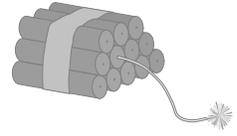


# The Primer



Newsletter of the Golden West Chapter, International Society of Explosives Engineers  
23633 Brewster Drive, Columbia, CA 95310

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Summer 2009

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## *Co-President's Message...*

I don't know where the year has gone, but as I write this I'm in the middle of moving the base of operations back down to warmer climates. We've already had a couple of mornings in the mid-twenties here in the mountains and my thin Arizona blood is starting to feel it. By the first part of November the cabin will be closed and winterized. First snow usually comes around the middle of October.

Not having close contact with the industry in California, I'm wondering how many of you are coping with the current financial times. While the housing market in the AZ cities is pretty bleak, the outlying areas don't seem to be that much affected. When Claudia and I passed through Las Vegas last month I was amazed at the amount of construction still taking place. Not being in CA though has me wondering. Drop me an e-mail and let me know how you are doing (address in the lower left corner).

Our Co-President, Bill Warfield, is up to his eyeballs in work, hence no article from him this month. I suspect that, like in many industries, he's a lot more busy because he's having to handle a good portion of work that others may have been doing in the past.

As editor of this publication, I've made numerous requests for suggestions for articles and for you readers to sit down and put some of your experiences on paper for the rest of us to read. Results have been somewhat bleak. Consequently, unless I hear from you, next issue I'll resort to writing an article on how to convert a VW engine to an air compressor. Don't laugh. It can be done, and rather successfully too. Vern Benning (you may remember him from George Reed Co in Jamestown) had one in Papua New Guinea when he was building an airstrip there. Slow, but got the job done.

Cheers,

Wes Bender

## The Primer

### Year-end Survey Results ...

The following represents an abbreviated compilation of the results of the survey that was sent out with the dues notice at the end of 2008. The return of questionnaires was a bit spotty, but the return rate was about what can be expected from a group such as ours.

#### Chapter Activities.

First, there were several suggestions pertaining to the annual Chapter Salmon fishing trip. Unfortunately, the State of California has placed limitations on salmon fishing that will preclude our having a chapter salmon fishing trip, at least for the foreseeable future. Maybe there are other fishing opportunities, if anyone wants to step up and help to make that happen.

The annual chapter barbeque that Duane Niesen was kind enough to put together for several years has been pretty much discontinued. I don't quite understand the lack of participation on the chapter's part, but that is what killed it.

There were several suggestions for chapter workshops: Vibration monitoring related to pile driving & construction equipment, Construction blasting, Yearly MSHA refresher class, Basic blasters class w/D&B, Product changes in last five years, Electronic detonators, Back to basics (which was presented in online form in 2008-2009), Current regulatory affairs, and Interesting projects and problem resolution. Unfortunately, no one has volunteered to conduct any of these. (Editor's note: If you, or someone you know, would be interested in conducting a workshop on any of the above topics, or of related topics, please let us know. We'll go to great lengths to get it done.)

Responses regarding the annual business meeting were just about on a par with the attendance at the past couple of meetings, i.e. bleak. Chapter leaders are hesitant to commit the chapter to paying for a meeting place only to have just a handful of members show up. Some potential attendees had scheduling conflicts and that was unfortunate. Some others probably didn't wish to show up because they were possibly concerned that they might get voted into some office that they didn't wish to fill. The annual business meeting will have to be held in one form or another. The election of officers and board members can be done by mailed ballot if necessary. Possibly a meeting could be scheduled in conjunction with a workshop. The board of directors is open to your suggestions. Please let us know.

#### Chapter Services.

Representation and involvement in state and federal regulatory affairs was listed by several respondents. This would require a committee, albeit a small one. It should consist of members conversant with state and federal procedures. If you are interested, contact us.

