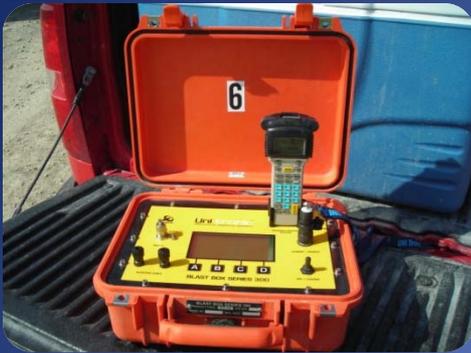




Explosive Technical Services
INC

Digital Blasting System Technology





The unparalleled accuracy, flexibility and safety of the i-kon™ Digital Energy Control System is making new levels of blast performance possible.

The i-kon™ System delivers total control over your blasting program.



A Tool That Increases Blast Performance



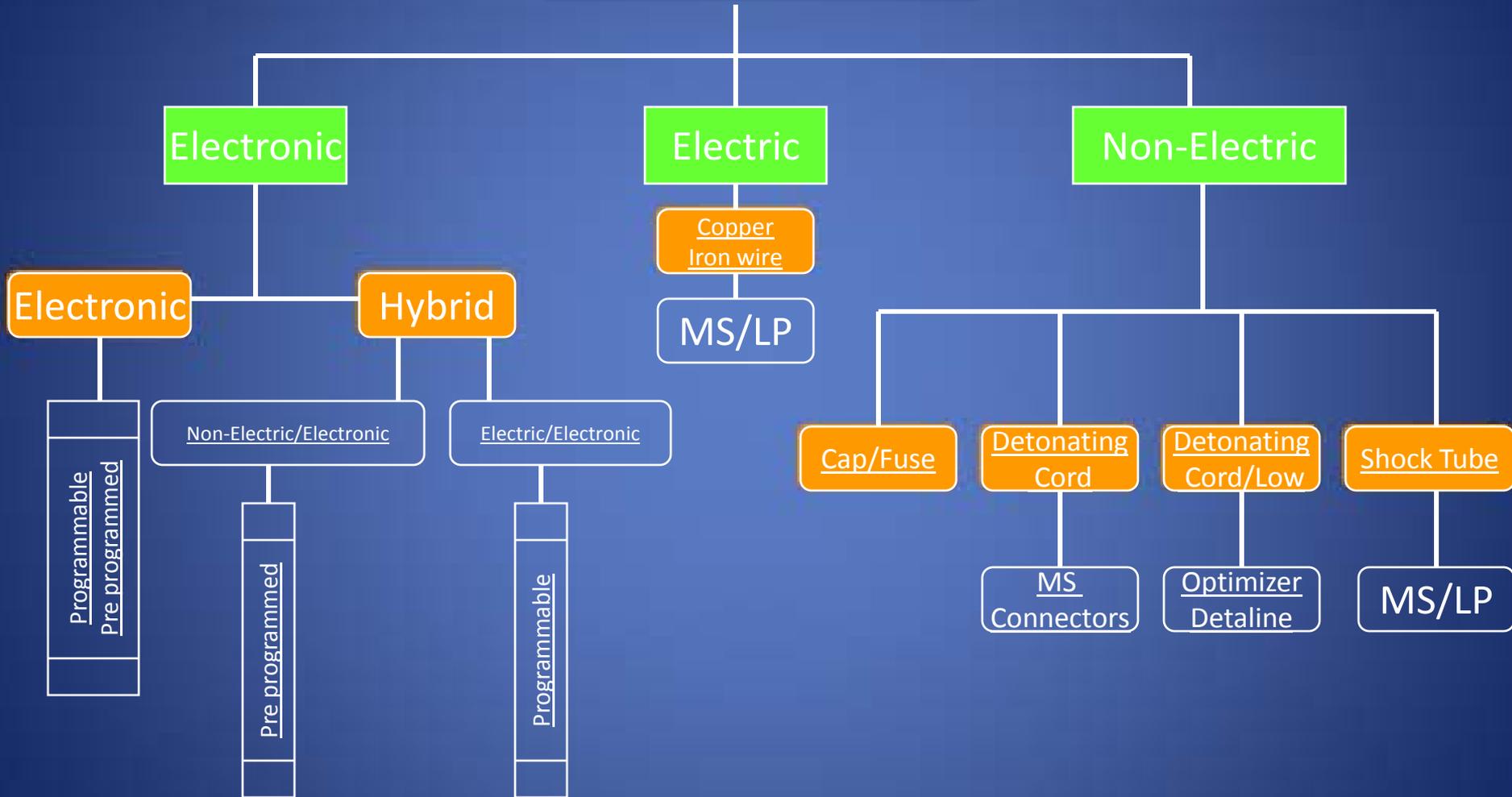
**Gives the Blast Engineer
Options Not Available
With Pyrotechnic Systems**



