



BLASTING and MSHA?



**Thomas E. Lobb
U.S. Department of Labor,
MSHA
Technical Support, A&CC**

7 billion pounds

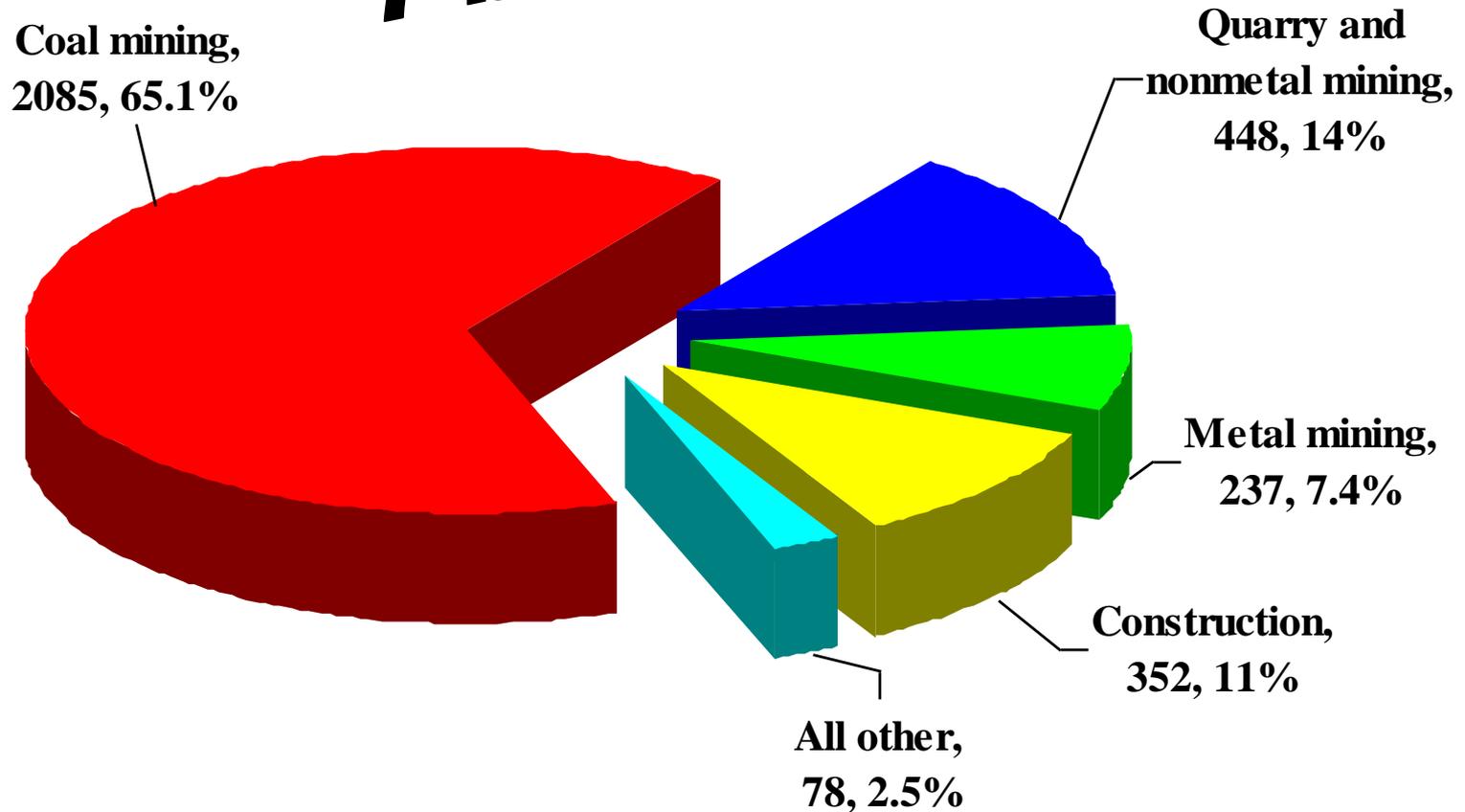


Figure 1 - Explosives & Blasting Agent Consumption in 2005
(thousand metric tons)

CONSUMERS OF EXPLOSIVES



COAL MINING - 65 %

QUARRYING & METAL/NONMETAL MINING - 21 %

CONSTRUCTION & MISC. - 13 %

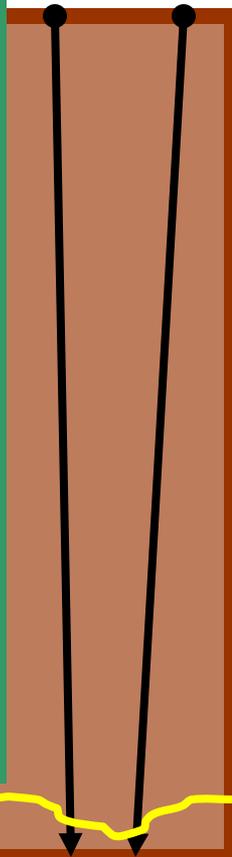


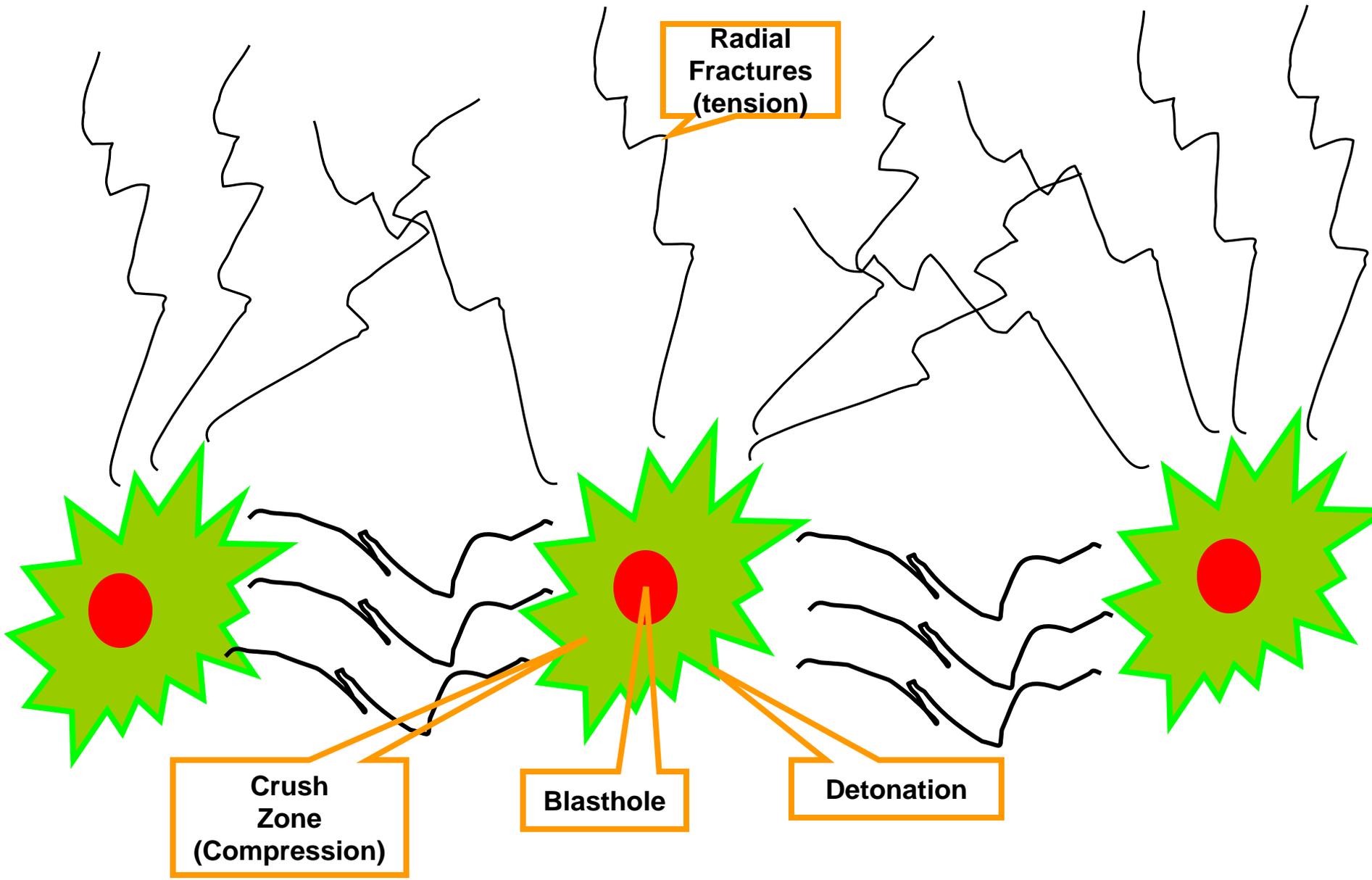
Flyrock: An Ever-present Danger In Mine Blasting



MSHA accident data reveal that the blasting crew and blasters often suffer serious injuries due to inadequacy of the shelter used for protection from blasts.

