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## **APPENDIX B**

### ***Blasting Plan***



## BLASTING PLAN

### A. General Considerations:

1. Insure that the pipeline lay contractor uses only a state-licensed blasting subcontractor (or its own employees are licensed blasters).
2. Where permits are required, they must be obtained in advance of project.
3. Blasting along live lines must be carefully monitored by means of a seismograph.
4. Before blasting near another pipeline or underground utility, the use of non-explosive means should be considered.
  - a. Equipping hoe with ripper blades
  - b. Utilizing a hydraulic hoe ram
  - c. Rock trenchers (Vermeer, Tesmec, Trencor)
  - d. S-Mite
5. If a pipeline contractor needs to blast near an existing pipeline or other underground utility while it is in service, it is their responsibility to arrange for a seismograph to monitor the blast vibrations.
6. Constructing near other existing pipelines requires extra considerations. Depending on the type of pipeline and age of the pipeline, they can vary in size, wall thickness, pipe grade, metallurgical properties, depth of burial, operating pressure, and degree to which they have been weakened by corrosion. The end result is that there exists NO RULE OF THUMB for dealing with blasts. Each one must be analyzed individually. All situations, which involve blasting, should be referred to Engineering to review prior to actual blasting.
7. A blast will propagate most readily toward a free or open face, such as a highwall. This is because the majority of the blast energy will travel towards the free face. When a pipeline is between a blast and the free face, a dangerous situation can be created. Great care must be exercised.
8. When blasting near an existing pipeline or underground utility, the distance from the nearest blast hole to the existing pipeline/utility as well as the geometric pattern of a blast are important in predicting the resulting stress on the existing pipeline/utility. Insure that these are properly shown on the blasting plan.
9. The blasting contractor is required to prepare a blasting plan. This plan should be forwarded to Engineering 48 hours prior to the blasting. A sample blast plan is shown on page 6-6.



10. Care should be taken to eliminate or minimize the occurrence of flyrock. Precautions include the use of blasting mats, using lesser amounts of explosives per shot hole and employing delays between adjacent blast holes.
11. After blasting is completed near an existing pipeline, a leak survey is recommended.
12. Blasting in streams, agricultural fields, near residences, etc. require special precautions. The Project Engineer should be consulted if blasting in these or similar situations.

#### **B. Type of Blasting**

1. Primary type of blasting will be for ditch excavation. Blasting may also be required during the right-of-way grading operation.

#### **C. Location of Shots and Proximity to Existing Facilities**

1. Blasting near existing pipelines or other structures will be approved by governing authorities prior to executing blasts. All blasting located along adjacent power line rights-of-way shall be conducted in a manner that will not cause damage to the power company property and facilities. The blast area will be backfilled with earth or covered by blasting mats as needed to protect nearby existing facilities, structures, highways, railroads or significant natural resources from “fly rock fragments”.
2. Method to be Used to Minimize Hole-to-Hole Propagation
  - a. Typically only cartridge explosives will be used.
  - b. The amount of explosives per borehole will be limited by the proximity of existing structures and utilities.
3. For Example: Types of Explosives / Initiation System to be Used
  - a. Dynomax Pro: desensitized extra gelatin dynamite with a density of 1.45g/cc. The cartridge size will generally be 2” x 8” (1.30 lbs/cartridge) or 2” x 16” (2.60 lbs/cartridge).
  - b. Sasol Dyno Nobel Primadet: non-electric delay detonators
4. A nonelectric shock tube system detonator will initiate all shots. This detonator will be attached at one point only for initiation of the entire shot and will not be used for down hole priming. Non-electric shock tube system detonator will initiate all shots. This will be attached at one point only for initiation of the entire shot and brought to the surface for trunk lines.

#### **D. Drill and Blast Pattern**

1. Typically the drilling program will be based on 1 row of 2-1/2” to 3” inch diameter holes drilled with a grid spacing of approximately 2-1/2 feet to 4 feet along the ditch line. The approximate depth of the drill and blast will be nine feet. The drill pattern will be established using a powder factor of about 3.0-3.5 pounds per cubic yard to achieve the desired explosive energy ratio needed to break the rock and pull the ditch. Where the ROW will require shooting to level the workspace, a site specific shot plan will be developed to address site conditions. This shot pattern may be adjusted on a site-specific basis to compensate for different geology, nearby structures, utilities or other sensitive areas.