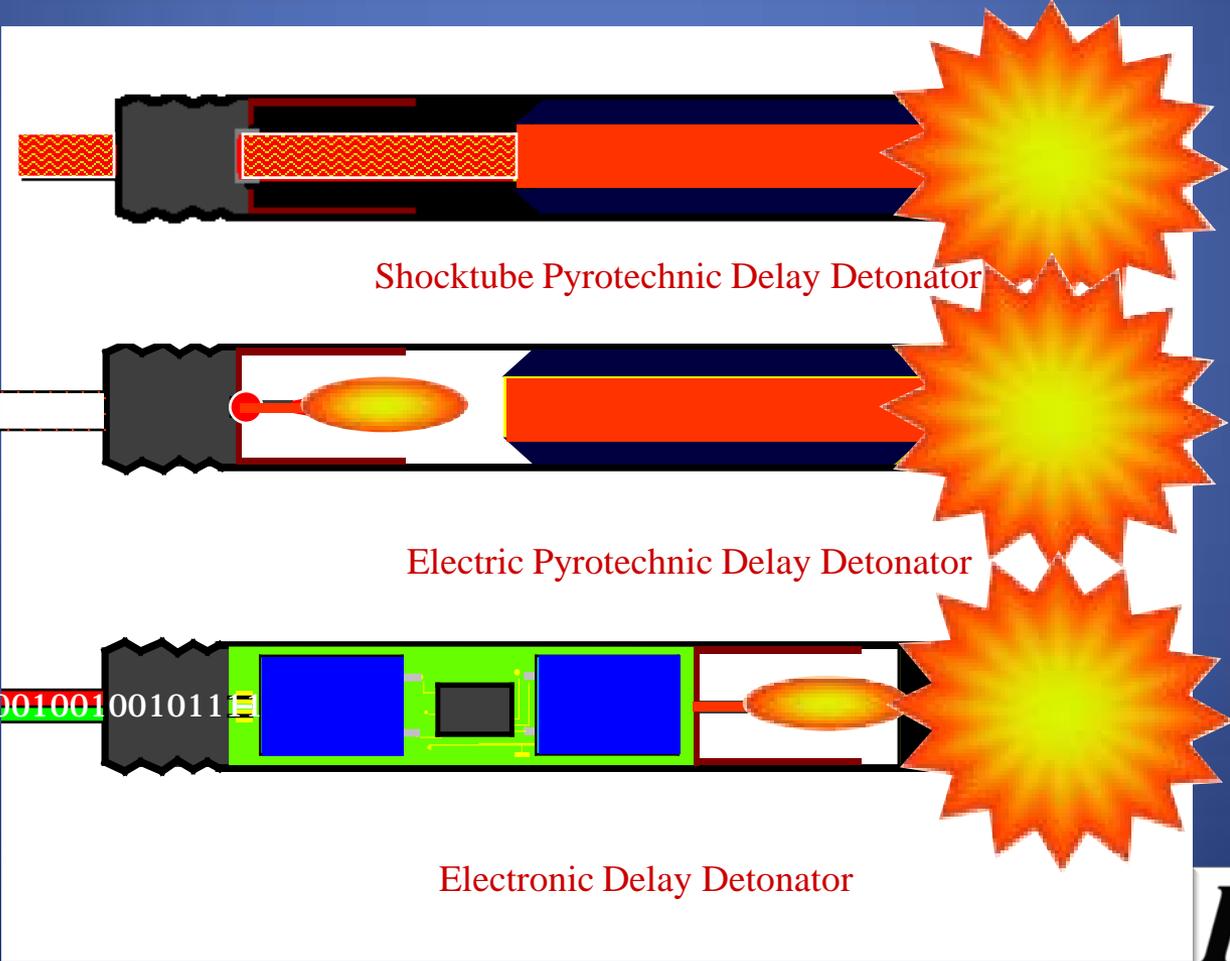
**Digital Blasting Technology
is not the Silver Bullet.
Good blast design and
blasting practices are still
required.**

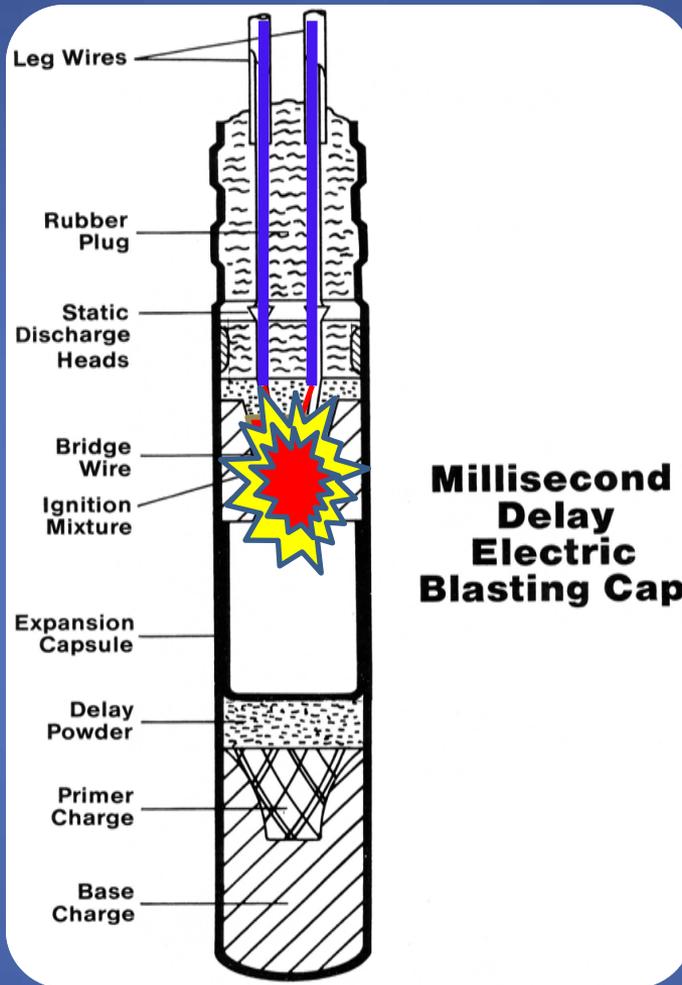


INITIATION SYSTEMS



Detonator Comparison





All Fire
0.25 amp

Test
0.05 amp

ELECTRICAL HAZARDS TO BLASTING

| Type of Electrical Energy | Products Affected | Safety Measures | Shunt Protection ? |
|--|---|--|--|
| Stray Current (from leaking power sources carried by rails, pipes, cables, machinery, vehicles) | Electric Caps | Stray Current Test. Place Wiring Safely. | Yes Keep shunts on Keep circuits shunted until blast time. |
| Radio Frequency (from various transmitters) | a. Electric Caps in wiring configurations b. No effect on Packaged electric Caps | Blaster's Handbook tables tell how far away to keep Radio Transmitters of various powers. | NO HELP |
| Static (from Anfo air-loading, belts, blowing particles, exhaust etc. Dust or snow storms.) | a. Electric Caps b. Non Electric Delays c. Fuse Caps | Avoid use in blowing dust, snow. For air-loading, use grounded semi conductive system. Follow Test Procedure in Blasters Handbook page 193. | SOME Protection but caps can still shoot. Keep shunts on until blast time. |
| Lightning (from atmospheric electrical storms) | a. DIRECT HIT, all products b. NEARBY, Electric Caps | Detect lightning with instrument. See Course Manual Evacuate and guard shot while storm is close | NO HELP. Shunted series will still shoot. Keep shunted, but don't feel PROTECTED |

30 CFR § 57.6401 Shunting.

Except during testing--

(a) Electric detonators shall be kept shunted until connected to the blasting line or wired into a blasting round;

(b) Wired rounds shall be kept shunted until connected to the blasting line; and

(c) Blasting lines shall be kept shunted until immediately before blasting.

[58 FR 69596, Dec. 30, 1993]



Shunt

Printed circuit tape directs high levels of extraneous current to the aluminum shell rather than through the bridgewire.



