required. Marks pattern of drill holes or issues drilling instructions for depth and placement of blast holes. Inserts, packs, or pours explosives, such as dynamite, ammonium nitrate, black powder, or slurries into blast holes and compacts charge, using tamping rod. Positions assembled primer and blasting cap in hole at depth that will cause most effective explosion. Connects wire to primer and covers charge or fills blast hole with clay, drill chips, sand, or other material. Tamps material to secure charge and prevent force of blast from escaping through blast hole. Inspects blasting area to ensure that safety laws are observed and signals workers to clear area. Connects wires to electrical firing device and pushes plunger, turns dial, or presses buttons to set off single or multiple blasts. May keep inventory of blasting agents on hand. May transport blasting agents to blasting area, using light truck [DOT]. May be required to hold license to handle explosives.



**Related and specific occupations** Blasting supervisor; explosive handler; explosive-operator; explosive-operator supervisor; explosives-truck driver; gun-perforator loader; oil-well shooter; powder loader; seismograph shooter; shot-firer helper/trainee

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**Tasks** Clearing; communicating; compacting; compiling; connecting; covering; crimping; cutting; delivering; designing; detonating; disposing; documenting; drilling; driving; evaluating; filling; igniting; initiating; inserting; inspecting; inventorying; lifting; loading; locating; maintaining; marking; measuring; packing; positioning; pouring; priming; signaling; storing; stripping; supervising; tamping; testing; training; transporting; warning

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**Primary equipment used** Anti-spark hand tools; blasting galvanometers; blasting machines (generator-type, capacitor discharge or sequential); blasting machine testers; blasting multimeters; cap crimpers; circuit testers; detonators (plunger, dial or button); drills; electric cap lamps; ground current monitors; ladders; lamps; loading poles; lowering ropes and hooks; mirror; non electric delay systems; personal protective equipment; powder knife; powder punch; tape measures; wire strippers

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**Workplaces where the occupation is common** Agriculture; civil engineering construction sites (incl. dam construction, road building, underwater engineering works, etc.); geophysical exploration; house demolition; mines (underground and open); pipeline trenching; quarries

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- Notes**
1. Respirable dust released during explosions may carry substantial amounts of absorbed or adsorbed blasting fumes.
  2. Blasting fumes are of variable composition, depending on the type of explosive used, the type of rock mined, etc., but the most hazardous components usually are nitrogen oxides and carbon monoxide.
  3. Accident statistics show many cases of injuries to shotfirers because of failure to use an adequate shelter.
  4. In certain mines - e.g. of sulfide-bearing ores, explosions have been caused by exothermic reactions of the ore with oxygen from the air or with some component of the explosive charge.
  5. According to some sources, shotfirers are at increased risk of multiple myeloma and of nasal cancer.



**References** Encyclopaedia of Occupational Health and Safety, 3rd Ed., ILO, Geneva, 1983, Vol.2, p. 295-287.



Hopler, A.B.: Blaster's Handbook. 17th Ed.. ISEE, 1988, 742 pp.

Daratany, A.J.: Blasting and explosion safety training manual. Eastside Service Co. Pub., Long Beach, 1985, 282 pp.

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