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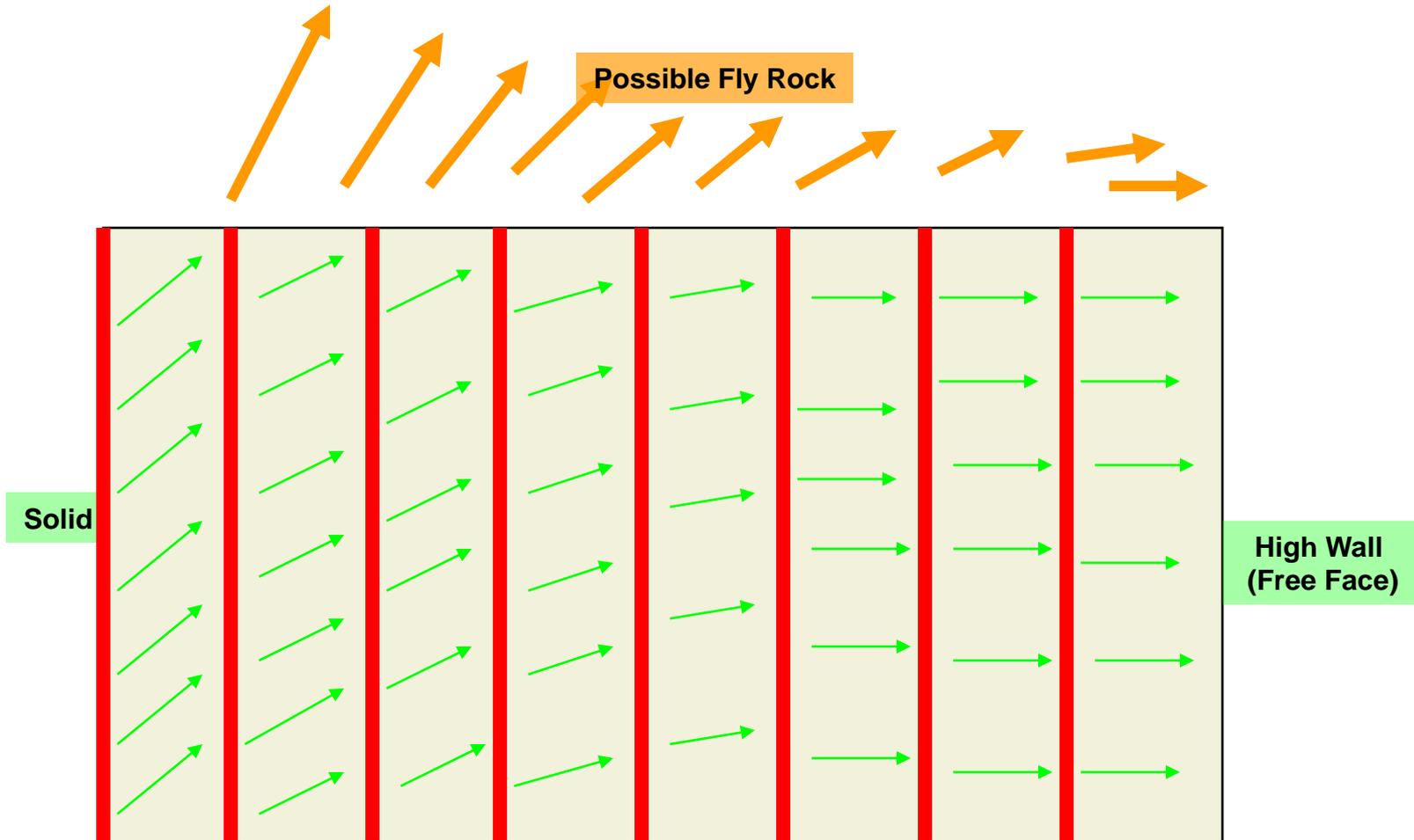
Radial Fractures (tension)

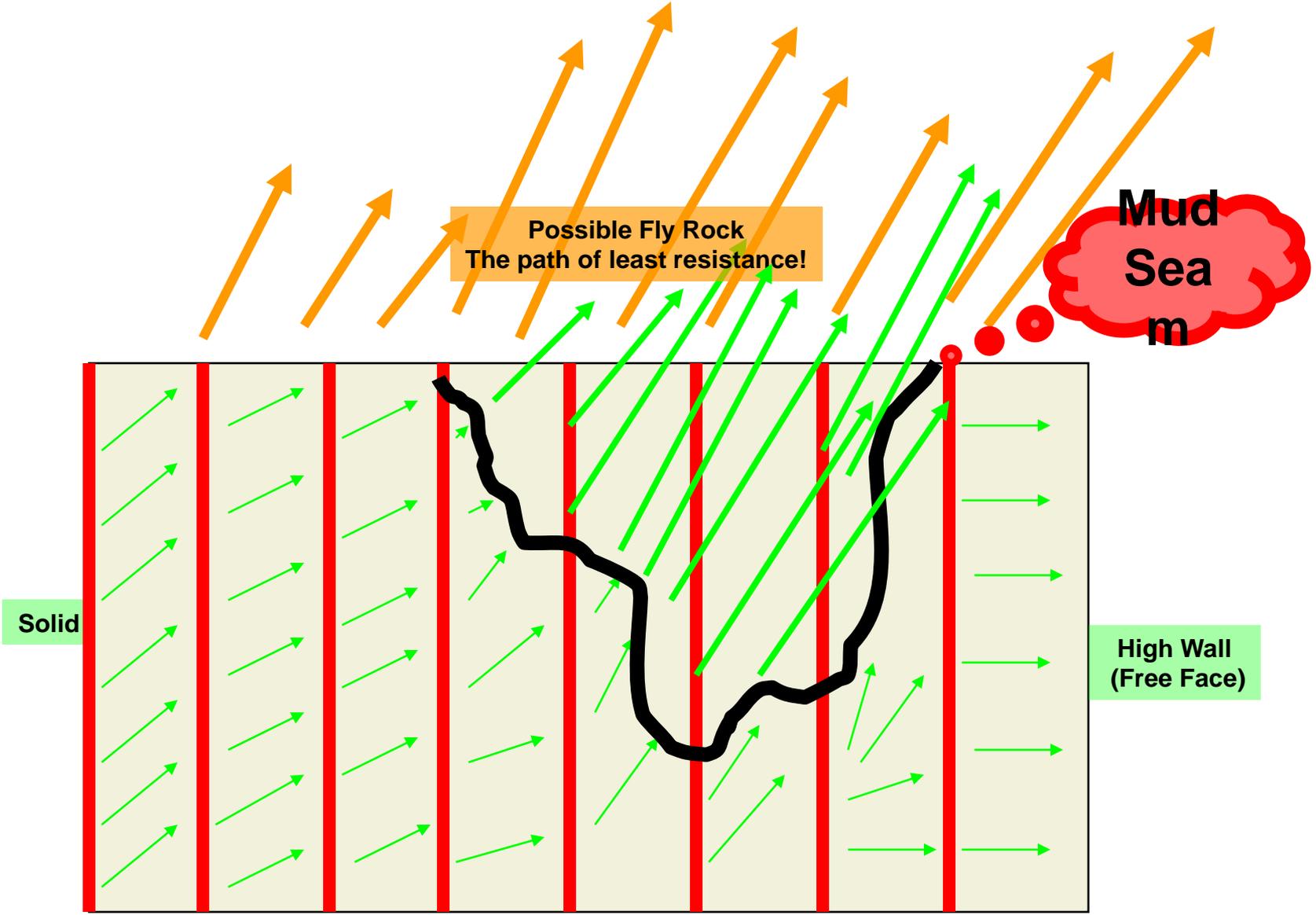
Crush Zone (Compression)

Blasthole

Detonation

As the number of rows increase, rock movement tends toward the vertical due to the low velocity of broken rock. Successively reducing relief toward quarry face.





Solid

Possible Fly Rock
The path of least resistance!

Mud
Sea
m

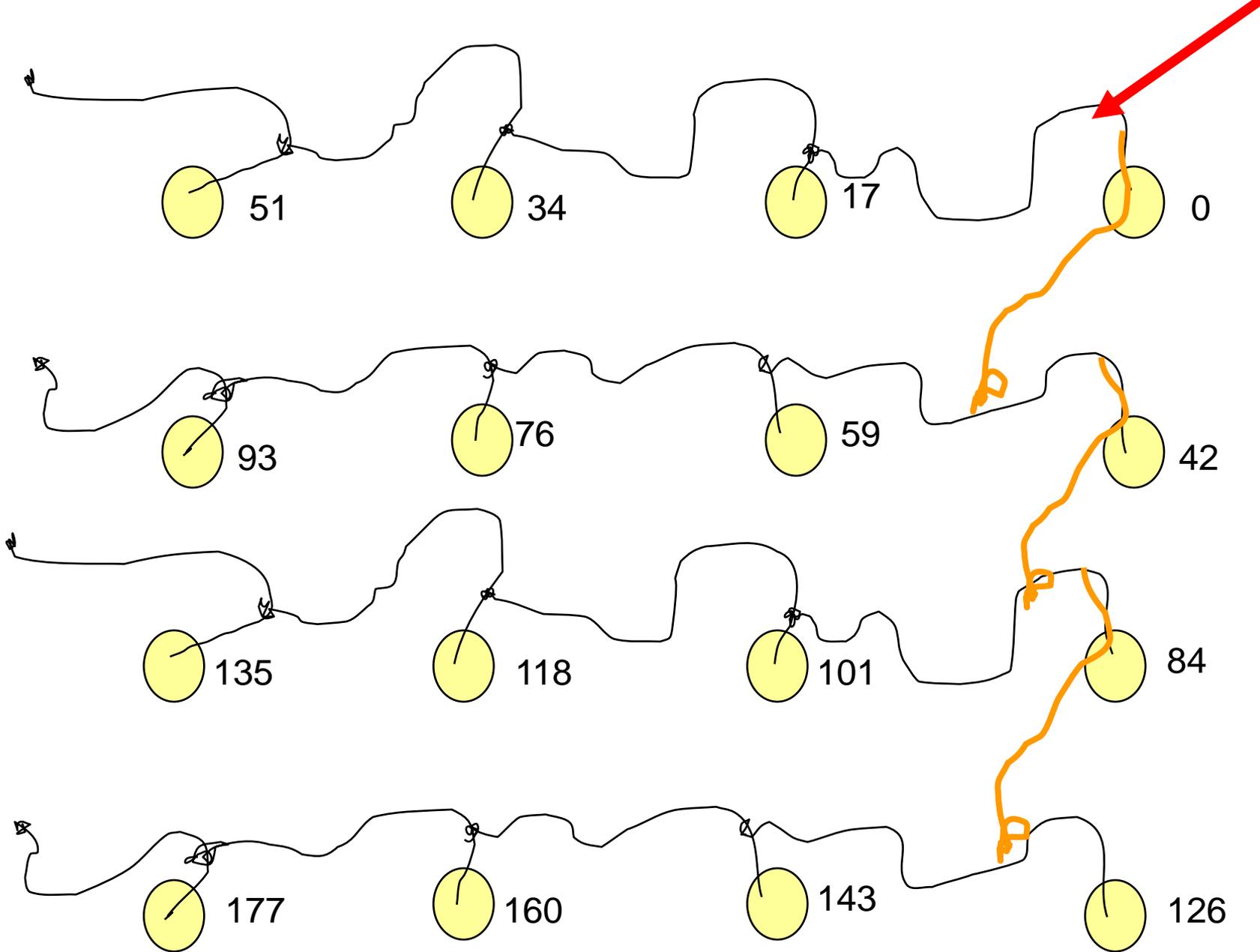
High Wall
(Free Face)



4.5M
16FT/PI

DYNO **Dyno Nobel**
Nobel
EXPLOSIVES KEEP AWAY FROM CHILDREN
DANGEROUS EXPLOSIVES KEEP AWAY FROM CHILDREN
DANGER EXPL
TENEZ ELOIGNE DES ENFANTS DANGER EXPL
EXPLOSIVO PELIGROSO ALEJE DE LOS NIÑOS
EXPLOSIVO PELIGROSO ALEJE DE LOS NIÑOS

EXPLOSIF-DANGER-EXPLOSIVE
EXPLOSIVO PELIGRO
C35
DYNO CAST BOOSTER
DYNO
Dyno Nobel
Eleventh Floor Crossroads Tower,
Salt Lake City, UT 84144
DO NOT USE THE CORD TUNNEL AS A CAPWELL
CORD TUNNEL=50 GRAIN CORD OR GREATER
EXPLOSIF-DANGER-EXPLOSIVO







1.5
BLASTING
AGENTS
D
1

CAUTION
FIRE
EXTINGUISHERS

OSIVES
D
1



Blasting

Control What

?????



