The Primer

Newsletter of the Golden West Chapter, International Society of Explosives Engineers
Alpha Explosives, P.O. Box 310, Lincoln, CA 95648

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In this issue . . .

The Primer is published four times per year on the web site of the Golden West Chapter of the ISEE:

www.iseegoldenwest.org

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President's Message...

Hey Members,

It's a Bird, it's a Plane, its, its, wait a second, IT'S A Clay Pigeon!! We saw over one hundred of the latter during participation in the first annual GWC Summer Scholarship fundraiser Sporting Clays shoot on Saturday July 20th.
We had twelve anxious participants, thanks to Brad Langner of Alpha Explosive's sponsorship of the event, we gathered at eight in the morning on Saturday to beat the heat.
Thanks again Brad!
It was a challenging course of twelve stations with two "Birds" flying at a time. You had to be very fast to shoot the first bird and follow and down the second bird. What made it even more challenging was the use of a pump shotgun that hadn't been fired in ten years!
All in all it was a great experience and a lot of fun.
Top finisher with 60 out of 100 kills was Danny Reeves. Danny received a $25.00 gift card to Bass Pro shops donated by our very own board member and BBQ Master Mike Burneson of Syar Industries. Thanks Mike for the Awesome Brats and Peppers! 2nd place went to Ryan Segress with 56 kills; 3rd place went to Jason Cavasos with 52 kills; 4th place went to Mike Burneson with 48 kills and 5th place to Ryan Staggs with 45 kills. I want to give a special "Way to Go" to our only lady in the group, Heather Gilder. Heather shot 34 birds out of the sky. And yours truly, how did I do? Yes it's true; I got beat by a girl! And proud of it!

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President's Message… continued from page 1

This was our main scholarship fundraiser of the year. After taking out the total cost of the event, the chapter gained a little over $200.00 towards the fund. In order to continue giving out scholarships, we are going to have to do better than that. My personal goal and I'm sure the board and officers would agree, is that we should set a goal of $1,000.00 for next year. In order to accomplish this, we will need sponsors to cover our costs for the lunch the shells and the prizes. We also need you, the members to come on out and participate. No problem if you don't shoot. A monetary donation will get you a great time as an observer and a great lunch! With that said we have one more opportunity for you to come out and talk explosives. Our final event is our annual picnic to be held at Pioneer Park in Nevada City. Not only is this a historical site in Gold Country, its right up the road from the birth place of our chapter.

Be Safe!

Your President,
Mike Chiurato

Editor's Notes…

Outstanding is the adjective that best describes the Sporting Clays event at Coon Creek. Alpha, we could not have done it without your generosity (Brad Langer). I really believe we can reach out to our members and have different vendors sponsor this event by bringing customers to participate. We can have an event that will raise a $ 1,000.00 for our scholarship fund. I will suggest at our next board meeting that we establish a committee to organize this event for next year. This way they can have the time to solicit donations and be ready for our major fundraiser of the year. I really think we could get fifty shooters. I hope to see you there next year it was a blast.
In this issue is information on our scholarship application. The deadline to apply is approaching real soon. We also have information on our picnic in Pioneer Park. This is a great park and a really good time. We will bring our horseshoes this year. They have a number of nice pits. Plan on coming to your chapter picnic. I would like to thank our Web Master for the article,
Can Blasting Trigger an Earthquake? Author: Wes Bender

Call for Scholarship application Starting June 1, 2013

Scholarship Eligibility: Graduating high school seniors or students already enrolled in college who are sons or daughters of an employee of an Explosives or other industry employing explosives may apply for the scholarship.

Judging Committee: Scholarship applications will be reviewed and judged by a panel, including the Chapter Officers and Board and the past President of the GWC or their respective designees.

Application Deadline and Scholarship Presentation: The scholarship application process will be an Internet-based process. Starting June 1, 2013 applicants will be able to apply via GWC on-line application process at **http://iseegoldenwest.org.**

The deadline for applications is August 31, 2013. The winning applicant will be named by September 30, 2013. The Scholarship will be issued to the winner at five hundred dollars per semester provided the student is considered by the institution as a full time student and maintains a grade point average of 3.0.

For more information, contact Gerald Fulghum 916-481-1421 or at

GRFULGHUM@SBCGLOBAL.NET

To apply for the Scholarship please include these four items:

The completed application.

A letter of recommendation from your industry representative.