(continued on next page)

## Survey Results (cont.)

More public outreach on behalf of the explosives industry, and outreach and communication with other related professional organizations were suggested. In that regard, Bill Warfield has been working with SME so that we might include their activities on our website calendar. We should also try to see if we can share some activities. Our fields are closely enough related that both could benefit by a working relationship. Public outreach on behalf of our industry is a bit more difficult to address. The ISEE and the IME do a pretty good job, but it does not always filter down to the local level. How can we assist in accomplishing that? Suggestions anyone?

The Chapter would also like to assist in forming a student chapter, or including student members in our chapter if a student chapter couldn't be formed. Also, in that regard, a student scholarship was suggested. This is still under consideration, although no decisions have been made at this time.

### Other Chapter mechanics.

The dues were overwhelmingly voted to remain at \$25 per year (\$12.50 for students). Likewise, the publishing schedule of four issues per year for the chapter newsletter, *The Primer*, was desired to remain the same.

### Chapter library.

Steps are currently underway to find a new home for the chapter library. We are thankful and appreciative for CalOSHA's Mining & Tunneling unit for providing a home for it for the past few years. They are short on space and their hours have been reduced. We will keep you advised of the status and location through this newsletter.

### Chapter participation.

The overwhelming percentage of responders indicated that, while they wished to remain members and included in the loop, they felt that they probably would not be participating to any great extent. The board certainly appreciates the desire for members to just "belong" and we can understand the feeling. On the other hand, where will we be finding the future leaders of the chapter? Eventually, all of the older, long-standing leaders will either retire, disappear or otherwise not be available. New blood will be needed for the chapter to continue. This needs some serious thought. We've taken steps to allow the chapter to continue with a reduced number of leaders, at least for the immediate time frame. We're only one step away from a "caretaker" status. That isn't what we want to be, but will probably be necessary to keep the chapter alive until someone wants to take the reins and move it back up to where it used to be. How can you assist us in resolving this problem? Let us hear from you.

## The Primer

### **Shakin' It Up.....**

with Wes Bender

Let's talk about **Perimeter Control**. Not the kind of perimeter control where you clear and secure the area before blasting, but the kind that you use to prevent damage to some object or area just outside your blast crater zone.

Most often you will encounter specified vibration limits to control damage. In some instances, however, vibration may not be the damage-causing mode and thus should not be our major item of concern. This usually comes about when you are blasting near buried pipelines or most any concrete structure, be it a slab on grade, a concrete wall or some massive concrete structure. Rock slopes that are expected to stand for extended periods of time or that will have concrete placed against them also fall into this category. In these instances, cratering, excessive fracturing or rock block movement should concern us the most.

In the case of a rock slope, perimeter control usually consists of some method of cautious blasting such as pre-splitting or smooth-blasting. Vibration is not usually a concern, nor should it be. Studies have shown that rock will usually withstand vibration intensities approaching 100 inches/second of peak particle velocity. Yes, some tensile slabbing may occur at lower levels, say 24 to 30 inches/second, but that is because the compressive wave passing through the rock encounters a boundary (such as air) with a change of impedance and the reflected tensile wave pulls the slab loose. In my opinion, this is not vibration damage in the strictest sense. You are far more likely to damage the remaining rock face through fractures extending from the crater zone or from rock block movement. Pre-splitting forms a crack that will normally stop such fractures and will vent the crack-forming gasses from well-designed blasts. Smooth-blasting uses more lightly loaded charges as the final face is approached and pulls the last of the rock away by breaking to a reduced burden. Usually a few test blasts will prove advantageous in either of these two methods. (We will probably investigate these methods of protecting a rock face in a future issue of *The Primer*.)

In the case of concrete structures, as long as there aren't any other devices nearby that may be sensitive to vibration, there is really no practical value to establishing vibration limits. Concrete will not be damaged below particle velocities of 100 to 500 inches/second or possibly more, depending upon the charge location. It just isn't practical to limit vibration. It is far more important to limit damage to the concrete from rock block movement or heaving or cratering of the blasted mass. How one goes about this depends largely upon the site conditions.