**Tom Lobb
MSHA**

MSHA

OSHA

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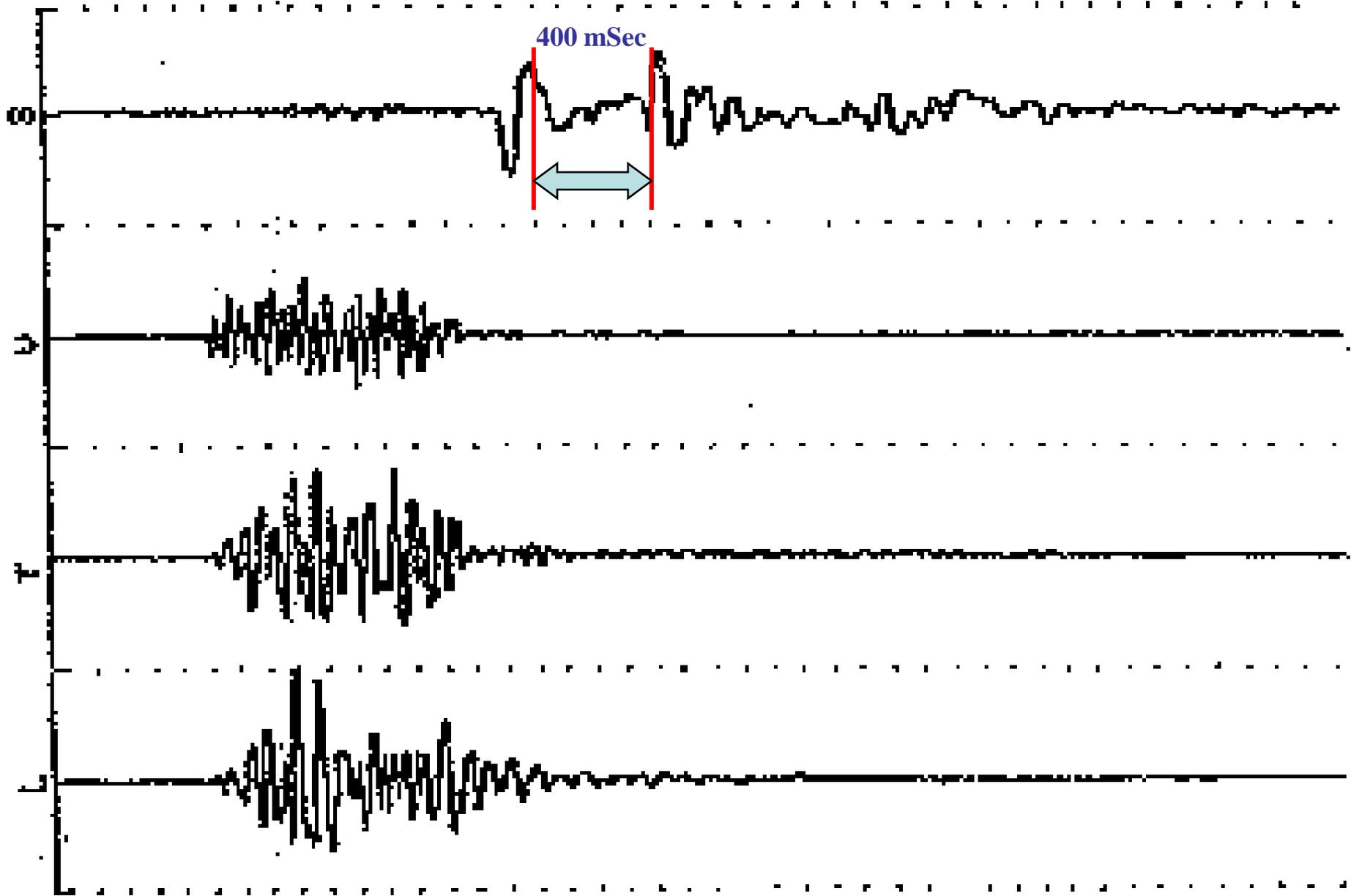
**MSHA data indicate
that blasters and
helpers often suffer
injuries due to the
lack of adequate
shelter!**







2011
10/12/11
10/12/11



When everything is coming your way, you're in the wrong lane.

Larry the Cable Guy



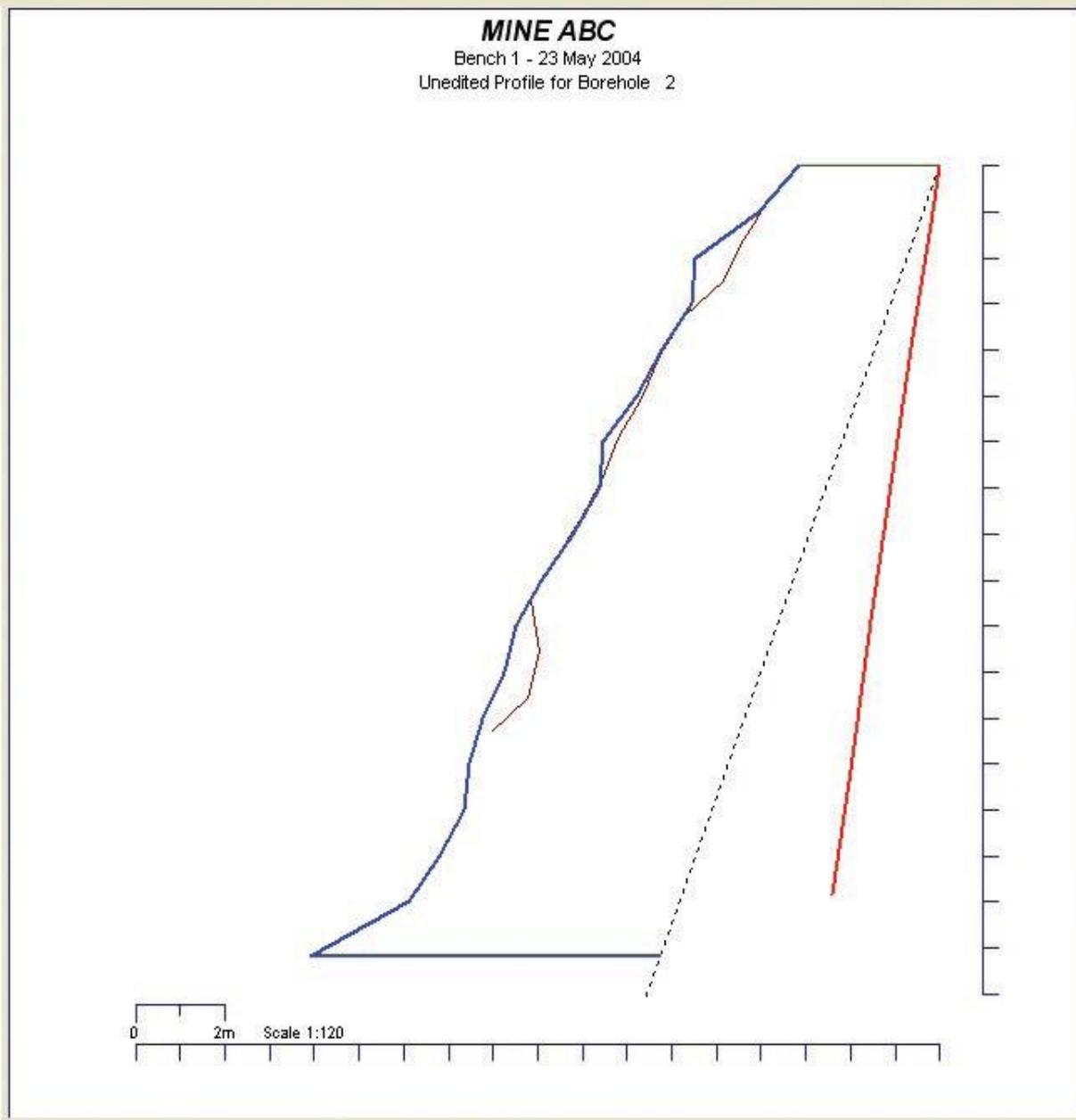
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Burden Data:

Borehole Depth	Burden @ Depth	True Offset	Separati to Previ Hole
1.0	Undefined	0.0	3.0
2.0	3.7	0.4	3.0
3.0	4.3	0.6	3.0
4.0	4.8	0.8	3.0
5.0	5.2	1.0	3.0
6.0	5.6	1.2	2.9
7.0	6.0	1.4	2.9
8.0	6.3	1.6	3.0
9.0	6.6	1.8	3.0
10.0	6.9	2.0	3.0
11.0	7.3	2.2	3.0
12.0	7.8	2.4	3.1
13.0	8.0	2.6	3.1
14.0	7.7	2.8	3.2
15.0	8.3	3.0	3.2
16.0	Undefined	0.0	3.3
17.0	Undefined	0.0	4.0
18.0	Undefined	0.0	3.0
19.0	Undefined	0.0	3.0
19.3	Undefined	0.0	3.0

