



# California Ground Water Association

• 1017 L Street, PMB #312 • Sacramento, CA 95814 •

## Explosive Destruction Standard

- I. Background:
  - a. The water well industry in California is familiar with the dictate of DWR Bulletin 74-81/90 for water well destruction procedures. Bulletin 74-81/90 does not specifically cover explosive uses for water well destruction procedures. This draft standard is intended to dictate how explosives should be used and by whom they should be used during water well destruction procedures. This standard will cover conventional water well destruction and monitoring well destruction.
- II. Required Licensing for Purchase, Possession, Storage and Use of Explosive Materials in California:
  - a. A current and in good standing Federal Explosives License (FEL) issued and regulated by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF).
  - b. A current and in good standing California Blasting License with Water Well Services Endorsement or superseding endorsement issued and regulated by the Occupational Safety and Health Administration (OSHA).
  - c. A current and in good standing Certificate of Eligibility issued and regulated by California Department of Justice (DOJ).
  - d. Local Permits:
    - i. Most Counties have permits required for possession and use of explosives within their County Limits. These permits are usually issued by the Sheriff Department or Fire Department.
    - ii. Some Cities have a Fire Permit that is required for possession and use of explosive materials within the City Limits.
- III. Required Licensing for Transportation of Explosive Materials:
  - a. A current and in good standing Motor Carrier Permit issued and regulated by the Department of Transportation (DOT).
  - b. A current and in good standing Hazmat Transportation License issued and regulated by the California Highway Patrol (CHP).
- IV. Documentation Provided by Blasting Company:
  - a. Blasting plan outlining intended blasting operation for each specific well.
    - i. The blast plan should include at a minimum:
      1. Blasting company name
      2. Blasting company contact information
      3. Blaster name
      4. Well name or defining number
      5. Well location
      6. Well construction details when available
      7. Blasting design showing intended perforation intervals



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8. Total quantity of explosive materials to be used
  9. Placement of explosive materials in well
  10. Operating procedure
  11. Estimated burst pressure at water well casing
  12. Author of blast plan
- b. Seismograph Service:
- i. Seismograph service should be offered for any blasting operation.
  - ii. Seismograph service can be offered by the blasting company or by a third party.
  - iii. Seismograph is to be specifically designed for blasting operations (InstanTel Blasmate series of seismographs or equivalent)
  - iv. Seismograph data should be available immediately after detonation via onsite printout from the seismograph or onsite processing through computer software.
  - v. Peak Particle Velocity of detonation should never exceed 2 inches per second.
- c. Material Safety Data Sheets are to be provided for each explosive product used upon request.
- V. Blast Design:
- a. Blasting designs are to be written by a competent licensed blaster with experience in field applications of explosives.
  - b. Permits and requirements of local authorities shall be implemented in blast design.
  - c. Permits and requirements of County level authorities shall be implemented in blast design.
  - d. Blasting designs are to provide sufficient blast pressures to exceed burst ratings of the type of casing that is to be perforated.
    - i. Current casing condition at the time of abandonment should be considered.
  - e. Suggested minimum charge weights:
    - i. PVC
      1. PVC Well Casings measuring 1/4 inch in diameter to 6 inches in diameter with a Schedule of 40 to 120 shall use a minimum of 25 grain per foot detonation cord.
      2. PVC Well Casings measuring 6 inches in diameter to 12 inches in diameter with a Schedule of 40 to 120 shall use a minimum of 50 grain per foot detonation cord.
      3. PVC Well Casings measuring greater than 12 inches in diameter with any Schedule size should use a minimum of 100 grain per foot detonation cord.
    - ii. Steel



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1. Steel Casings measuring 1 inch in diameter to 6 inches in diameter with a wall thickness .188 to .25 inches shall use a minimum of 50 grain per foot detonation cord.
  2. Steel Casings measuring 2 inches in diameter to 6 inches in diameter with a wall thickness greater than .25 inches shall use a minimum of 100 grain per foot detonation cord.
  3. Steel Casings measuring 6 inches in diameter to 12 inches in diameter with a wall thickness .188 inches shall use a minimum of 100 grain per foot detonation cord.
  4. Steel Casings measuring 6 inches in diameter to 10 inches in diameter with a wall thickness of .25 inch or greater shall use a minimum of 200 grain per foot detonation cord.
  5. Steel Casings measuring 10 inches in diameter to 18 inches in diameter with any wall thickness shall use a minimum of 50 grain per foot detonation cord in conjunction with 150-gram Cast Boosters.
    - a. Cast Boosters shall be evenly spaced along the detonation cord line.
  6. Steel Casings larger than 18 inches in diameter with any wall thickness shall use a minimum of 50 grain per foot detonation cord in conjunction with 450-gram Cast Boosters.
    - a. Cast Boosters shall be evenly spaced along the detonation cord line.
- iii. Blaster In Charge shall always reserve the authority to change blast designs based on Safety Factors or Un-Disclosed information about the well design.
- f. Existing sanitary seals are to be evaluated and accounted for in the blast design.
- i. Existing sanitary seals should not be perforated unless evidence of seal failure is present or suspected seal failure is present.
    1. Extra safety measures shall be implemented to reduce the potential of fly material during seal perforating operations.
- g. Surrounding areas are to be evaluated and accounted for in blast designs.
- i. Surface and underground structures as well as utilities must be accounted for.
- h. Redundant firing system should be used to insure proper detonation of the entire charge during deep set operations.
- i. Cement set time retardant is recommended for wells deeper than 400 feet and required for wells deeper than 1000 feet.
- i. Without a set time retardant such as Delvo, cement will harden before the well can be filled and charges detonated. The result of this is inadequate flow of cement into native formation after detonation.
  - ii. Deep wells should be completed in one continuous pour.