Several years ago I was asked for an opinion and/or method to control damage to a massive concrete wall that needed to be breached to install a passageway.

## Shakin' It Up (cont.)

The owners of the project wanted to make sure that the remaining concrete would not be damaged and asked the contractor to establish either a vibration limit or a Scaled Distance limit. (For those unfamiliar with Scaled Distance, it is a means of scaling blasts of differing charge weights. Square Root Scaled Distance is derived by dividing the distance by the square root of the charge weight.) The contractor was at a loss as to how either method could be implemented. The massive concrete structure could easily experience peak particle velocities of 500 inches/second or more at the perimeter (the demarcation line between the blasted concrete and the concrete to remain). How would one measure it? In the matter of Scaled Distance limitations, the distance would eventually be zero, hence no Scaled Distance number would be possible.

The answer was to incorporate some form of **Perimeter Control**. I had previously conducted test blasting of concrete out of the face of a small dam on the Sacramento River and suggested that similar methods (modified to suit the specific conditions) could be used. The procedure was to use a concrete saw to cut (as deeply as possible) the perimeter. This would help to eliminate ragged edges. Next, a fairly large hole would be drilled in the center of the intended opening. This would provide relief for the initial breakout of the concrete. A series of smaller holes would be drilled adjacent to the large holes, loaded with detonating cord and shot. Following the shot, the area would be cleaned and inspected for radial cracking. Spacing of holes and loading of same would be adjusted according to the results obtained. When the final perimeter was reached, holes would have to be spaced closer together and the loading reduced accordingly. It was also pointed out that, if there were any construction joints or openings near the intended perimeter, some cracking to them might occur. The job was carried out successfully. No vibration monitoring was deemed necessary, nor were any Scaled Distances calculated.

In the instance above, it should be pointed out that this was a rather massive concrete structure. Had it been a wall with a thickness of only 12 to 18 inches, different blasting methods would have been required, not because of perimeter control, but because horizontal holes would blow out without cracking the concrete.

In the twenty years that I investigated claims of blast damage, I encountered numerous instances where homeowners felt that their concrete walks, slabs, swimming pool decks, etc. had been damaged by vibration from nearby blasting. In every instance, it was found that some other cause was to blame. Either there had been insufficient compaction and the slab finally cracked under its own weight, a nearby tree had roots that extended under the slab and eventually lifted it high enough to crack it, etc. Other investigators have also had the same experiences. Blast vibration has not been found to be a cause of cracked concrete.

(continued on page 9)

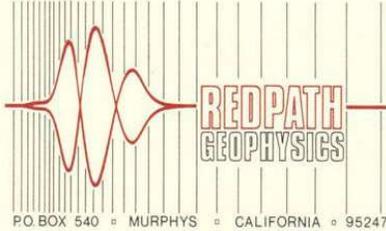
**The Primer**



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## Shakin' It Up (cont.)

Constrained underground objects such as pipelines and most wells have also been shown to be quite resistant to damage from blast vibration. On the other hand, they can be damaged if subjected to excessive rock block movement, physical displacement or having the surrounding confining material shifted such that they are distorted. Obviously, the condition of the object has a lot to do with just how much abuse it can withstand.

For how these are better addressed with **Perimeter Control**, see *Rose, R., Bowles, B. & Bender, W., (1991), Results of Blasting in Close Proximity to Water Wells at the Sleeper Mine. Proceedings of the Seventeenth Conference on Explosives and Blasting Technique. International Society of Explosives Engineers.* Yes, vibration intensities were recorded, but only from a purely investigative standpoint. The wells were protected through good blast design. Even those wells that were within the blast itself survived intact. It was deemed prudent to remove the pumps from wells so situated. True, a portion of casing that was within the blast zone was occasionally bent and dented, but it was cut off, the well checked and the pump reinstalled. More damage occurred from mucking out the blast than occurred from the blasting. The blast designs basically kept the rock mass surrounding the well from shifting laterally and damaging the well. The blast designs were successful enough that pumps were not even removed from wells that were adjacent to the shot but not included in the crater zone. It was unfortunate that we weren't able to conduct destructive testing to determine at what vibration intensity physical damage from heaving and block movement occurred. It would have been a convenient yardstick.

