Basic principles of controlled avalanche release

Metric system

It is known from practical experience and from the theory of how avalanches arise in deep winter, that the effect of a detonation above the snow cover leads to the best results with respect to residual risk of unpredictable avalanches. The explosive devices used should give a high detonation speed and produce a large volume of gas with a high work factor. Tests with numerous experiments show that explosives with the above-mentioned properties and charging positions above the snow cover give the highest effective ranges.
The following table from the WSL Institute for Snow and Avalanche Research SLF Davos Report no. 53/1996 shows the approximate effective ranges for dry new snow of various explosive charge sizes in different positions with respect to the snow surface.

In order to test and to safeguard the avalanche release zone, the whole of the potential release area must be subjected to an additional stress (e.g. by a detonation). This is necessary, because the location of the so-called „hotspots" (super weaknesses) are not known in advance. An acceptable residual risk after blasting operations is only then reached if these „hotspots" have been subjected to a sufficiently high additional stress and high strain rates within the snow cover with high speed of deformation (= high detonation speed).

Height of detonation point	Charge size	Radius of effective range to prevent a natural release	Radius of effective range to prevent by a single skier
Blasting above the snow (+3 to 3.5 m)	4 - 5 kg	120 - 130 m	70 m
Blasting above the snow (+2 to 2.5 m)	1.5 - 2.5 kg	80 - 90 m	50 m
Blasting above the snow (approx. +1 m)	4 - 5 kg	80 - 90 m	50 m
Blasting above the snow (approx. +1 m)	1.5 - 2.5 kg	60 - 70 m	35 - 40 m
Surface blasting	4 - 5 kg	50 - 60 m	30 - 35 m
Surface blasting	4 - 5 kg	50 - 60 m	30 - 35 m
Blasting in snow (approx. - 0.2 m)	4 - 5 kg	40 m	25 m
Blasting in snow (approx. - 0.2 m)	1.5 - 2.5 kg	25 m	15 m
Blasting in snow (- 0.7 m)	1.5 - 5 kg	10 m	5 - 10 m
Mortar 12 cm (0 m)	3 kg	40 m	-
RPG 8.3 cm (0 m)	0.7 kg	20 - 25 m	10 - 15 m
Mortar 8.1 cm (0 m)	0.6 kg	15 - 20 m	10 m

Table from the WSL Institute for Snow and Avalanche Research SLF Davos Report no. 53/1996

Basic principles of controlled avalanche release

Imperial measure system

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Height of detonation point	Charge size	Radius of effective range to prevent a natural release	Radius of effective range to prevent by a single skier
Blasting above the snow (+10 to 11.5 ft)	8.8 - 11 lbs	395 -425 ft	230 ft
Blasting above the snow (+6.5 to 8 ft)	3.3 - 5.5 lbs	260 - 295 ft	165 ft
Blasting above the snow (approx. +3 ft)	8.8 - 11 lbs	260 - 295 ft	165 ft
Blasting above the snow (approx. +3 ft)	3.3 - 5.5 lbs	200 - 230 ft	115 - 130 ft
Surface blasting	8.8 - 11 lbs	165 - 200 ft	100 - 115 ft
Surface blasting	8.8 - 11 lbs	165 - 200 ft	100 - 115 ft
Blasting in snow (approx. - 0.6 ft)	8.8 - 11 lbs	130 ft	82 ft
Blasting in snow (approx. - 0.6 ft)	3.3 - 5.5 lbs	82 ft	50 ft
Blasting in snow (- 2.3 ft)	3.3 - 11 lbs	33 ft	16 - 33 ft
Mortar 4.7 in. (0 ft)	6.6 lbs	130 ft	-
RPG 3.3 in. (0 ft)	1.54 lbs	65 - 82 ft	33 - 50 ft
Mortar 3.1 in. (0 ft)	1.32 lbs	50 - 65 ft	33 ft

Table from the WSL Institute for Snow and Avalanche Research SLF Davos Report no. 53/1996