#### **E. Charge Weight and Delays**

1. Delays will be used accordingly to control the vibration as well as limiting the transmission of energy below the damaging levels at any existing structure. The delay pattern will be created to provide the energy relief immediately down the ditch in preference to a horizontal direction. Because detonating cord will be used to initiate the dynamite, the amount of dynamite used in each hole will be limited to the manufacturer’s recommendations and specifications.

#### **F. Flyrock Control Plan**

1. Typically contractors attempt to locate the rock by drilling test holes along the ditch line in 25ft increments. The overburden will be left on top of the rock in order to provide a blanket of earth to prevent fly rock during the shot. Where the rock is exposed to the surface, earth or blast mats will be placed over the shot to prevent fly rock. Where power lines or other above ground structures are present, fly rock will be controlled with blast mats.
2. A good quality, non-bridging stemming material that completely fills any voids in the drill hole will also be used to reduce the amount of fly rock.

#### **G. Blasting Products and Methods**

1. Blasting products are chosen because of many years of dependable use and positive results which are demonstrated by the:
  - a. Quality, safety and reliability of the product;
  - b. Support offered by the manufacturer;
  - c. Availability;
  - d. Price

2. The use of detonating cord to initiate explosive charges is the safest and most reliable nonelectric system. Use of detonating cord has the added advantage of visibility (if undetonated cord remains) to pinpoint misfire locations. The use of shock tubes to transmit the blast leaves thousands of feet of plastic tube along the ditchline and misfires are not readily evident. The delays used are color-coded for easy identification of delay length.
3. A nonelectric detonator with shock system will initiate all shots.
  - a. Primarily the completely nonelectric system (including initiation) is chosen for several important reasons:
    - Should blasting be required in the proximity of the high voltage power lines, stray current may be an issue that could result in the premature firing of an electric detonator.
    - The numerous radio equipped trucks belonging to all personnel (surveyors, inspectors and other subcontractors) on the project mandate that nearly all shots be totally nonelectric to eliminate accidental detonation of electric caps.
    - Furthermore, there may be other commercial and/or non-commercial radio users in the area not associated with the project (logging operations, quarry sites, etc.) that could compromise the safety of the blasting operations.
    - The nonelectric detonator shock tube system works instantaneously (like electric blasting caps). This allows for precise and reliable initiation of shots in congested areas, adjacent to highways or in other locations where blast initiation control is an issue. Unlike electric blasting caps, nonelectric detonator shock tube system is unaffected by extraneous electric currents from known and/or unknown sources.

## **H. Monitoring, Reporting and Controlling Ground Cracking and Displacement**

1. All pre- and post-blast surveys deemed necessary on existing homes and/or structures will be made. A list of homes and/or structures will be identified prior to blasting for inspection. A third party Seismic Consultant will conduct the inspection(s). Seismograph readings will be recorded at the time of each shot from seismic monitors at residences closest to the working area.

## **I. Explosives Storage and Transportation Procedures**

1. Explosives storage and transportation will be outlined in the Safety Program and will follow the guidelines from the New York Code of Regulations and ATF-Explosives Law and Regulations.

#### **J. Peak Particle Velocity Monitoring and Control**

1. Each blast will be monitored by a licensed blaster or other person experienced in monitoring blasts using an InstanTel DS 477 seismograph or comparable equipment. The seismograph will be placed at the “point of interest”. In most cases, this will be next to the foundation of the closest building, power line foundation, utility or well. In all cases, both the sensor and seismograph will be protected from flyrock.
2. This recorder gives a direct peak particle velocity (PPV) reading that is indicated on a tape as well as decibel reading to capture sound levels.
3. After each blast, a blast report will be compiled and the peak particle velocity at the point of interest will be recorded.
4. If the peak particle velocity at the existing structure exceeds acceptable limit, steps will be taken to reduce the peak particle velocity. This could include reducing the pounds of explosives per delay and/or increasing the length of delay and/or drill pattern modification.