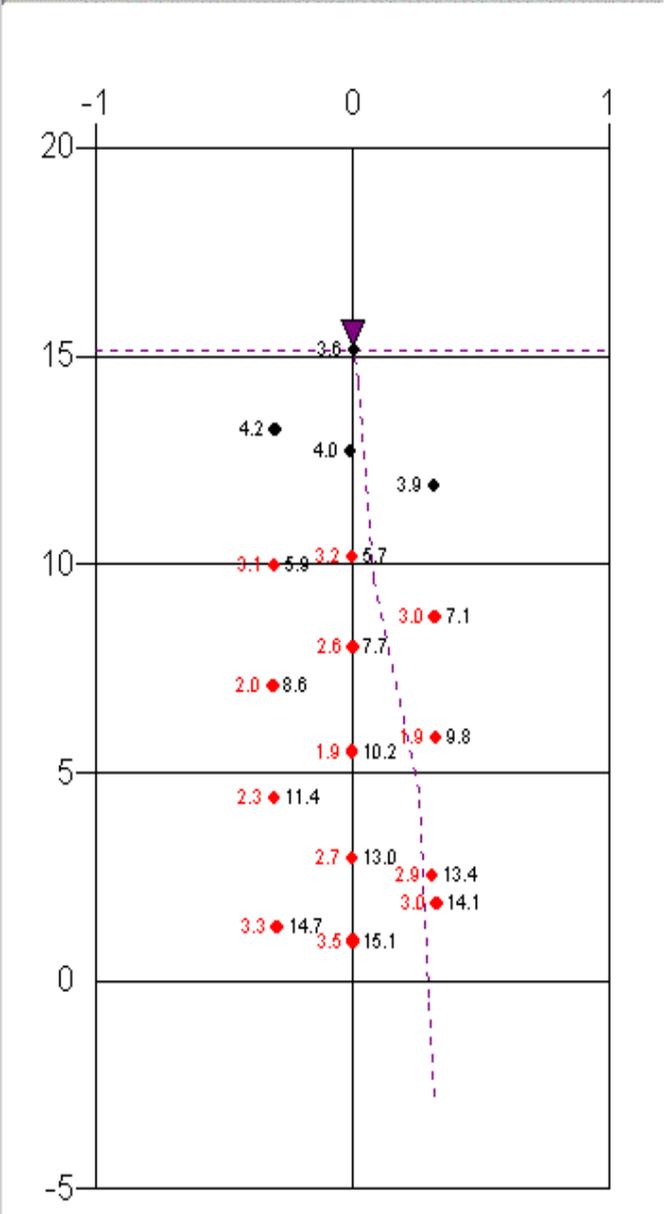
Profile Data: (FlexT Data)

Diameter	115.00 mm
Hole Angle	Varies
Hole Depth	16.0 m
Stemming	3.0 m
Back Fill:	0.0 m
SubDrill	1.0 m
Area	114.4 m ²
Volume	365 m ³
Min Burden	4.26 m
@ Depth	3.0 m
Max Burden	8.34 m
@ Depth	15.0 m
Ave Burden	6.53 m
Exp Mass:	0.0 kg
Nominal Powder Factor:	
	0.000 kg/m ³
	0.000 kg/ton

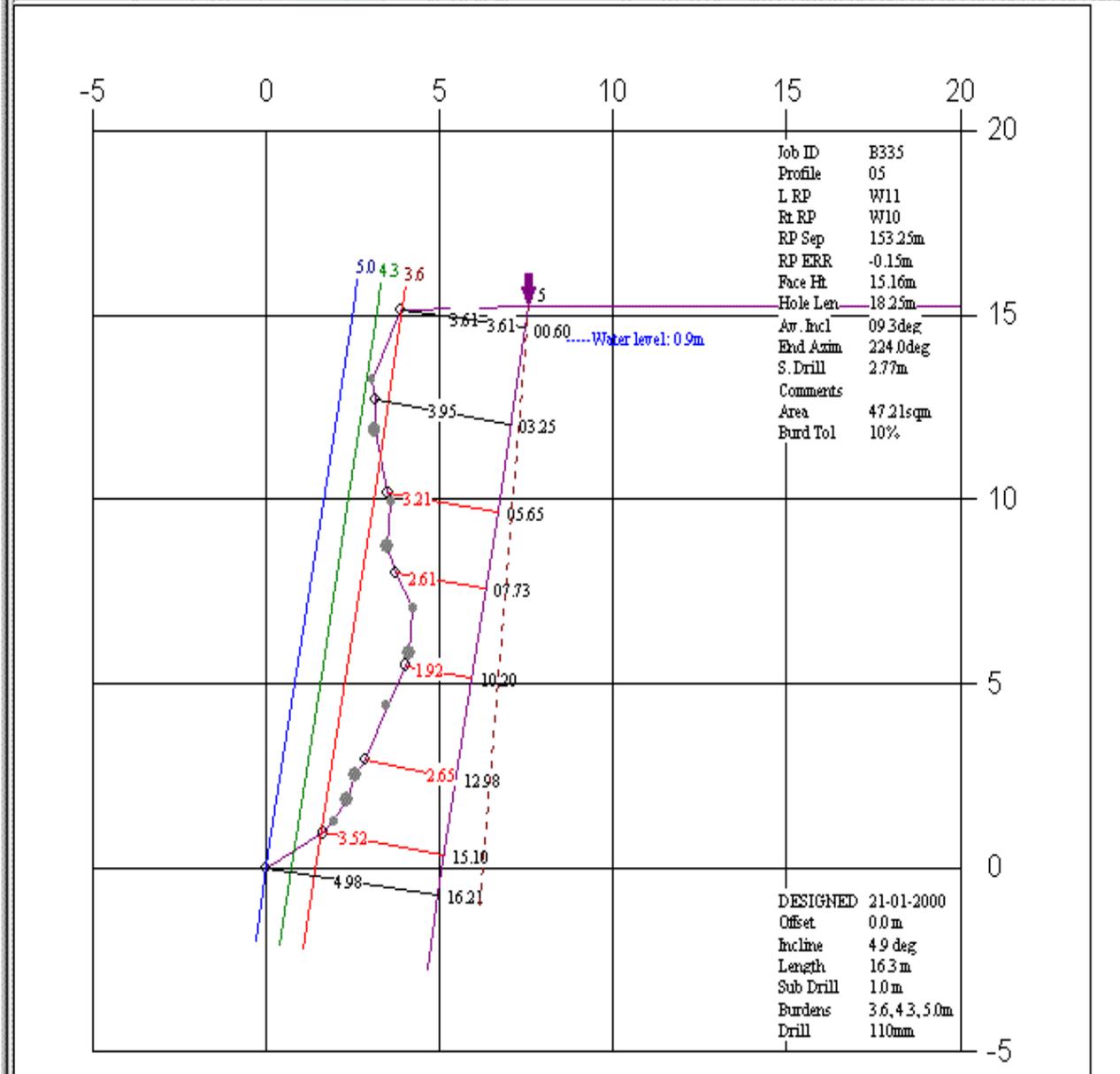
Profile #

Warning





Face View Hole 5 [B335]

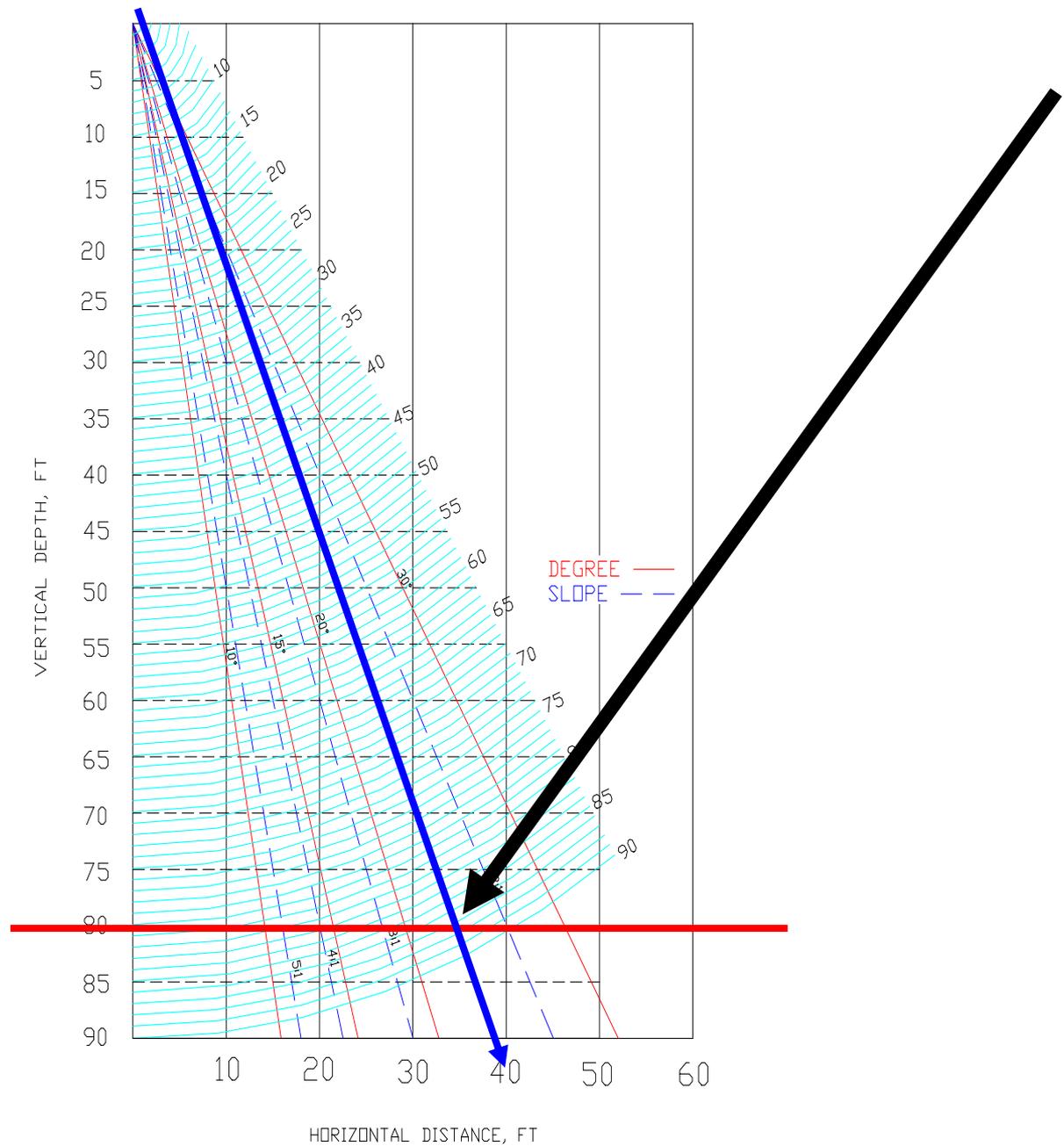


Job ID	B335
Profile	05
L RP	W11
Rt RP	W10
RP Sep	153.25m
RP ERR	-0.15m
Face Ht	15.16m
Hole Len	18.25m
Av. Incl	09.3deg
End Azim	224.0deg
S. Drill	2.77m
Comments	
Area	47.21sqm
Burd Tol	10%

DESIGNED	21-01-2000
Offset	0.0m
Incline	4.9 deg
Length	16.3 m
Sub Drill	1.0m
Burdens	3.6, 4.3, 5.0m
Drill	110mm

Face and Hole Survey for Hole 5 [B335 210100]

NOMOGRAPH FOR ANGLED HOLES



Event Report

Date/Time Vert at 12:05:23 June 11, 2007
 Trigger Source Geo: 0.0400 in/s
 Range Geo: 10.00 in/s
 Record Time 3.0 sec at 1024 sps