Phenolic plug is pressed into shell to make a positive seal that withstands high hydrostatic pressures.

Regulatory Approvals



P.I.B.

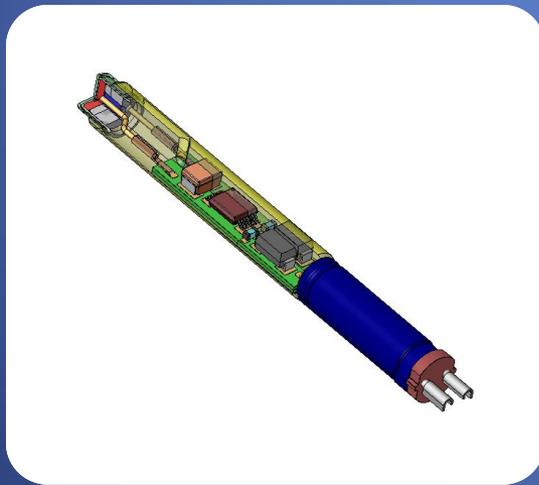
www.msha.gov

Increase in Blast Performance

- ➔ Improved Safety and Diagnostic
- ➔ Eliminate pyrotechnic scatter
- ➔ Delay selection, site specific

➤ Improved Safety and Diagnostics

- Immunity to RF, EMI and Stray Current



➤ Improved Safety and Diagnostics

- Immunity to RF, EMI and Stray Current



Evacuate

➤ Improved Safety and Diagnostics

- Immunity to RF, EMI and Stray Current
- Completely testable

➤ Improved Safety and Diagnostics



At the Blasting Machine



On the bench

2-way Communication

CHECKING ... COUNTING... CHARGING



Total System Verification

➤ Improved Safety and Diagnostics

- Immunity to RF, EMI and Stray Current
- Completely testable
- Automated self-test and disarm features



➤ Improved Safety and Diagnostics

- Immunity to RF, EMI and Stray Current
- Completely testable
- Automated self-test and disarm features
- Autonomous operation

➡ Improved Safety and Diagnostics



Firing line

➔ Improved Safety and Diagnostics



Fully Energized Blast

➤ Improved Safety and Diagnostics

Security

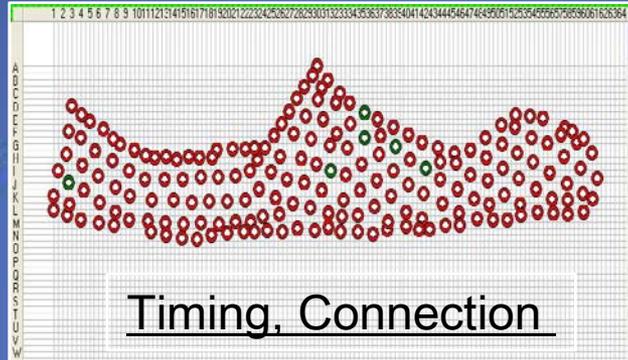
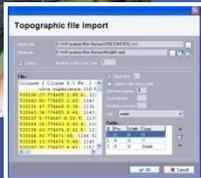
- Requires a specific Blast Machine to fire
- Minimize inventory
- Ease of control