#### **K. Seismographs**

1. A seismograph is an instrument which measures the velocity of the ground vibration caused by blasting, vibratory and impacting equipment.
2. It is a sensitive piece of equipment and should be handled with care.
3. A seismograph should always be set up by a trained blasting consultant. (They may ask for assistance from the contractor or Pilgrim employees, but the consultant should oversee its use.)
4. A typical seismograph setup consists of a velocity receiver (usually about the size of a hockey puck) and a data recorder. They are hooked together with hardwired electric cables.
5. The receiver should be installed immediately over the top of the pipe (about 3-6 inches is ideal) in a small hand bug bell hole. Placing the receiver in the same depth horizon as the pipe allows it to measure the vibration as seen by the pipe.
6. The receiver should not be placed on the surface of the ground. If this is done, inaccurate readings can result from the air blast.
7. The receiver should be located as far away from the blast as the wire cables will allow. Additional protection can be afforded by building a small corral around the instrument using a dozen or so pipe skids. This will help protect it from being damaged by flyrock.



8. Printouts from the seismograph should be sent to Engineering. Any reading in excess of 2.0 inches per second violate Pilgrim's Blasting Specifications and require changes to the blasting plan before continuation of blasting.

**L. Fire Prevention**

1. Following the required waiting period after each shot, the blast area will be inspected for any indication of fire or fire hazard. Particular attention will be paid to the vegetated areas outside of the R.O.W. Generally, the detonating cord and the dynamite cartridges are vaporized at the instant of explosion and there is no fiber or other material left to smolder or be a source of concern. Any plastic shock tube from the initiation system that remains after the blast will be picked up for proper disposal immediately after the blast.
2. The blasting operation will generally take place after the grading operation has graded the right-of-way to bare mineral soil. The blaster shall ensure that the initiating detonator is placed on bare mineral soil and that there is no vegetation within a 20-foot radius.
3. The initiating detonator will be a minimum of 650 feet from the nearest loaded hole.
4. When fire danger is high due to forest conditions, a 2-man fire watch team will patrol each blast area for a period of 1 hour after the required waiting period.

**M. Environmental Concerns**

1. All necessary measures will be taken to exclude livestock from the blasting area. During the normal safety check prior to blasting, the area will be checked for both livestock and wildlife. The blast will not be initiated until the area is clear.

**N. Explosives Safety Program**

1. Contractors will follow all Federal and State regulations.
  - A. Bureau of Alcohol, Tobacco and Firearms – 27CFR 181 (Commerce in Explosives).
  - B. Occupational Safety and Health Administration – 29CFR 1926.90 (Safety and Health Regulations for Construction Blasting and Use of Explosives).
  - C. Carriage by Public Highway – 49CFR 177 (self-explanatory).
  - D. Explosives and Blasting Agents – OSHA, 29CFR 1910.109 (Safety in the Workplace When Using Explosives).



- E. Guidelines to be Followed by Natural Gas Pipeline Companies in the Planning, Locating, Clearing and Maintenance of Right-of-Way and the Construction of Above Ground Facilities – 18CFR 2.69.

## 2. General Regulations

- A. Only authorized and qualified personnel shall handle explosives and shall always be under the direct supervision of a blaster licensed, if required, by the state of New York.
- B. No flame, heat, radio transmitter or spark-producing device shall be permitted in or near explosives during handling, transport or use.
- C. No person shall be allowed to handle, use or work in the area while under the influence of liquor, narcotic or dangerous drugs.
- D. Explosives shall be accounted for at all times. Explosives not in use shall be kept in locked, approved storage magazines. A running inventory shall be maintained at all times. Appropriate authorities shall be notified of any loss, theft or unauthorized entry into a magazine.
- E. No explosives shall be abandoned.
- F. No fires shall be fought where contact with explosives is imminent. All personnel shall be cleared and the area guarded against other intruders.
- G. Separate Class I and II magazines shall be used for transport of detonators and explosives from magazine storage area to blast site. Magazines shall be kept locked except for removal of material for use. In addition, explosives will be loaded directly to each shot point from the magazines on approved ground transportation equipment.
- H. When blasting in areas of congestion or in close proximity of other structures or services, special precaution will be taken to avoid damage or personal injury.
- I. Every reasonable precaution shall be used to notify others of use of explosives (visual, audible, flags, barricades, etc.). No onlookers or unauthorized personnel will be permitted within 1000 feet during loading or blasting. Flaggers shall be stationed on roadways that pass through the danger zone to stop traffic during blasting operations.
- J. All necessary precautions shall be taken to prevent accidental current discharge from any possible source. The exclusive use of a nonelectric initiation system will eliminate this possibility in nearly every situation with the possible exception of lightning strikes. A lightning detector will be used in all loading and shooting operations.