Serial Number BA6949 V 8.12-8.0 BlastMate III
 Battery Level 6.3 Volts
 Calibration March 15, 2007 by InstanTel Inc.
 File Name H949BPMP.KZ0

Notes
 next to primary
 Client: pike lebanon
 User Name: Joe St.Pierre
 General:

Extended Notes

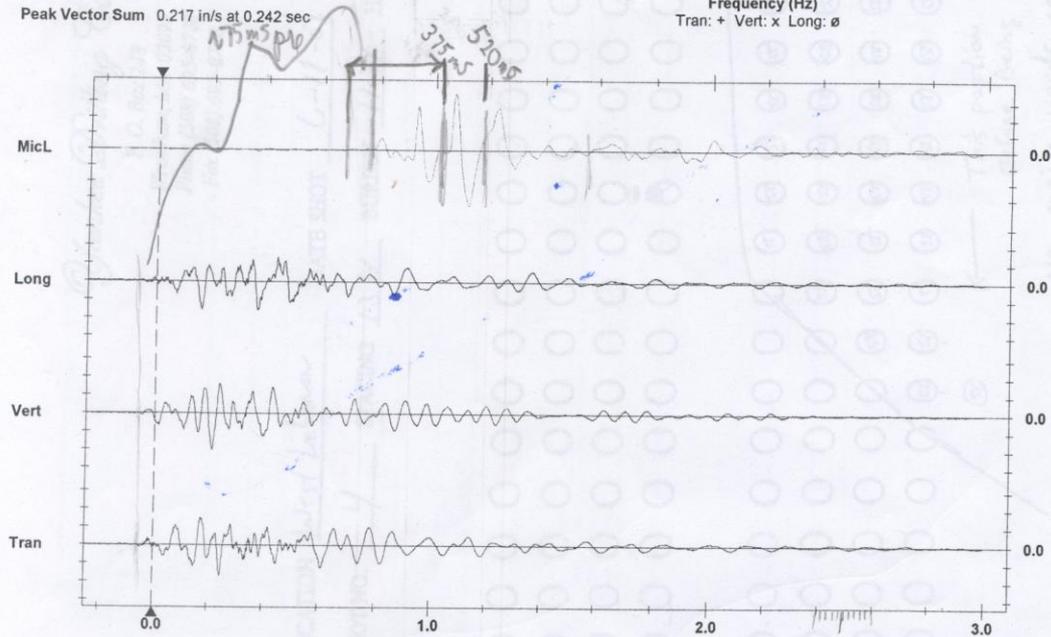
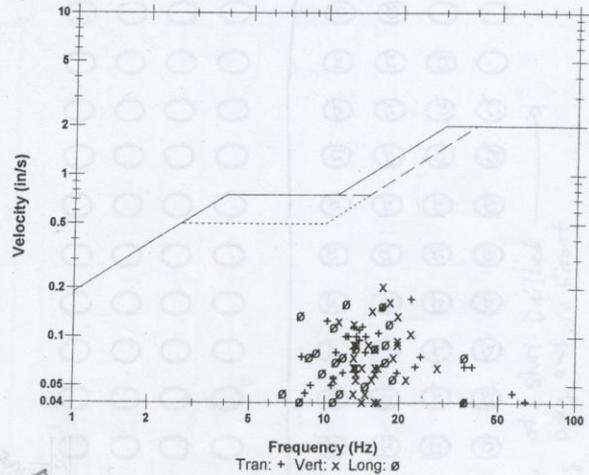
Post Event Notes

Microphone Linear Weighting
 PSPL 135.7 dB(L) at 1.070 sec
 ZC Freq 12 Hz
 Channel Test Passed (Freq = 19.3 Hz Amp = 574 mv)

	Tran	Vert	Long	
PPV	0.170	0.205	0.160	in/s
ZC Freq	22	17	12	Hz
Time (Rel. to Trig)	0.246	0.212	0.371	sec
Peak Acceleration	0.0795	0.0795	0.0795	g
Peak Displacement	0.00163	0.00187	0.00201	in
Sensorcheck	Passed	Passed	Passed	

Peak Vector Sum 0.217 in/s at 0.242 sec

USBM R18507 And OSMRE



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 0.100 in/s/div Mic: 0.00500 psi(L)/div
 Trigger =

Event Report

Date/Time Vert at 12:05:23 June 11, 2007
 Trigger Source Geo: 0.0400 in/s
 Range Geo: 10.00 in/s
 Record Time 3.0 sec at 1024 sps

Serial Number BA6949 V 8.12-8.0 BlastMate III
 Battery Level 6.3 Volts
 Calibration March 15, 2007 by InstanTel Inc.
 File Name H949BPMP.KZO

Notes
 next to primary
 Client: pike lebanon
 User Name: Joe St. Pierre
 General:

Extended Notes

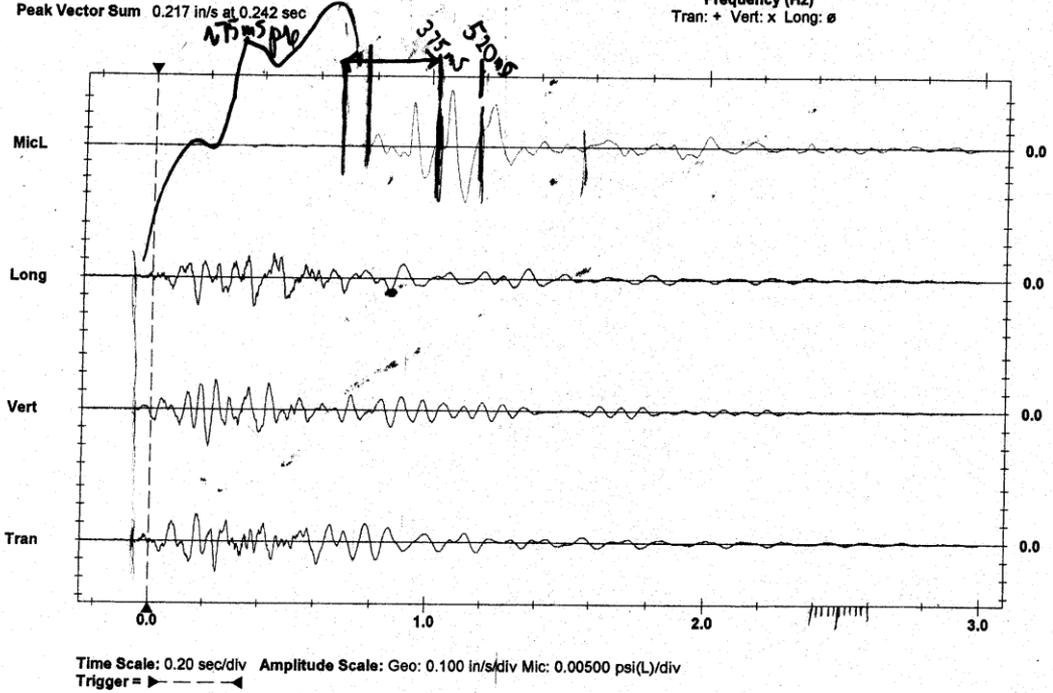
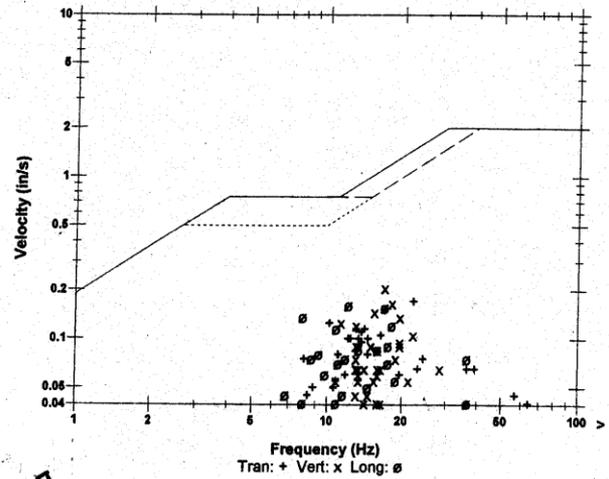
Post Event Notes

Microphone Linear Weighting
 PSPL 135.7 dB(L) at 1.070 sec
 ZC Freq 12 Hz
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Sensorcheck	Passed	Passed	Passed	