In 2005 I wrote a *Primer* article on blasting adjacent to a petroleum pipeline in New Mexico in 1994. The blaster on the project intuitively knew that the pipeline wouldn't be damaged by vibration. Unfortunately, he couldn't convince the petroleum company engineers that damage wouldn't occur, so he asked them to call me. I won't go into all the details of the incorrect specifications on the project. They were based upon flawed modeling data and were severely impeding progress. Basically, they were blasting trench for a parallel line 20 feet from the existing pipeline. At numerous points an intertie between pipelines was required. Allowed charge weights per delay were extremely low, on the order of less than 1 lb at 10 feet or less than 5 lbs at 20 feet. (Adjusted downward because they were using dynamite rather than ANFO, another fallacy in the specifications.) For trench blasting, this meant drilling an excessive number of holes, even to the extent of having to take the rock out in more than one lift.

After a thorough discussion with all concerned, we arrived at the following plan that incorporated **Perimeter Control**.

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## The Primer

### Shakin' It Up (cont.)

We would conduct a series of test blasts, increasing the charge weights as we proceeded. Following each test blast, we would inspect the area carefully, with an eye to limiting the backbreak (cracks on the surface) to half the distance, or ten feet, to the buried pipeline. After the third test blast, charge weights were up to 10 lbs per delay, backbreak was still only about 1/3 of the distance to the existing pipe and everyone was satisfied that the work could be done safely and efficiently. My final recommendations were: (1) limit backbreak to a maximum of 50% of the distance to the pipe, (2) measure cracking and backbreak after every blast and adjust loading accordingly if it approached 50%, (3) record vibration at a constant 40 feet beyond the existing pipe and compare vibration levels and backbreak to see if there was a correlation between the two, (4) conduct conservative test blasts again whenever the rock changed appreciably and, (5) use cautious test blasts and similar ground control limits if blasting were to be required at distances less than 10 feet.

The vibration recording indicated above was a requirement of the owner's engineers and I saw no reason to eliminate it, even though it served no real useful purpose. I calculated a surface vibration intensity of 12 to 15 inches/second or more directly above the pipe. It was probably half that at the actual depth of the pipe. Vibration was not considered to be of concern. The main concern was to keep the crater zone or area of fracturing and rock block movement sufficiently away from the existing pipeline to keep it from being damaged. The project was completed successfully. As an aside, the matter of blasting for the interties was solved rather easily by moving them to place them outside of known rocky areas.

One last case of using **Perimeter Control** is worth mentioning. A water treatment facility near San Diego was being expanded and I was engaged to design all the blasts. Part of the contract involved blasting near massive concrete structures, a dam, buried pipes, instrumentation and storage buildings. Of course, everything had a vibration limit established at the old familiar 2 inches/second. Most of the distances were large enough that the vibration limit didn't adversely impact the blasting so it wasn't worth arguing over. One case, however, involved blasting a trench past a corner of a brick storage building. In fact, the wall of the trench would be right up against the foundation corner. Obviously, vibration limits would be exceeded, but that wasn't my main concern. I didn't want to break or heave the foundation and cause severe damage to the building. The use of small decked charges, quite a few delays and very small burdens allowed us to proceed past the building without causing damage. 2 inches/second!! We probably put in excess of 25 inches/second into that corner of the building, but we had a friend named **Perimeter Control** on our side and didn't damage the building at all.

As in all critical blasting situations, conduct conservative test blasts before undertaking this kind of work. As the blaster-in-charge, it's your dusty butt that's hanging out in the wind.

## How Come.....

This is a test for men only. Women will also benefit by reviewing the questions so they get to understand men and thereby enrich their own lives.