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1. Multiple detonations on deep wells create a new problem in the abandonment process. After initial detonation, it is possible for native material to mix with the sealing material causing the sealing material level to be higher in the well than anticipated. Multiple detonations can result in sections of the well casing not being perforated. This method should be avoided.

## VI. Down Hole Charge Control and Placement Methods:

- a. There are two methods of charge placement that are acceptable:
  - i. Weighted charge lines:
    1. Using a weight at the bottom of the charge line to anchor the shot in the bottom of the well. This method is most commonly used in the industry. Tremie pipe should be left 5 to 10 feet off the bottom of the well prior to sealing material placement to anchor the weight.
  - ii. PVC Control Pipe:
    1. This method requires PVC pipe, usually 1 inch in diameter, to be glued or threaded together and set in the well to total depth. The charge is attached to this line as it is being lowered into the well. This method gives positive control of the charge line as sealing material is being pumped to the surface. This method is not accepted in some Counties in California due to the remnants of PVC left behind after the detonation.
  - iii. A charge line should never be attached to the same pipe used to convey sealing material into the well. If the Tremie pipe becomes compromised, the charge line will also become compromised. Example: Tremie pipe becomes plugged and must be extracted, the charge will also be extracted.
- b. Tremie pipe should be placed prior to installation of charge line. After pumping has begun and charges are anchored, tremie pipe can be removed as necessary until sealing material has reached the surface.
- c. Surface containment:
  - i. A proper blast design should have no surface activity; however this is not always under the blasters control. In most situations, surface containment is not necessary, the Blaster in Charge makes the final decision to contain potential surface splash or to distance personnel and equipment from the splash.
  - ii. If surface containment of potential sealing material splash is decided. Several options are available, such as front loader buckets, backhoe buckets, plywood tents, tarps, plastic sheeting. In any situation, the containment device should either be large enough to not become a projectile, or light enough to not be a danger if it becomes a projectile.



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1. Metal objects such as well caps and discharge manifolds should never be used as containment devices. In the event of well evacuation, these become dangerous projectiles.

## VII. Storage and Handling of explosive materials on site:

- a. All explosive materials to be used for the day shall be stored or transported in a Type 3 Day Box that meets ATF requirements at minimum.
  - i. ATF Type 3 Day Box minimum requirements are:
    1. Construction: No less than 12 gauge steel, lined with either at least ½” plywood or ½” Masonite-type hardboard.
    2. Doors: Must overlap sides by at least 1”
    3. Locks (Hood not required): One steel padlock with at least 5 tumblers and casehardened shackle of at least 3/8” diameter.
    4. Unattended storage: Explosives must be removed to an appropriate magazine for unattended storage.
- b. Detonators must be stored separately from explosives.
  - i. Minimum separation of at least 18 inches.
- c. All explosive materials are to be handled by the blaster in charge or his or her authorized apprentice(s) only.
- d. All unauthorized personnel are to be relocated to a safe distance designated by the blaster in charge during loading procedures.
- e. All personnel are to be relocated to a safe distance designated by the blaster in charge during firing procedures.
- f. Detonators may not be attached to blasting machines or triggers under any circumstance until the blast zone has been cleared and the blaster in charge is ready to fire.

## VIII. Blasting Safety Plan:

- a. Blasting safety plan shall include in detail:
  - i. Hazard and risk assessment
  - ii. Storage Plan
  - iii. Transportation Plan
  - iv. Blast design
  - v. Loading procedure
  - vi. Misfire, hang fire, partial fire procedure
  - vii. Surrounding area notification plan
  - viii. Local authority communication plan
  - ix. Material Safety Data Sheets
  - x. Emergency plan
  - xi. Initiation or firing plan

## IX. Explosive Materials:



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- a. Explosives used for water well procedures should only be consisted of molecular type explosives.
- b. Explosives used should leave behind no traces of water contaminants.
  - i. Element information is found on the MSDS for each product.
- c. Only NONEL or Non Electric initiation should be used in congested areas.
  - i. NONEL or Non Electric systems can not be accidentally detonated by radio waves, cellular waves, static electricity, or errant stray current.
- d. Explosives used should be water proof or resistant for a minimum of 24 hours without losing potency or sensitivity.
- e. Blasting Caps should be of the instant time delay type or very near.