100% accountability

➡ Improved Safety and Diagnostics

➤ Advanced Programming



Survey Import

Auto or Manual



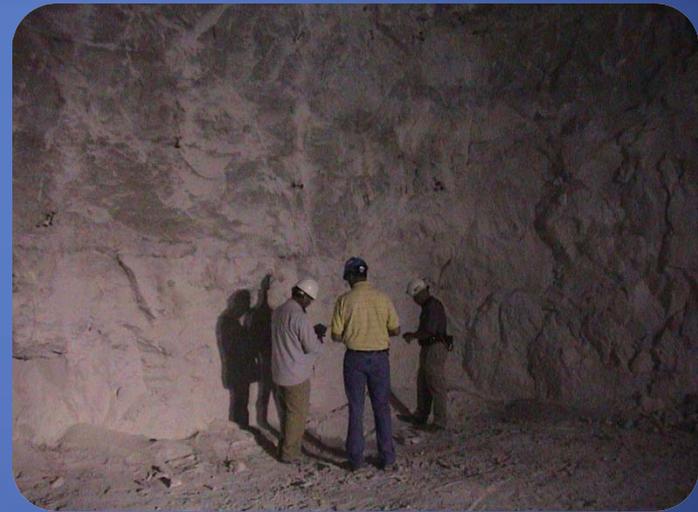
Auto Programming



➤ Improved Safety and Diagnostics

➤ Remote Blasting Systems

Underground

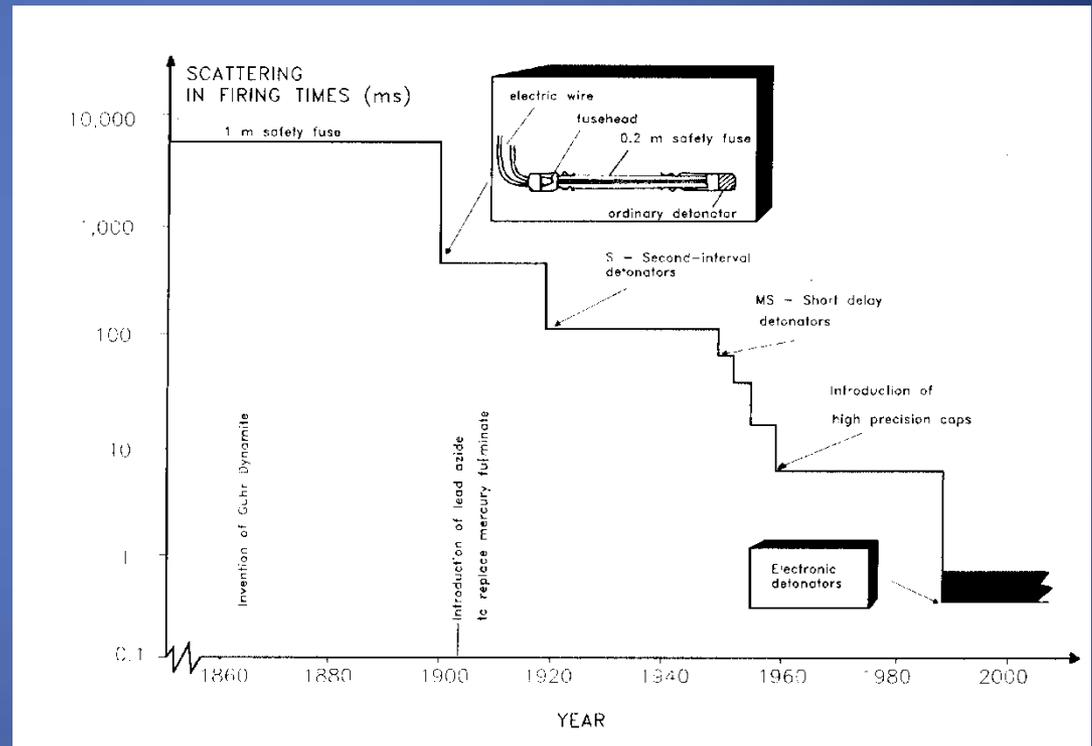
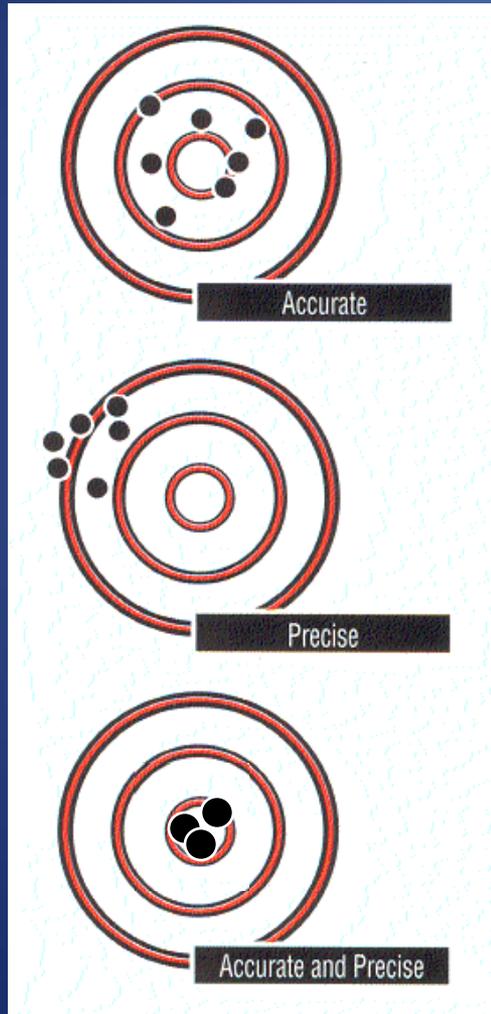


Surface

Performance Advantages

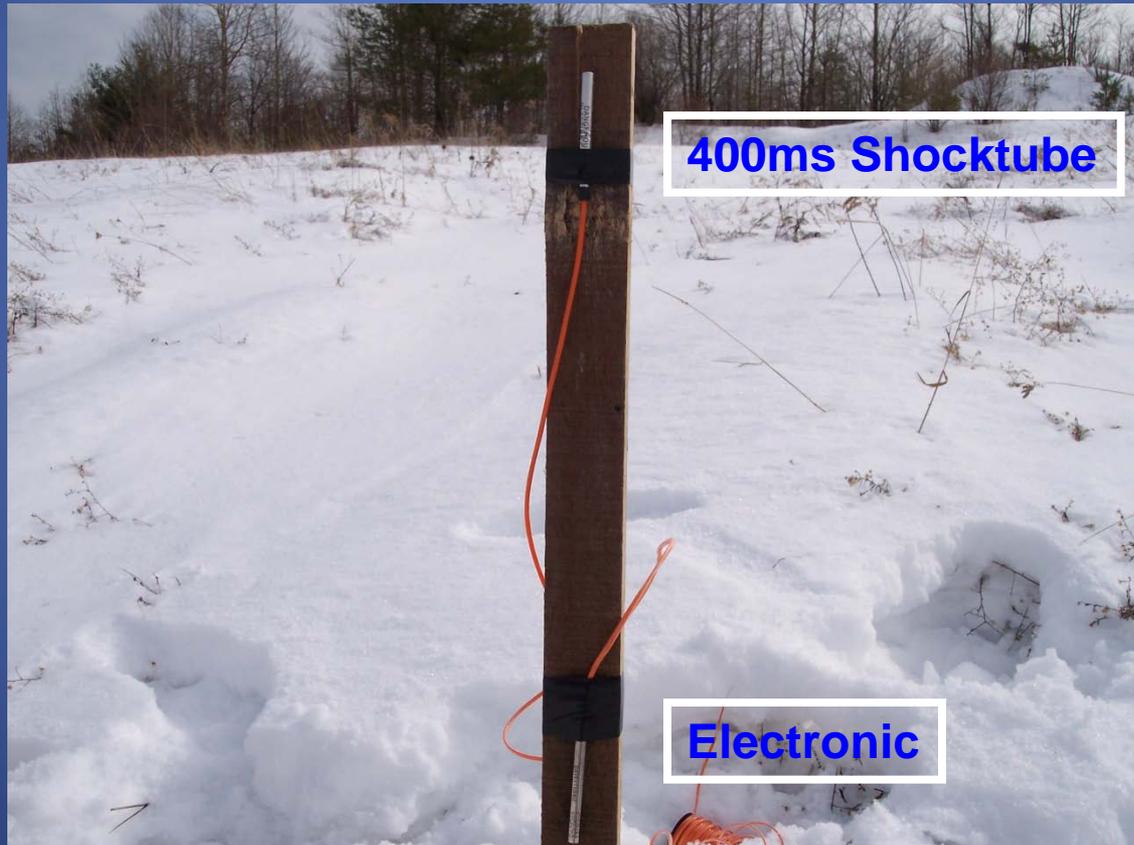
- ➔ Improved Safety and Diagnostics
- ➔ Eliminate pyrotechnic scatter