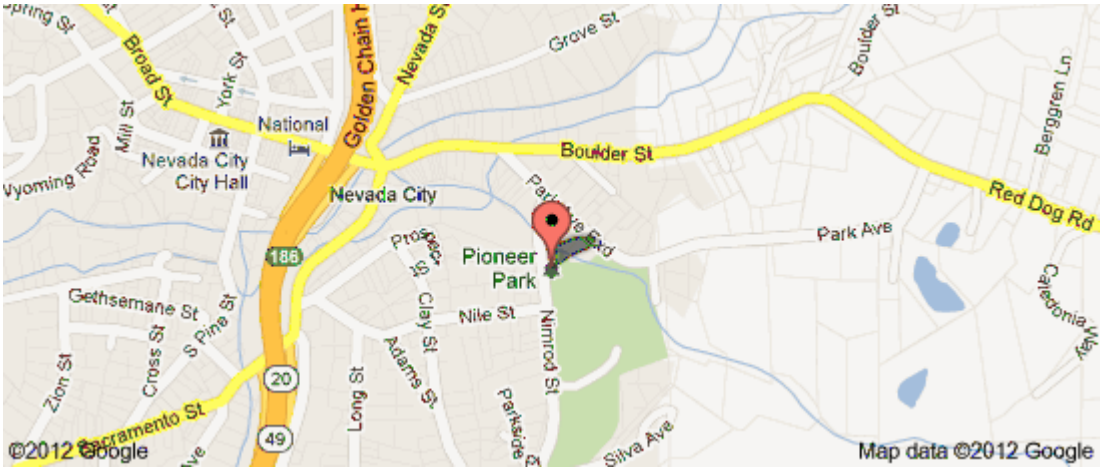
A 300 to 500 word statement of your plans for a career in the explosives or aggregate industry;

If you have work experience in the aggregate or explosives industry as a summer employee, an intern or through a cooperative work program, please include one or more recommendation letters from your employer(s).

The Golden West Chapter of the International Society of Explosives Engineers is having a Members Appreciation

BBQ / Picnic / Games / CASH Prizes

When: Saturday, September 21, 2013 – 12 o'clock to 4 PM
This event is free to all members. Non members $15.00
Where: Pioneer Park 423 Nimrod St., Nevada City 95959
The location at the park is called Upper picnic area.



Menu: Tri Tip, Pork Ribs, Chicken, Salads, Beans, Wine Beer and Sodas. Yes we will have dessert. Ice Cream & Cake.

Registration: Please contact Mike Chiurato at 916-645-3377 by August 31st. This will allow us to purchase the food and drinks for those that are ready for a good time.

The Party starts at 12 o'clock

Can Blasting Trigger an Earthquake?

Author: Wes Bender

This is a reasonable question, usually asked by someone who has a very real concern that it could happen. To arrive at the answer, however, requires some research and investigation into the mechanisms involved in earthquakes.

In 1994 I was asked to analyze the potential hazards and risks of blasting for Milagra Terrace, a proposed housing development near Pacifica, south of San Francisco. The total amount of rock to be removed was rather small, on the order of only two to three thousand cubic yards. There would also be some minor blasting to install utilities. Assuming reasonable blast designs, there would have been no adverse impacts on neighboring homes. One of the project opponents' concerns, however, was that the blasting would take place in close proximity to the San Andreas Fault, the surface trace of which was located a short distance east of the development. Several opponents argued that blasting would surely trigger an earthquake. The project owner, the Planning Department and several members of the City Council wished for me to address this concern.

In order to answer such a question, the first thing to consider is the actual location of the source of an earthquake. While a fault trace may be visible on the earth's surface for some earthquake faults, in many instances the fault does not break through to the surface. The actual focal point or source of an earthquake is located deep in the earth where the rock near the base of the fault has been locked in place. Strain is constantly building at this point and, when the strain becomes too great, the rock fails and the earth shifts. The point where the rock fails and the energy is suddenly released is called the hypocenter (or focal point) of the earthquake. If such a locking point did not exist, the strain would not build to such an extent and one side of the earthquake fault would slowly creep past the other. The epicenter that you hear about in news reports is a point on the surface of the earth directly above the hypocenter. Earthquake hypocenters are normally located from 15 or 25 to 60 kilometers below the earth's surface, although a few small ones have been calculated to be at a depth as shallow as 6 kilometers (see Richter, 1958). The initiating point of the energy release from an earthquake is located at these depths and this is where it would have to be triggered. The surface fault trace that you can see (or that may be hidden below the earth's surface) is actually an extension of the fault and is an effect of the earthquake rather than the cause of it.