1. Alien beings from a highly advanced society visit the Earth, and you are the first human they encounter. As a token of intergalactic friendship, they present you with a small but incredibly sophisticated device capable of curing all disease, providing an infinite supply of clean energy, wiping out hunger and poverty, and permanently eliminating oppression and violence all over the entire Earth. You decide to:

- A. Present it to the President of the United States.
- B. Present it to the Secretary General of the United Nations.
- C. Take it apart.

2. As you grow older, what lost quality of your youthful life do you miss the most?

- A. Innocence.
- B. Idealism.
- C. Cherry bombs.

3. In your opinion, the ideal pet is:

- A. A cat.
- B. A dog.
- C. A dog that eats cats.

4. You have been dating a woman for several years. She's attractive and intelligent, and you always enjoy being with her. One leisurely Sunday afternoon the two of you are taking it easy. You're watching a football game. She's reading the paper and suddenly, out of the clear blue sky, tells you she thinks she really loves you, but she can no longer bear the uncertainty of not knowing where your relationship is going. She says she's not asking whether you want to get married; only whether you believe you have some kind of future together. What do you say?

- A. You sincerely believe the two of you do have a future, but you don't want to rush it.
- B. Although you also have strong feelings for her, you cannot honestly say you'll be ready anytime soon to make a lasting commitment, and you don't want to hurt her by holding out false hope.
- C. You cannot believe the Broncos called a draw play on third and seventeen.

5. Okay, so you have decided you truly love a woman and you want to spend the rest of your life with her, sharing the joys and the sorrows the world has to offer, come what may. How do you tell her?

- A. You take her to a nice restaurant and tell her after dinner.
- B. You take her for a walk on a moonlit beach, and you say her name, and when she turns to you, with the sea breeze blowing through her hair and the stars in her eyes, you tell her.
- C. What was that you were going to tell her?

6. One weekday morning your wife wakes up feeling ill and asks you to get your three children ready for school. Your first question to her is:

- A. "Do they need to eat or anything?"
- B. "They're in school already?"
- C. "There are three of them?"

(continued on page 12)

## The Primer

### How Come.....(cont.)

The test for men continues.....

7. When is it okay to throw away a set of veteran underwear?

A. When it has turned the color of a dead whale and developed new holes so large you're not sure which ones were originally intended for your legs.

B. When it is down to eight loosely connected underwear molecules and has to be handled with tweezers.

C. It is never okay to throw away veteran underwear. A real guy checks the garbage regularly in case somebody, and we are not naming names, is quietly trying to discard his underwear.

8. What is the human race's single greatest achievement?

A. Democracy.

B. Religion.

C. The remote control

Okay. How do you think you did? Real men answered them all C.

---

For those of you who are looking for firearm info, we submit the following:

1- Don't pick a fight with an old man. If he's too old to fight, he'll just kill you.

2- If you find yourself in a fair fight, your tactics suck.

3- I carry a gun, 'cause a cop is too heavy.

4- America is not at war. The U.S. Military is at war. America is at the mall.

5- When seconds count, the cops are just minutes away. (Yep, time it some time, but shoot first - then call 911).

6- A reporter did a human interest piece on the Texas Rangers. The reporter recognized the Colt Model 1911 the Ranger was carrying and asked him 'Why do you carry a .45?' The Ranger responded 'Because they don't make a .46.' (Ed: comment attributed to H. Joaquin Jackson, in One Texas Ranger. Also see the next.)

7 - A mayor called for the Texas Rangers to help quell a riot. He was a bit dismayed when only Joaquin Jackson stepped off the train. "Only one Texas Ranger?", he asked. Joaquin: "You got more than one riot?"

8 - An armed man will kill an unarmed man with monotonous regularity.

9 - The old sheriff was attending an awards dinner when a lady commented on his wearing his sidearm. 'Sheriff, I see you have your pistol. Are you expecting trouble?' 'No Ma'am. If I were expecting trouble, I would have brought my rifle.'

10 - Beware the man who only has one gun. He probably knows how to use it!