Eliminate pyrotechnic scatter



➡ Eliminate pyrotechnic scatter

Detonators Attached to Grade Stake



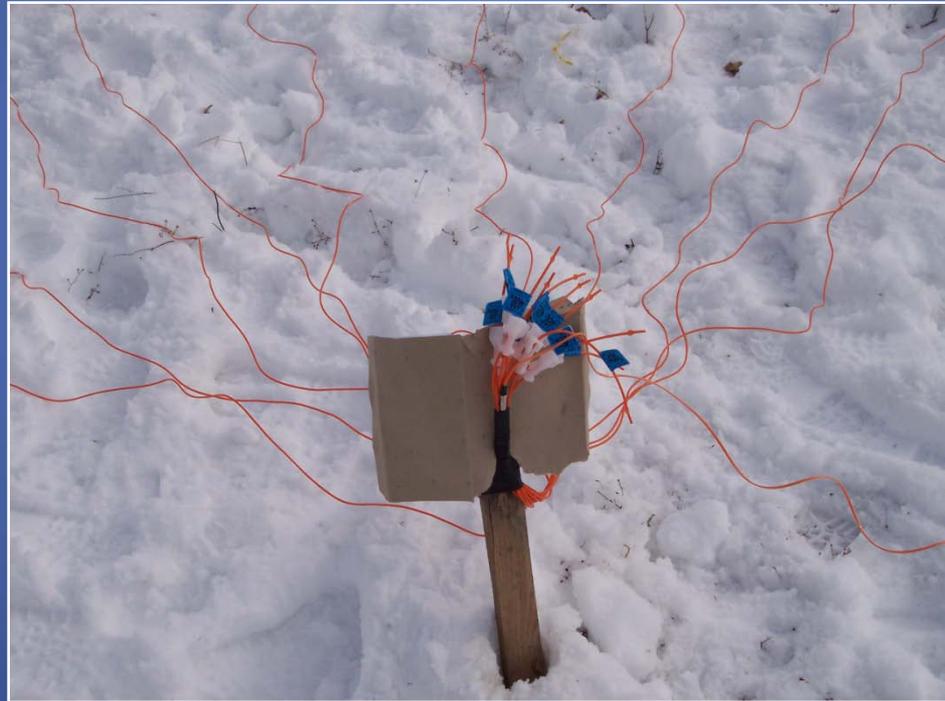
➡ Eliminate pyrotechnic scatter

Detonator Demonstration



➡ Eliminate pyrotechnic scatter

Shocktube fired simultaneously



➡ Eliminate pyrotechnic scatter

High Speed Video at 1000Frames/sec.



➡ Eliminate pyrotechnic scatter

Actual Firing Times

| Grade Stake | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-----------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pyrotechnics/ms | 405 | 411 | 417 | 383 | 428 | 405 | 413 | 412 | 419 | 421 |
| Electronics/ms | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |

➡ Eliminate pyrotechnic scatter



➡ Eliminate pyrotechnic scatter



Performance Advantages

- ➔ Improved Safety and Diagnostics
- ➔ Eliminate pyrotechnic scatter
- ➔ Delay selection, site specific