- K. During electrical storms all blasting operations shall be suspended and all persons shall be removed from the blasting areas during the approach and progress of an electrical storm. The following rules must be followed:
1. When the storm is 10 miles distant, notify all persons in the blasting crew of approaching storm. Stop all loading of holes and evacuate all personnel, except blaster and assistant, to a safe distance (1,000 feet) from the blast area. Blaster and assistant to initiate the blast prior to the arrival of storm.
  2. Blasting must be completed before storm distance is 2 miles from site. A lightning detector or an AM radio will monitor the proximity of lightning.
  3. If the blast cannot be initiated before the storm is within 2 miles, the blaster and assistant shall evacuate the site to a safe distance.
  4. Personnel may return to worksite when the storm has passed and is 5 miles distant or after the completion of blast allowing for the inspection of site and/or misfire.
- L. Empty packing material shall not be used again for any purpose. Packing materials will be removed from the work area and properly disposed.
- M. Damaged or deteriorated blasting supplies shall not be used.
- N. Delivery and issue of explosives shall only be under, by and to authorized persons and into authorized magazine or temporary storage handling areas.
- O. Blasting operations shall not be carried out in the proximity of other utilities or property owners without prior approval. "ONE CALL" notification requirements shall be followed.
- P. All loading and firing shall be directed and supervised by a competent and experienced person.
- Q. No loaded holes shall be left unattended or unprotected. No explosives or blasting agents shall be abandoned on the right-of-way. Explosives shall not be primed until immediately before use and shall not be allowed to lay overnight in drilled holes.
- R. All jurisdictional authorities shall be granted unrestricted access to all explosive records as well as site access for procedural inspections. All personnel not involved with the current blasting operation must check in with the blaster before entering the blasting zone.
- S. Warning signs, indicating the blast area, shall be erected and maintained at all approaches to the blast area. Warning sign lettering shall be a minimum of four (4) inches in height



on a contrasting background. Warning signs shall comply with the requirements of the jurisdictional authorities.

T. The warning signs (4" lettering) will be erected and maintained at all approaches to the blast area. Flaggers will be stationed on all roadways passing within 1000 feet of the blast area and be responsible to stop all traffic during blasting operations. All personnel not involved in the actual blast shall stand back at least 1000 feet and workers involved in the actual blast shall stand back 650 feet from the time the blast signal is given until the "All Clear" has been sounded. An audible blasting signal (air horn or siren) shall be used. The following blast signals will be used during blasting.

1. Warning Signal: A one (1) minute series of long horn or siren sounds will be made 5 minutes prior to the blast.
2. Blast Signal: A series of short horn or siren sounds will be made one minute prior to the blast.
3. All Clear Signal: A prolonged horn or siren sound following the inspection of the blast area.

U. All blasting will be performed with a non-electric initiation system and shall follow standard industry guidelines in regard to use and safety.

V. Blaster qualifications shall meet all federal, state and local standards.

W. Misfires

1. If there are any misfires, all employees shall remain away from the suspected misfire area for at least 30 minutes. Misfires shall be handled under the direction of the person in charge of the blasting. All leads shall be carefully traced and a search made for unexploded charges.
2. If a misfire is found, the blaster shall provide proper safeguards for excluding all employees from the danger zone.
3. No other work shall be done except that necessary to remove the hazard of the misfire and only those employees necessary to do the work shall remain in the danger zone.
4. No attempt shall be made to extract explosives from any charged or misfired hole. A new primer shall be inserted into the hole and the hole shall be reshot. If refiring of the misfired hole presents a hazard, the explosives may be removed by washing out with water or, where the misfire is underwater, blown out with air.



5. No drilling, digging or picking shall be permitted until all missed holes have been detonated or the authorized representative has approved that work can proceed.
6. Prior to the end of the working day, any misfires shall be located and rendered safe.