So the question becomes how much of a triggering force might be felt at the hypocenter from blasting at or near the earth's surface? Obviously we can impart a fairly large impact (depending upon the size of the blast) on portions of the surface trace of a fault and, in fact, this has been done in many instances.

Blasts near earthquake faults occur on a fairly regular basis near Permanente, Corona, Davenport, and other locations in California. In several instances, tunnels have been driven through earthquake faults by blasting. No earthquake has been known to have been triggered by blasting in close proximity to an earthquake fault.

(references can be found at the end of this article)

Continued on the next page

Can Blasting Trigger an Earthquake (cont.)

We can readily estimate the maximum vibration that would be generated by any given weight of explosive at a particular distance. The formula for doing so is:

$$\mathbf{PPV = H \times (Dist / Wt^{-1/2})^{-1.6}}$$ where

PPV is the vibration expressed as Peak Particle Velocity in in/sec,

H is a factor that varies between approximately 24 and 242, depending upon various site factors.

Dist is the distance between the detonating charge and the location of interest expressed in feet.

Wt is the maximum weight of explosive (in lbs) detonated within any 9 ms time frame.

The attenuation slope of **-1.6** is typical for most blasts.

(Some may recognize that the value for **Dist / Wt** $^{-1/2}$ is often termed the square root scaled distance.)

For estimating blast vibration, we have to select a representative charge weight of explosives. Blasts at construction sites and at open pit mining locations usually subdivide the total amount of explosives in a blast into smaller quantities that are detonated on individual delays. These delays are separated by 9 to 25 milliseconds or so. This is done to, (1) control vibration at nearby structures, (2) improve fragmentation and, (3) control the distance and direction of the heave of the blasted rock. Except for certain specialized blasts, it is usually not practical nor is it advisable to detonate large blasts without subdividing the explosive weight into such delays. Vibration is proportional to the maximum charge weight per delay rather than to the total explosive weight.

Let's use as an example a charge weight of 10,000 lbs per delay as being a reasonable largest practical charge for conventional blasting. Although it could be larger, more often it is smaller. We can also use the previously mentioned 6 kilometers (19,684 ft) and 15 kilometers (49,212 ft) for our example distances.

We will have to arbitrarily select a value for the factor H. An average value of 160 for estimating vibration along a horizontal surface would be appropriate; however blast vibration intensities at depth are estimated to be from 1/3 to 1/2 of those on the surface (Oriard, 2002). Body waves, both compression and shear, dissipate more rapidly than do surface waves. At fairly large horizontal distances, surface waves dominate. There are no surface waves at depth. Also, because velocities within the earth increase with depth, the body waves will tend to curve back toward the earth's surface, further reducing the impact at depth. Although it could very well be smaller, it would be reasonable to use half of 160, or 80, as the factor H in our calculations.

Using 80 for the factor H, a charge weight of 10,000 lbs and using distances of 6 and 15 km respectively, we estimate the Peak Particle Velocities to be:

$$80 \times (19{,}684 / 10{,}000^{-1/2})^{-1.6} = 0.017 \text{ in/sec (at 6 km)},$$

and $$80 \times (49{,}212 / 10{,}000^{-1/2})^{-1.6} = 0.004 \text{ in/sec (at 15 km)}$$

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Can Blasting Trigger an Earthquake? (cont.)

Blast vibration with peak particle velocities of 0.004 or 0.017 inches per second would not be capable of doing cosmetic damage to sensitive structures, let alone being able to trigger an earthquake.

It should be noted that In these estimations we have used rather large charge weights and a factor for H that is probably too high considering the reductions in vibration previously recorded at depth. In spite of using overly aggressive criteria, the vibrations are still quite low, mainly due to the large distances involved. If one were to further increase the charge weight and use an even higher H factor, the resulting vibration estimates would still not reach levels where they could adversely impact the locked portion of an earthquake fault at depth.