➡ Delay selection, site specific

➤ Blast analysis



➤ Seismic analysis

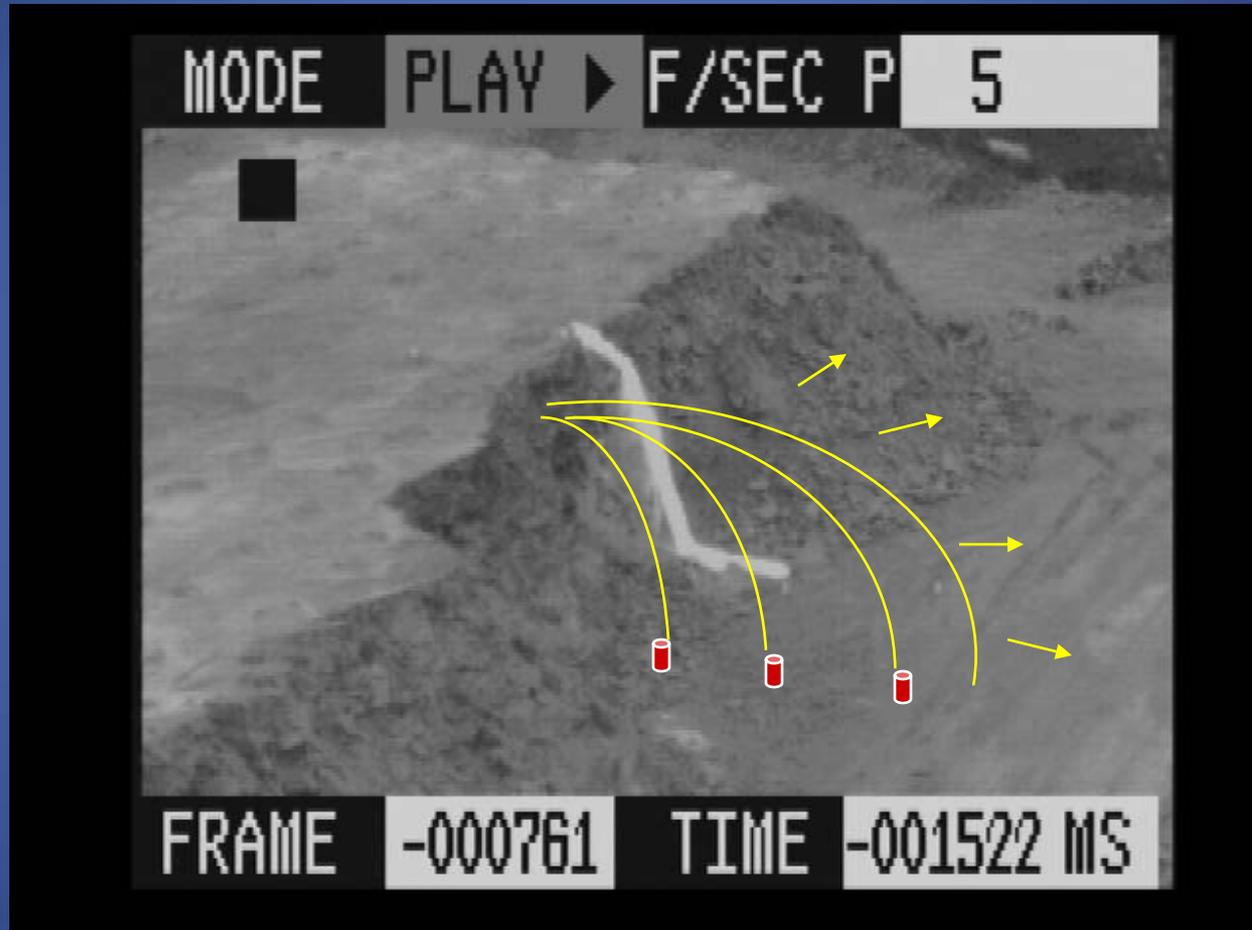
➡ Delay selection, site specific

Blast Analysis

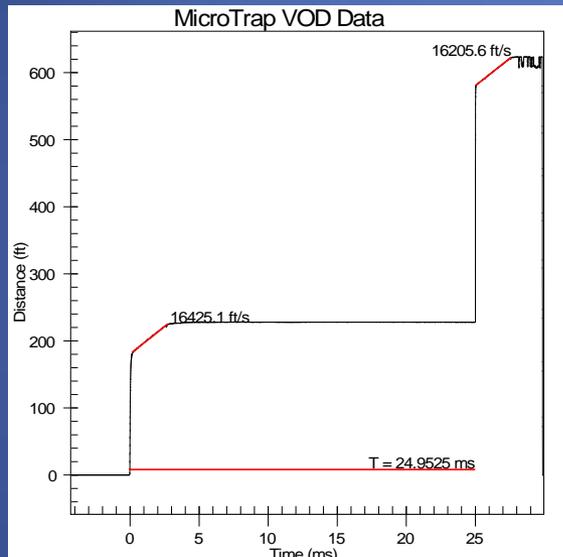


T- Min, Burden face velocities

➡ Delay selection, site specific



➡ Delay selection, site specific



Explosive V.O.D

➡ Delay selection, site specific

Blast Analysis



Row to Row Timing

➡ Delay selection, site specific

Blast Analysis



Vertical bench Movement

➡ Delay selection, site specific

Blast Analysis