Peak Vector Sum 0.217 in/s at 0.242 sec

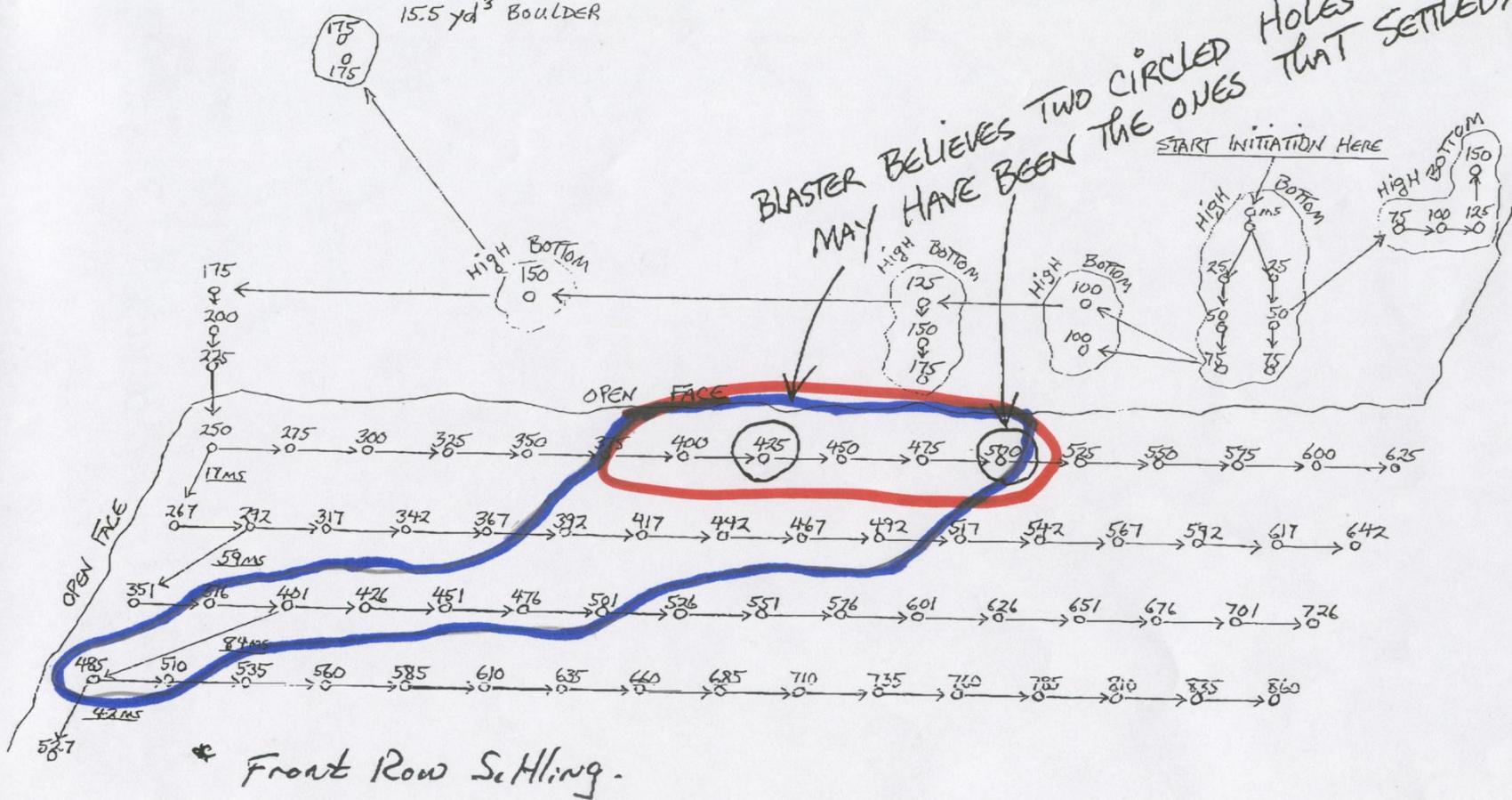
USBM R18507 And OSMRE



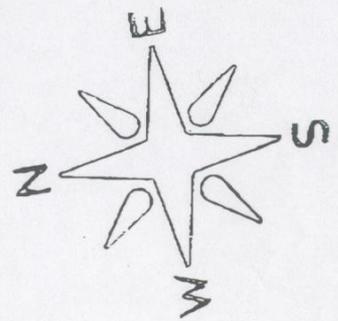
15.5 yd³ BOULDER

BLASTER BELIEVES TWO CIRCLED HOLES MAY HAVE BEEN THE ONES THAT SETTLED.

START INITIATION HERE



* Front Row Settling.



MAXAM

North America

Tim Rath
Technical Manager, Eastern Division, North America
trath@maxam-northamerica.com

Green Mountain Explosives, LLC
66 Gold Ledge Avenue
Auburn, NH 03032 (USA)

Phone: (800) 370-8442 x 205
Mobile: (603) 490-3644
Fax: (603) 490-3700

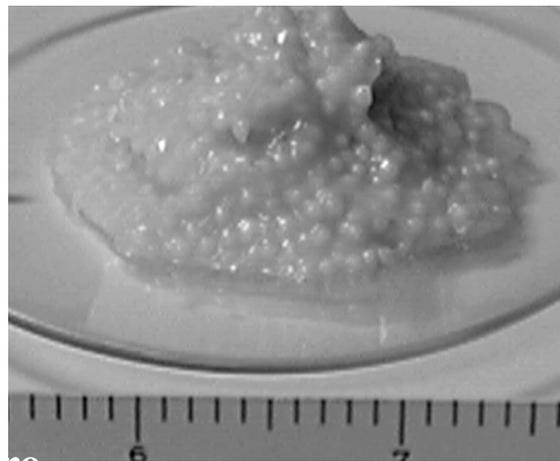
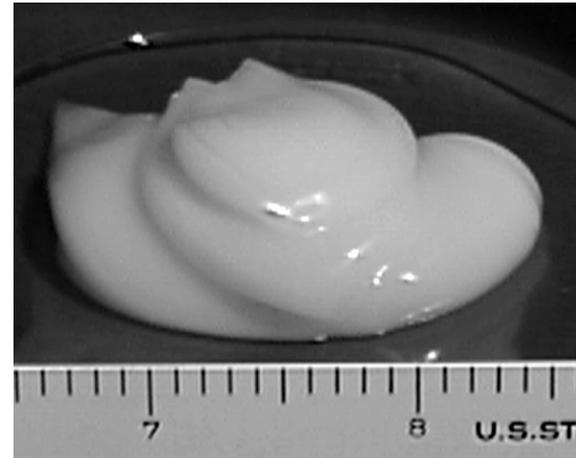
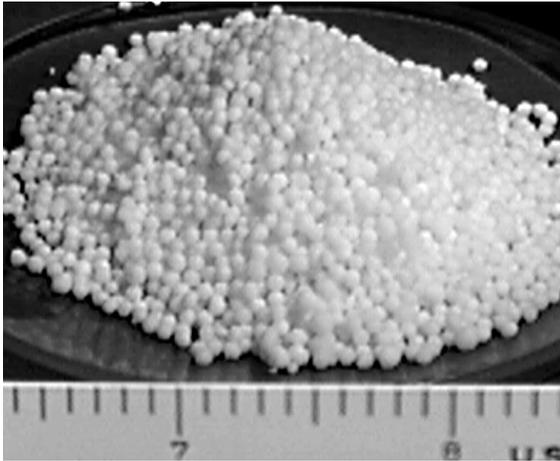
LEBANON CRUSHED STONE

65 PRODUCTION HOLES - 4 1/2" DIA
58' DEPTH - FACE 54'

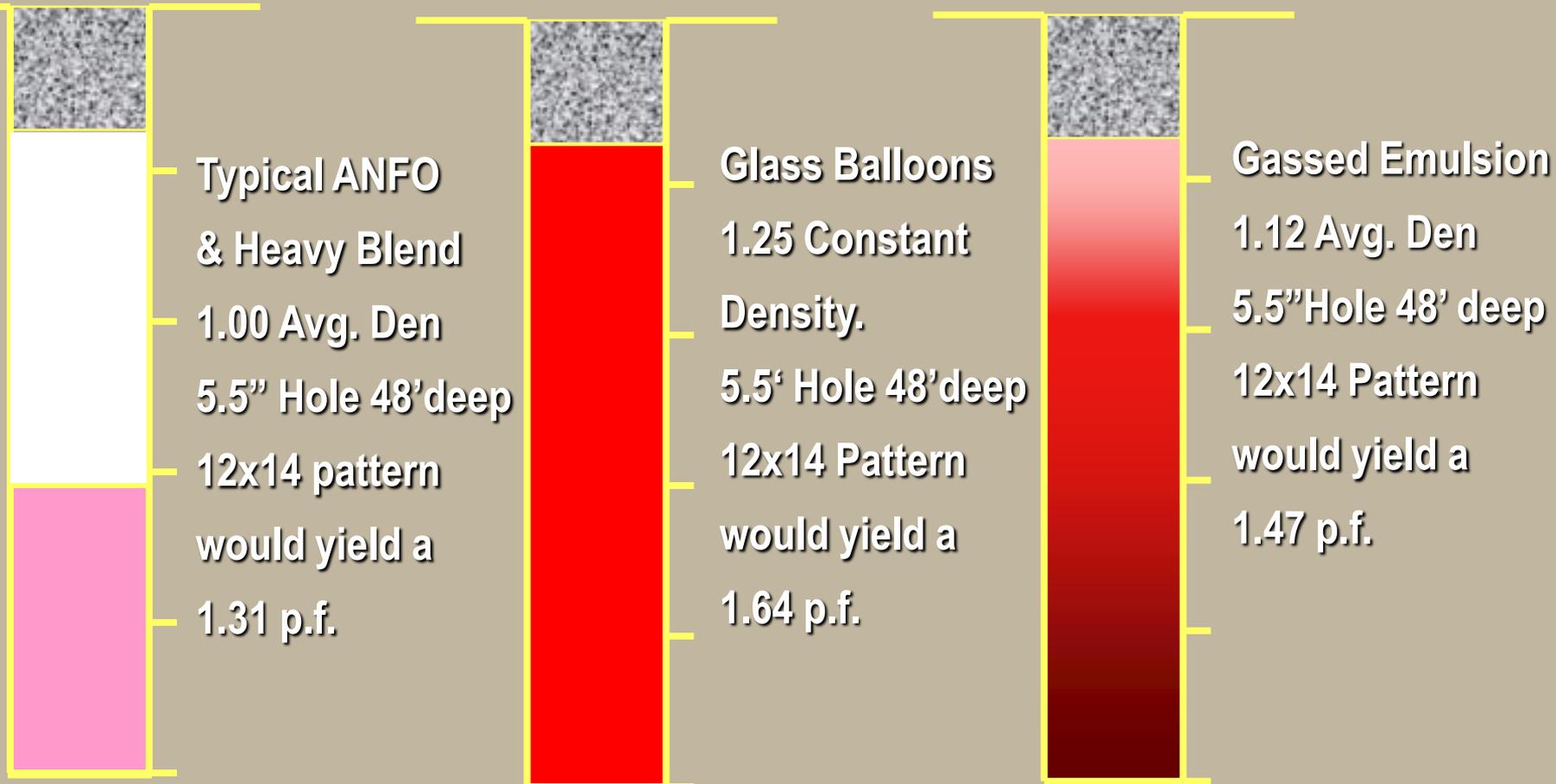
19 HIGH BOTTOM HOLES - 4" DIA
8' DEPTH

1 BOULDER 15 1/2 yd³
2 Holes

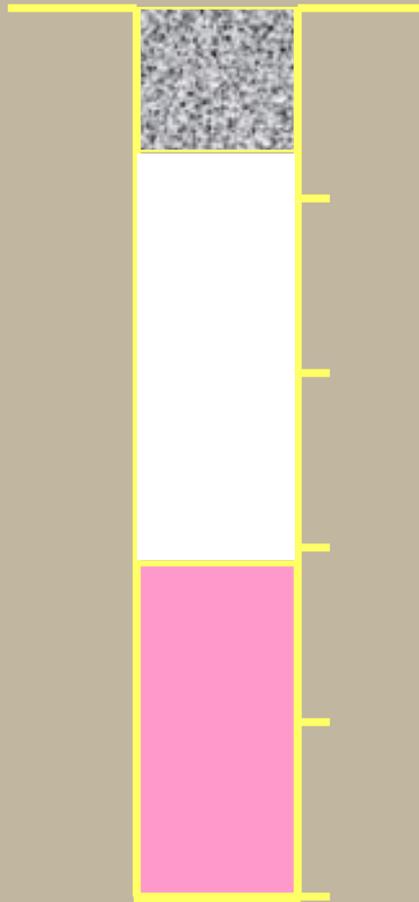
AN-Based Products



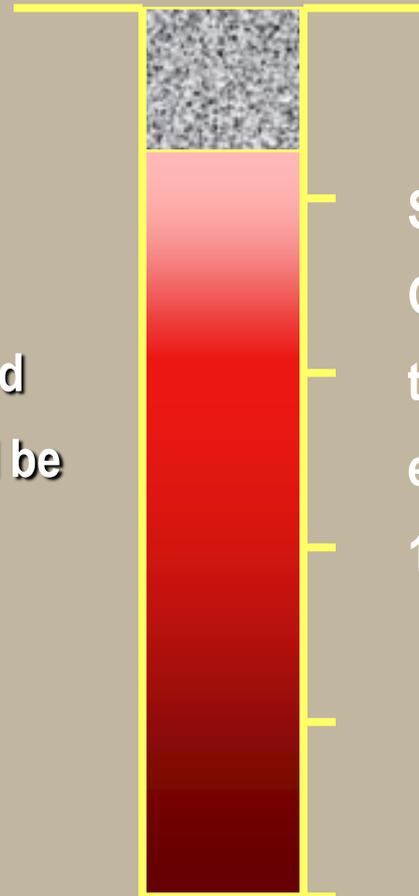
Comparison of "Options"