To further reinforce the argument that blasting would not be able to trigger an earthquake, two good examples of extremely large blasts in the vicinity of earthquake faults might also be considered. These blasts were the two coyote blasts that were detonated to obtain rock for the Ord River Project in Australia (see Oriard, 2002). Coyote blasts, unlike conventional blasts, detonate a large amount of explosive instantaneously inside tunnels in order to fracture a large volume of rock. Usually the rock has jointing systems that allow it to fracture adequately when the rock mass is lifted by the force of the explosion and then dropped. The two coyote blasts at Ord River detonated 994,000 lbs and 1,154,000 lbs respectively. There were two faults in very close proximity to the blasts. The Blind Gully fault and a connecting fault were immediately adjacent on opposite sides of the rock ridge where the blasts were located. The site was instrumented and, following each of the blasts, a survey was done to determine if there had been any movement along the faults. None was found.

Some might wish to argue that even minor vibration levels from a blast could be enough to trigger an earthquake if the strain at the focal point is at a peak and an earthquake were about to occur. In other words, vibration from the blast would be the straw that broke the camel's back. This could not be the case, however, because the strain at the locked point would have been elevated well above that of the blast vibration numerous times previously by other stronger sources (such as other nearby earthquakes on the same or other nearby faults). These sources would have had far more impact on the locked point than the small impact from a distant blast.

It is unfortunate that man cannot trigger earthquakes by blasting in close proximity to a fault. If it were possible to do so, we could intentionally trigger small earthquakes in fault zones that were locked. Instead of having large earthquakes with a magnitude of 6 to 8 or higher on the Richter scale when the rock fails, it might be possible to regularly nudge the locked point into slipping with a resulting earthquake in the range of 2 to 3 or smaller.

Portions of the San Andreas Fault System (SAFS) manage to creep along at its average rate of a little less than 1-1/2" per year, while other portions that have been locked for long periods of time will only shift when the rock's strength is exceeded by the strains that have built up, resulting in a major earthquake. The zones that creep or shift with small earthquakes may cause some inconvenience, but preventing major earthquakes that result from locked portions of the SAFS would be a huge benefit if we were able to do so.

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Can Blasting Trigger an Earthquake? (cont.)

Several technical advances would have to be made in order for such a scheme to work. Drilling accurately to a depth of 15 kilometers or more could be difficult. Nuclear devices would probably have to be used in order to provide sufficient energy in a small package. A chemical explosive charge of sufficient size would require too much volume. The proposed use of nuclear energy for such a purpose would surely be opposed by some for environmental or political reasons. Elevated temperatures at depth would be a possible problem. Implementing such a scheme would also be problematic in today's litigious society. The process would have to be initiated at some location on the fault shortly after a major earthquake had just occurred, otherwise the strain would build up again and any subsequent man-made earthquake could reach major proportions. Even if the nudging of a partially locked fault were successful and resulted in a relatively minor earthquake, it is possible that there would be claims of perceived damage.

Mother Nature will continue to relieve the strain that develops from plate tectonics in her own way and in her own time frame and we currently have to accept the consequences.

Blasting, however, has not been nor will it be a contributing factor in triggering earthquakes.

References:

Oriard, L. L. (2002), *Explosives Engineering, Construction Vibrations and Geotechnology*, published by the International Society of Explosives Engineers.

Richter, C. F. (1958), *Elementary Seismology,* published by W. H. Freeman and , Company Inc.

Recommended further reading:

Bullen, K. E. (1963), *An Introduction to the Theory of SEISMOLOGY, Third Edition*, published by the Cambridge University Press.

Chapter contact information:

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Treasurer: Gerald Fulghum (916) 481-1421