➡ Delay selection, site specific

Blast Analysis



Fragmentation and Crusher Throughput

➡ Delay selection, site specific

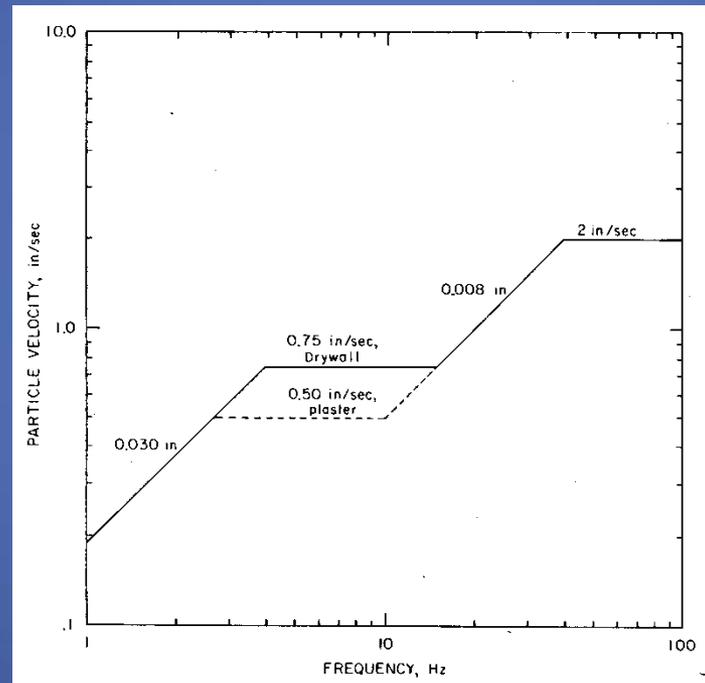
Blast Analysis



Digability Floor Control

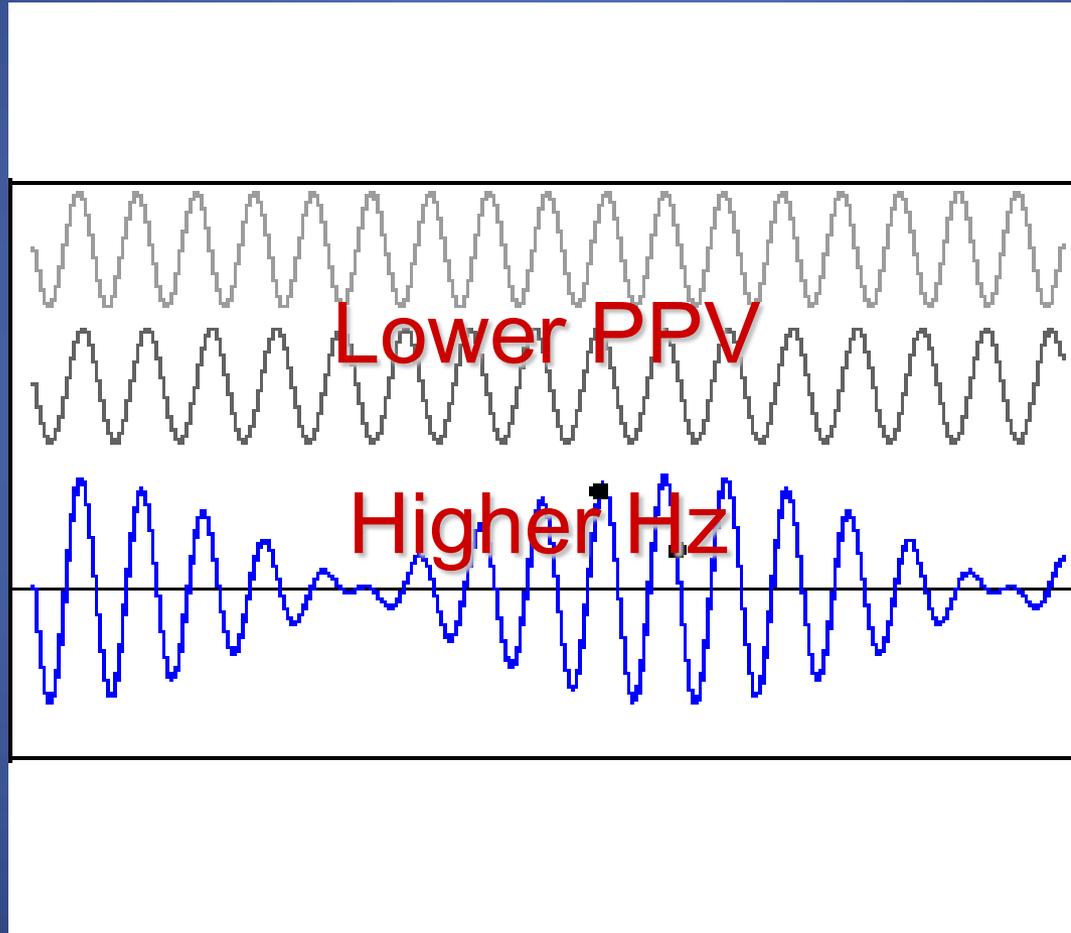
➔ Delay selection, site specific

Seismic Analysis



U.S.B.M. 8507

➡ Delay selection, site specific

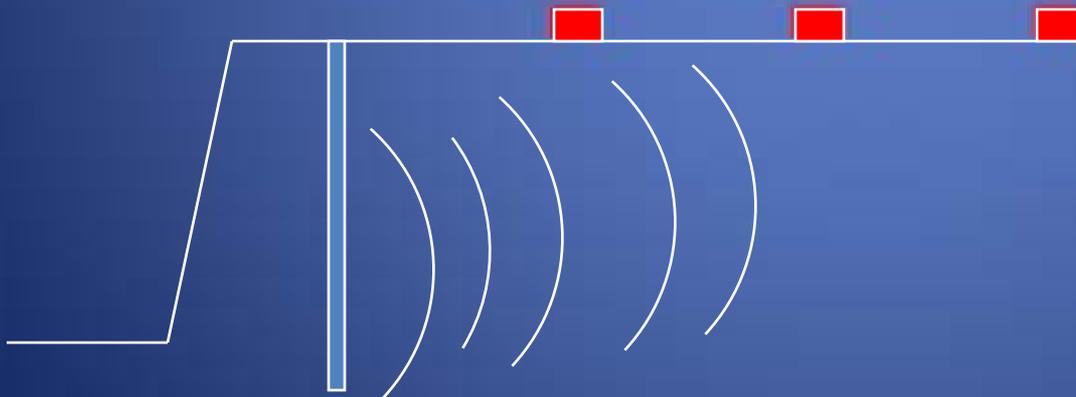


U.S.B.M. 8507

➡ Delay selection, site specific

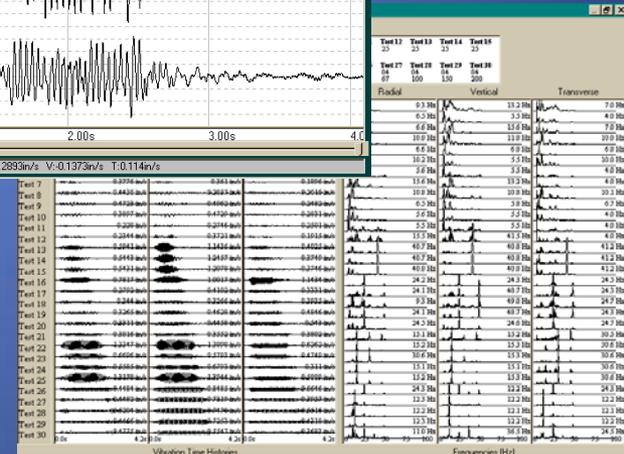
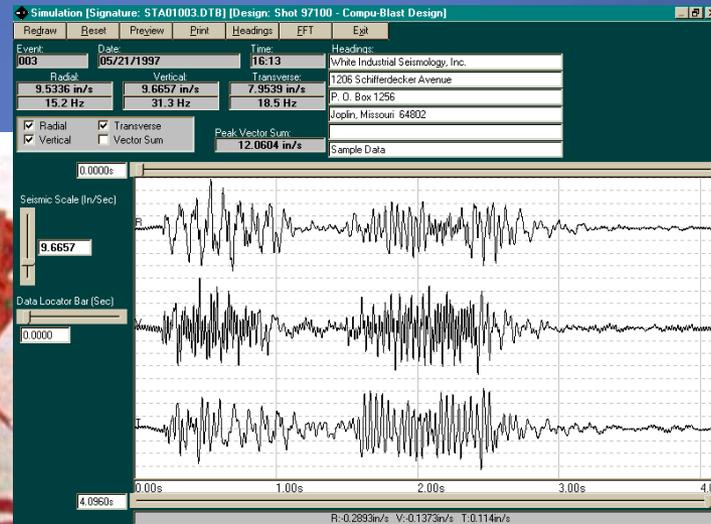
Seismic Analysis