Comparison of “Options”



Maintaining a
p.f. of 1.31 with
Typical glass beaded
ANFO -Blend would be
a 13x16 pattern



Same p.f. with
Gassed Emulsion
the Pattern could
expand to
12.5 x 15

Remember we started with a 12 X 14 pattern

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◆☐◆♁♁





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AW
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Potential Problems As Related To The Stiffness Ratio (Hole Depth/Burden)

STIFFNESS RATIO	1	2	3	4
FRAGMENTATION	POOR	FAIR	GOOD	EXCELLENT
AIRBLAST	SEVERE	FAIR	GOOD	EXCELLENT
FLYROCK	SEVERE	FAIR	GOOD	EXCELLENT
GROUND VIBRATION	SEVERE	FAIR	GOOD	EXCELLENT
COMMENTS	Severe backbreak & toe problems. Do not shoot. REDESIGN!	Redesign if possible.	Good control and fragmentation.	No increased Benefit by increasing stiffness ratio above 4.

What are the 'Post Blast' inspection freebies???

- Fly Rock
- Crooked Walls
- Slips of Ground
- Excessive Dust (from the blast)
- Excessive Back Break
- Uneven Floor
- Muck Scattering

- High Air Differential Overpressures
- High Differential Vibrations Recordings
- Non-Communicating Crews
- Non-Uniform Sized Muck





<http://www.cdc.gov/niosh/mining/products/product150.htm>

















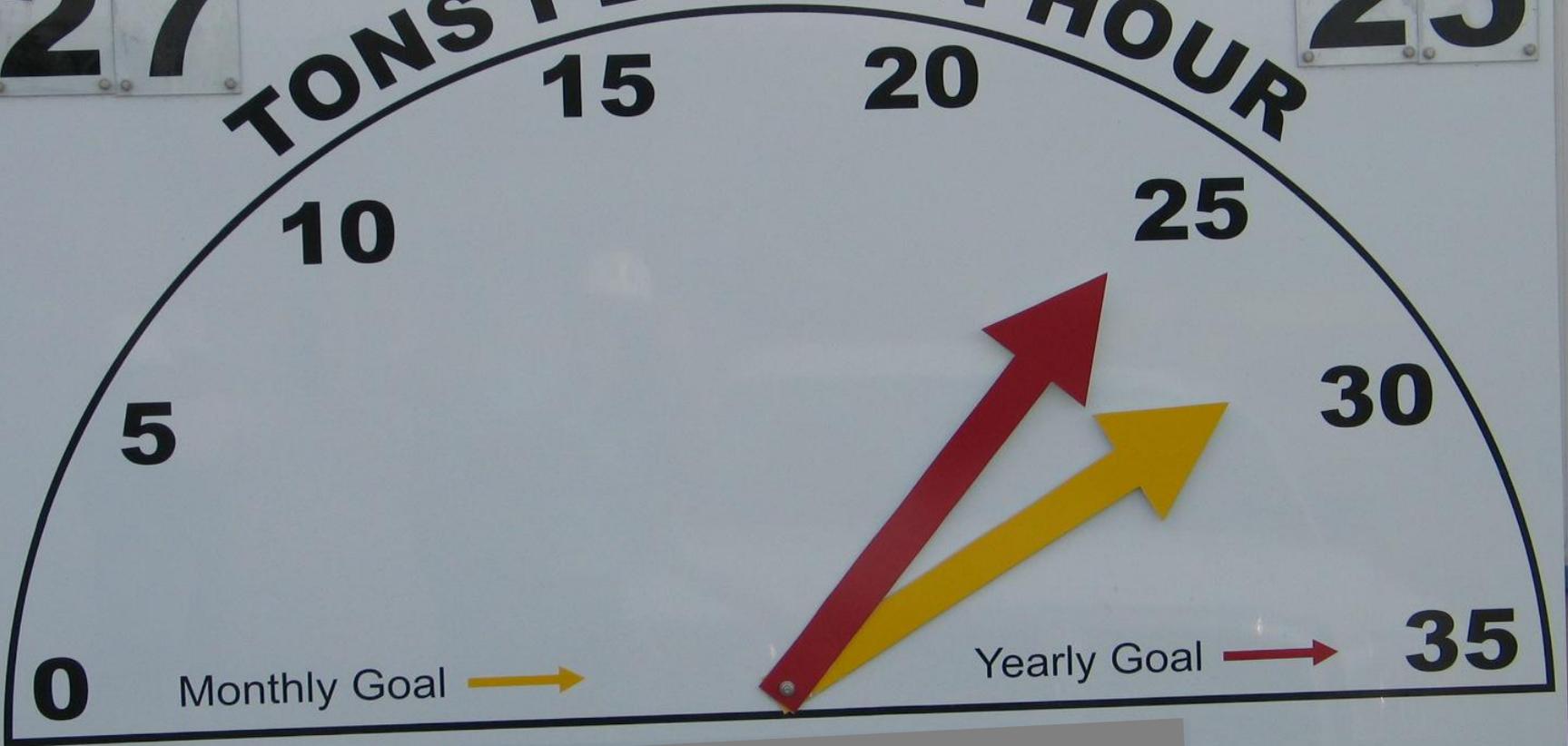
Monthly Goal

27

Yearly Goal

25

TONS PER MAN HOUR



Monthly Goal →

Yearly Goal →







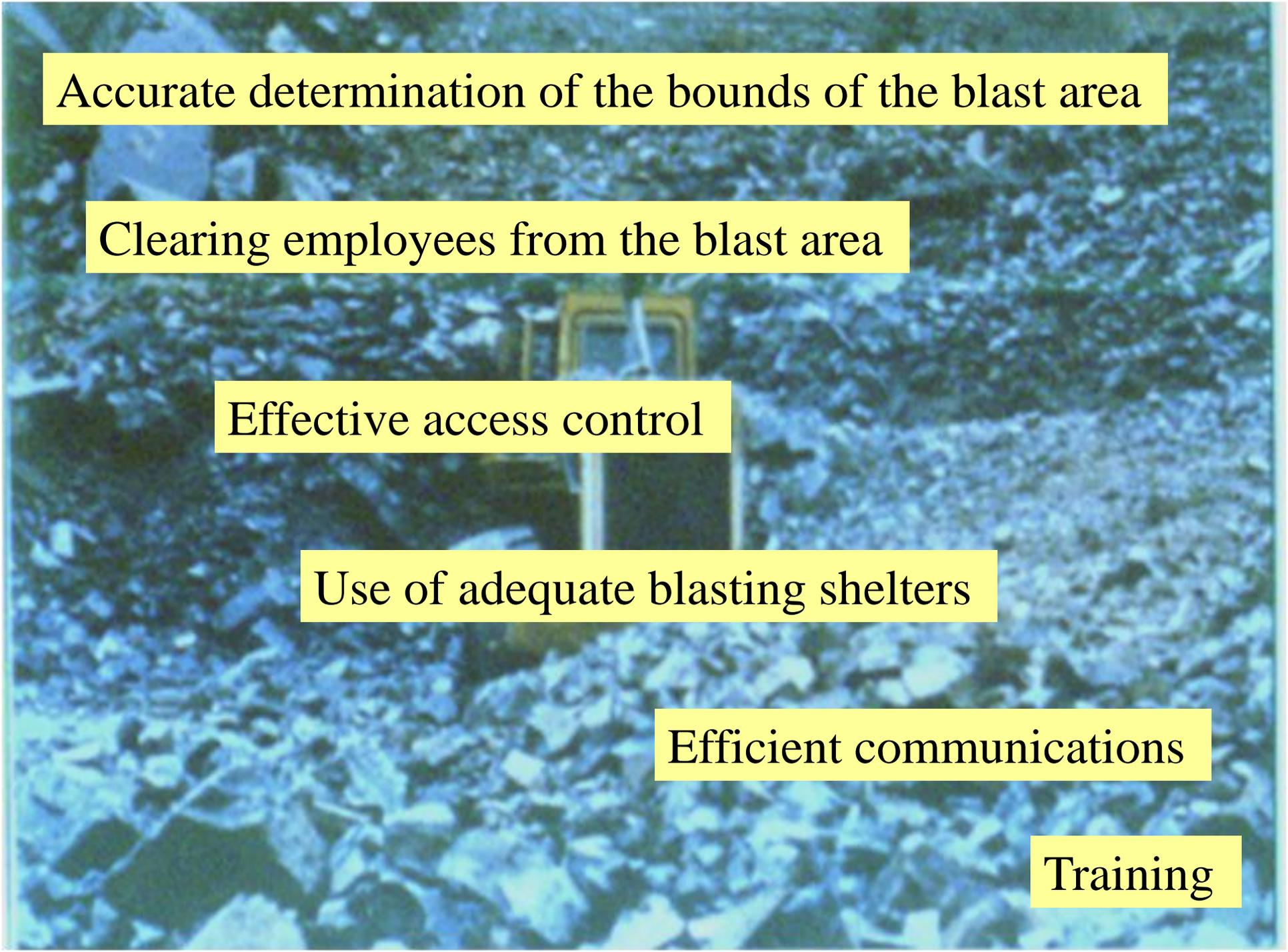








STAY OUT!

The background of the slide is a photograph of a construction site. A yellow excavator bucket is visible in the center, partially obscured by the text boxes. The ground is covered in dirt and some sparse vegetation. The overall scene is in a natural, outdoor setting.

Accurate determination of the bounds of the blast area

Clearing employees from the blast area

Effective access control

Use of adequate blasting shelters

Efficient communications

Training





What Truck?