Board Member / Web Master: Wes Bender (520) 648-3581

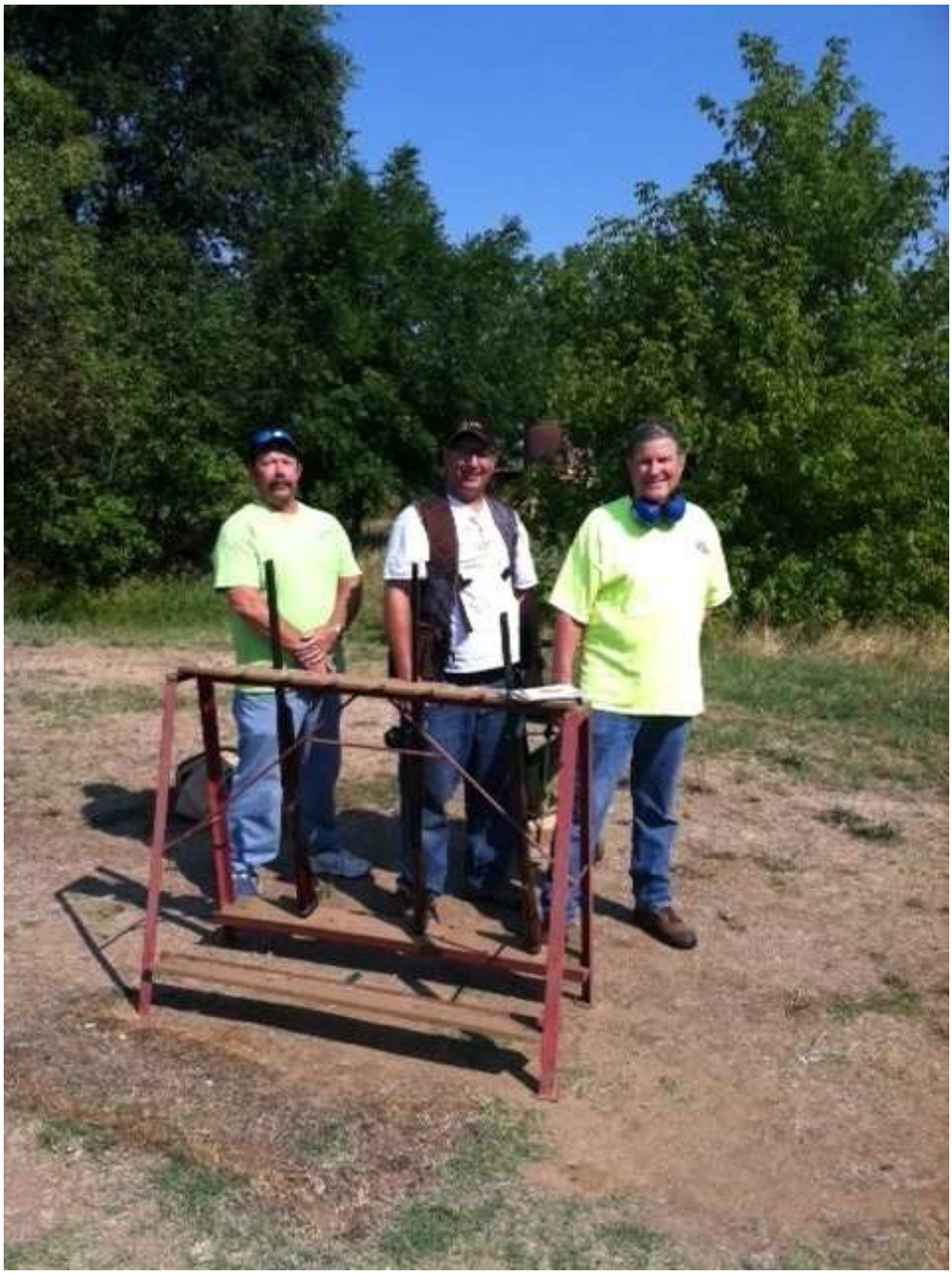
Board Member / Newsletter Editor: Mike Burneson (707) 558-1510

Chapter Activities - 2013

Fall Social Event-Picnic & Horseshoe Tourney- Pioneer Park- September 21st

Annual Winter Business Meeting -Mt Pleasant Hall- Lincoln- January 25, 2014

Editor's Notes...



Pictured from right to left: Brad Langner, Mike Chiurato and Gerald Hackler at the Coon Creek Sporting Clays Scholarship Fundraiser . July 20, 2013 Rio Oso, CA.

Fire in the Hole…

Guy's cruising down the highway way over the speed limit. Cop pulls him over.

"Sorry officer, guess the speedometer got away from me. Happens every time I get hammered and try to drive home."

"What?! You're intoxicated?"

"Well I needed a stiff drink after I shot that guy! It's okay though, I managed to fit the body in the trunk."

"Sir, keep your hands where I can see them. Give me your license and registration right now."

"Well I would but it's in the glove box where I threw the gun, it's still pretty bloody and I don't want it to fall out until it's dried."

"Do. Not. Move. I'm calling for back-up."

Back-up gets there. Second officer gets out, says

"Sir, please open your trunk."

Guy opens it. Clean as a whistle.

"Please show me your glove box."

Guy opens it. Clean as a whistle, along with his license and registration.

"I'll need you to take a breathalyzer."

Guy blows a .00

"Well what's going on? This officer said you had a dead body in the trunk, a bloody gun in the glove box and were drunk."

Guy says

"Hah, I bet he said I was speeding, too."