- Signature Hole Study
- Regression Analysis
- Rock Sonic Velocity



Delay selection, site specific

Signature Hole Analysis

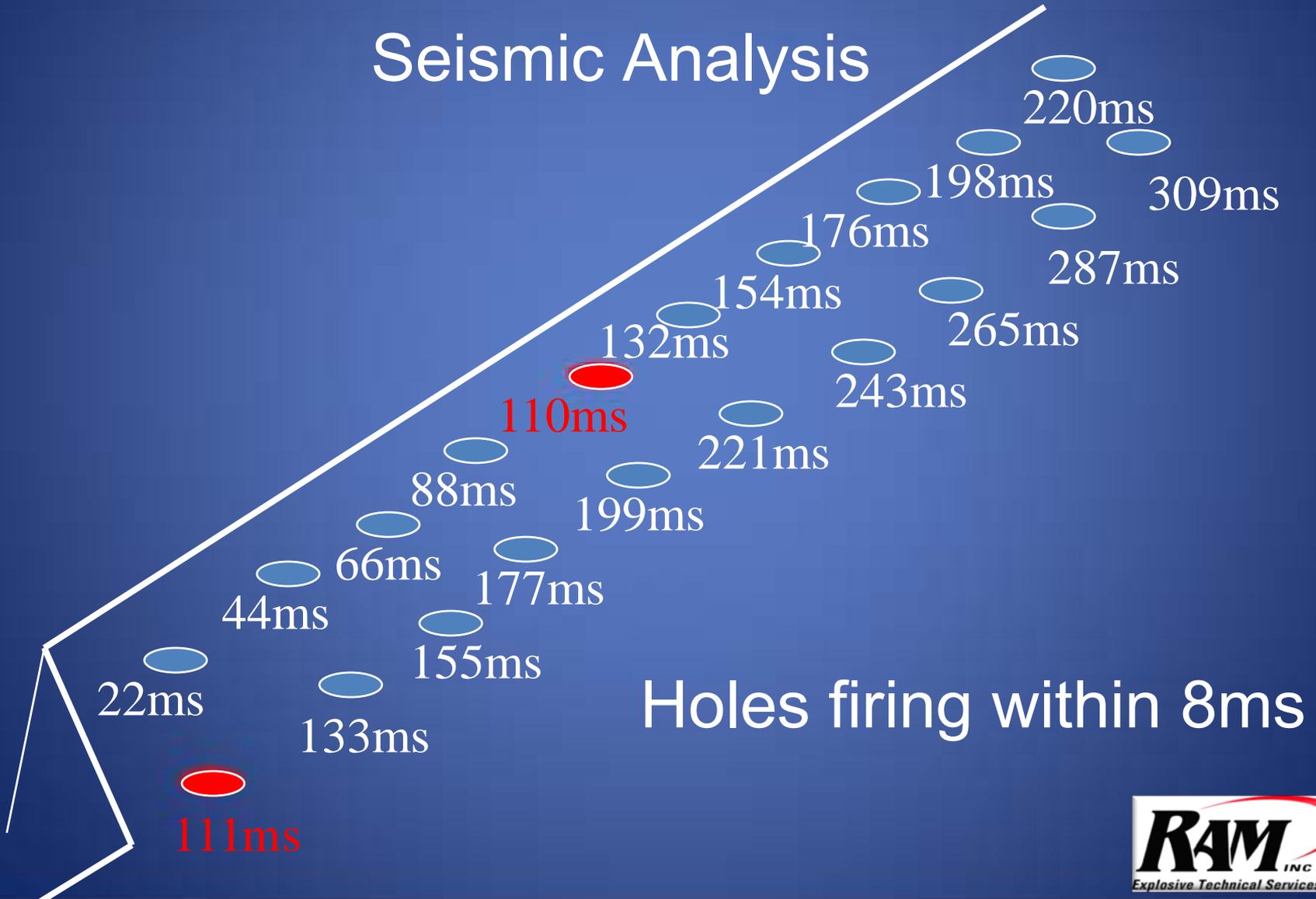


Analysis Software



➡ Delay selection, site specific

Seismic Analysis



Design Options

Design Options

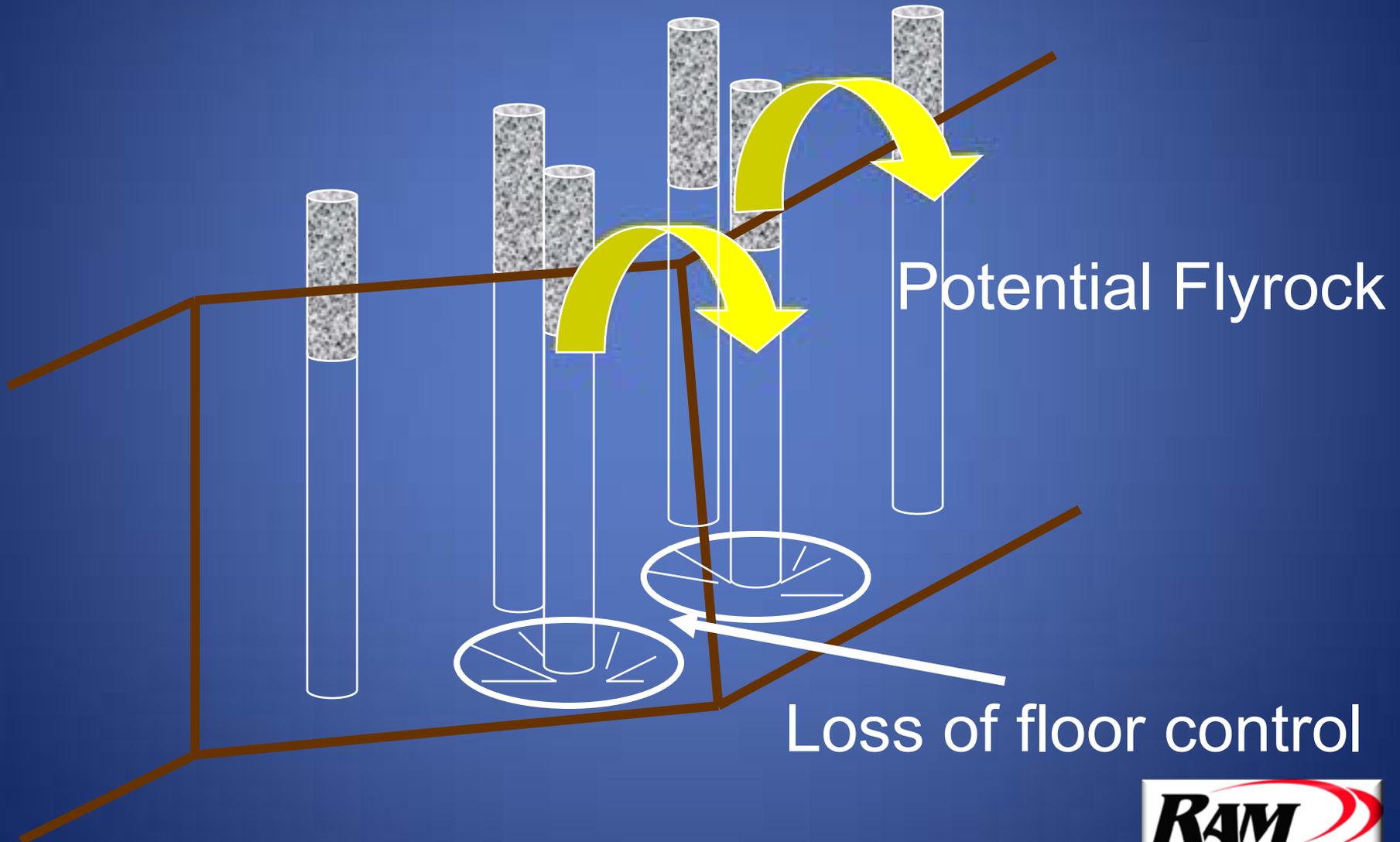
- Production blasting
- Casting
- Pre-split blasting and wall control
- Underground
- Construction
- Demolition

Design Options

Pyrotechnic Systems



Design Options



Design Options

Digital Blasting Systems



Design Options



Design Options



System Selection

- Safety, tested system
- MSHA, INERIS, CE approvals
- Track record
- Programmable, fixed delay
- Special boosters
- Training
- Testing capabilities, diagnostics

System Selection

- Two way communication
- Ease of use
- Technical support
- Supply, inventory
- Blasting machine (back-up)
- Upgrades
- Design Software

Manufactures

- Orica
 - IKON
 - Unitronic
 - E-Dev Canada

Manufactures

- Dyno
 - DigiShot

Manufactures

- Special Devices Incorporated (SDI)
 - US, Arizona EIM

Manufactures

- Austin Powder
 - E-Star
 - SDI technology

Manufactures

- Lectronic
 - Austin Powder
 - SDI technology

Thank you