I don't know....pump....quad....auger...side boom....reverse mount....standard mount?????

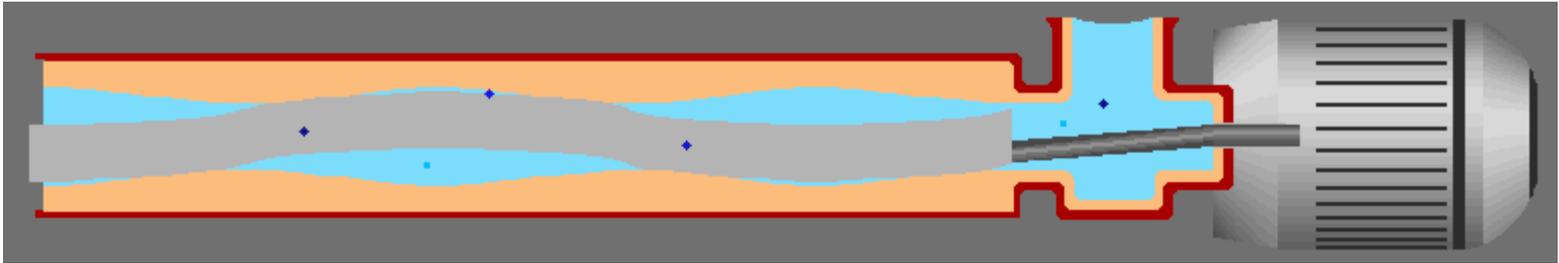


Location	Date	Product	Outcome	Comments
Kansas City, Missouri	November 29, 1988	50,000 lb ANFO, most with Al pellets	Fire, explosion 6 firefighters killed	Firefighters didn't know what was in trailers
Walden, Ontario	8/5/1998	Blasting Explosives	Fire followed by explosion about 32 to 37 minutes later.	No injuries, debris thrown 2,472 meters
Neyshabur, Iran	2/18/2004	Explosives, type is unclear	Explosion	More than 200 killed. 182 of those killed were emergency workers who apparently tried to fight the fire.
Ryongchon, North Korea	4/22/2004	Probably ANFO	Explosion	54 killed, 1,249 injured. Town severely damaged.
Mihailesti, Romania	5/24/2004	Nitrogen-based fertilizer	Fire, explosion	Killed: 6 firemen, 2 TV journalists, and 8 people who got out of their cars to watch fire. Police chief of Nechita injured. 5 firemen severely burned. Crater 10 meters deep. Damaged 20 houses.
Gwinnett County, Georgia	9/2004	Ammonium nitrate, detonators, and blasting boosters.	No fire, no explosion.	I-85 interstate closed. Cleared 500-ft radius around accident scene.
Wells, Maine	5/13/2005	3,000 lb of an ammonium nitrate-based liquid and detonation devices	No fire, no explosion	Nearby homes and businesses evacuated. 18 miles of Maine Turnpike closed.
Salt Lake City, Utah	8/2005	35,500 lb boosters	Explosion.	Cratered 20-35 ft deep. 3 injured. 10 injured, 4 hospitalized.
Ouray, Utah	5/31/2006	40,000 lb ammonium nitrate, 10,000 blasting caps, several hundred pounds of dynamite	No fire, no explosion.	Sparsely populated area. Authorities evacuated homes within 2-mile radius.
Mesa, Arizona	6/16/2006	22,050 lb AN, 8 cases dynamite, and 1,466 blasting caps.	Fire, no explosion	Some educating is necessary: "To trigger an explosion, the tractor trailer would have been consumed by flames, Mason said." "A one-mile perimeter was established around the truck by police until authorities were able to separate the ammonium nitrate from the blasting caps, eliminating the threat." "Mesa firefighters and J&D employees, who are trained in handling the explosives, worked together to extinguish the fire."
Tumbarumba, New South Wales	2/1/2007	Ammonium nitrate	No fire, no explosion.	Truck rolled over into creek.

Hazards' Of Pump Trucks?



Progressive Cavity Pump!



??? 77.404(a)??? IME 3-4.1.1 (extracts from)

As a minimum requirement, protect against "dead-heading", dry running or high pressure conditions. Redundancy may be desired in the pumping system protective circuits and is recommended as a good practice.

Oxidizer Truck

Hose Reel



1993
3

2426
5.1

NO SMOKING
OR
OPEN FLAME

252

Original Truck Model Number
Specification Plate

C. Gross Wt.	Truck Class
F. GVW (Gross Vehicle Wt.)	Truck Type
L. GV. Wt. of Axle	Truck Type
M. Max. Payload	Truck Type
N. Max. Load Cap.	Truck Type
O. Max. Load Capacity	Truck Type
P. Max. Load Capacity	Truck Type
Q. Max. Load Capacity	Truck Type
R. Max. Load Capacity	Truck Type
S. Max. Load Capacity	Truck Type
T. Max. Load Capacity	Truck Type
U. Max. Load Capacity	Truck Type
V. Max. Load Capacity	Truck Type
W. Max. Load Capacity	Truck Type
X. Max. Load Capacity	Truck Type
Y. Max. Load Capacity	Truck Type
Z. Max. Load Capacity	Truck Type

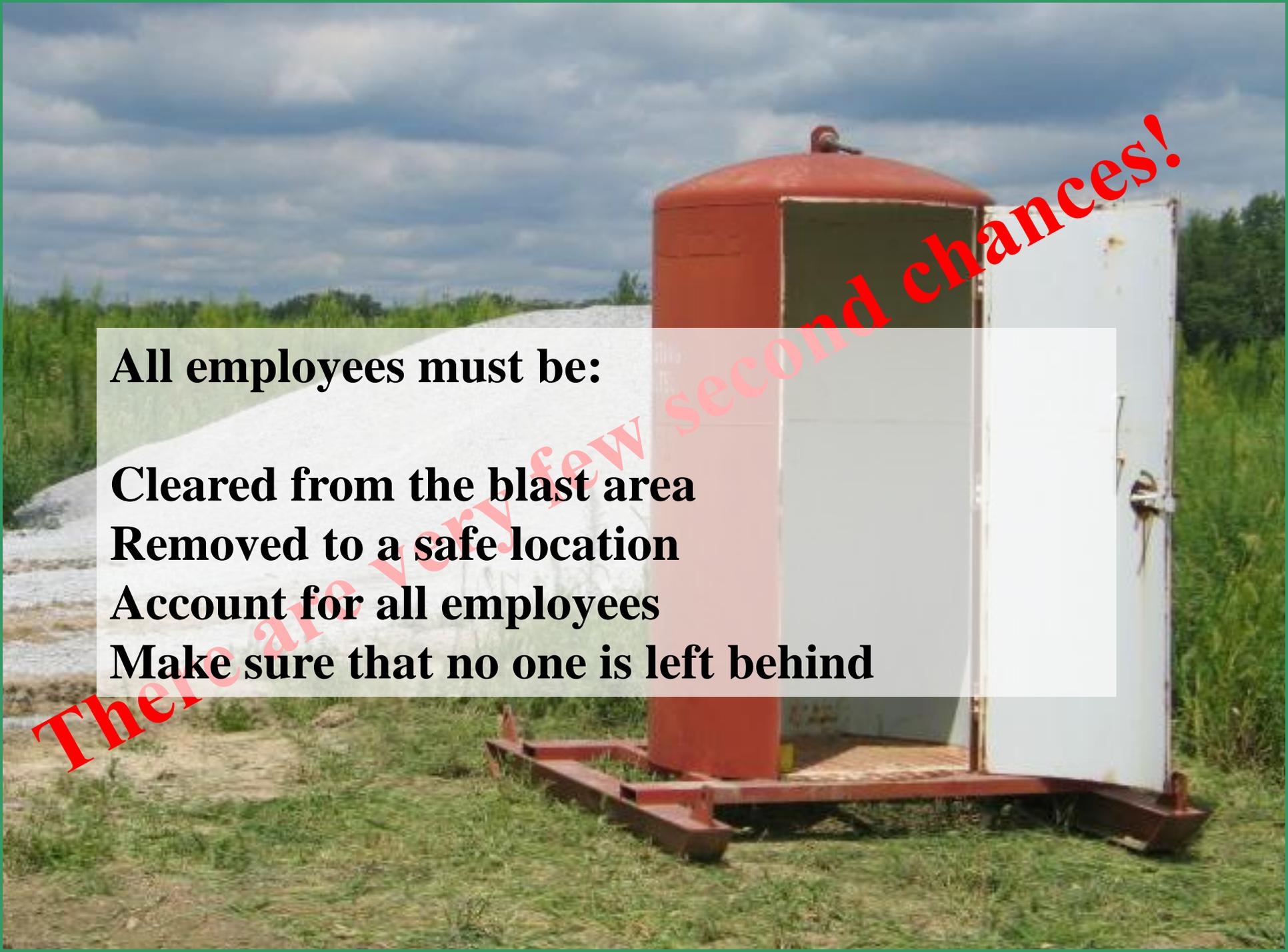
03/23/2005









A red cylindrical tank with a white door is mounted on a trailer in a grassy field. The tank has a rounded top and a small vent pipe. The door is open, revealing a dark interior. The background shows a line of trees and a cloudy sky.

All employees must be:

Cleared from the blast area

Removed to a safe location

Account for all employees

Make sure that no one is left behind

There are very few second chances!

A APPROX. 1320 HOURS LIGHTNING STRUCK THE SOUTH MAIN HIGHWALL WHERE A LOADED PRODUCTION SHOT WAS AWAITING DETONATION. ALL EES HAD BEEN EVACUATED PRIOR THE THE OCCURRENCH. 36 OF 38 HOLES DETONATED WHEN THE LIGHTNING STRUCK. THE TWO MISFIRES WERE LATER EVALUATED BY THE TECHNICAL REPRESENTATIVE AND THE RECONNECTED AND DETONATED. NO PERSONNEL INJURIES OCCURRED. MSHA WAS NOTIFIED ON TH



A photograph of a construction or mining site. In the foreground, a white sign with a rusted metal frame and red text reads "BLASTING AREA STAY OUT!". The sign is positioned on a dirt and rock path. In the background, several people are standing near a white pickup truck and a red truck. Further back, there are more vehicles, including a white van and a large white truck. The site is surrounded by a rocky, excavated hillside and a forested area in the distance under a clear sky.

**BLASTING
AREA
STAY OUT!**



Hot Holes



Tempilstik®

Temperature
Indicators

Tempilstik®

° Fahrenheit

Tempilstik®

You know the
temperature
when the
chalk melts

Tempilstik®

° Celsius

Tempilstik®





