ATTACHMENT 20

BLASTING PLAN

Blasting Guidance Document
National Fuel Gas Supply Corporation
Tioga Pathway Project

PROCEDURES FOR BLASTING

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PROCEDURES FOR BLASTING

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 (either ours or someone else's) must be carefully monitored by means of a seismograph. (See notes on use of seismographs, page 6-5.)

4. Before blasting along a live line, the use of non-explosive means should be considered.
   - Equipping hoe with ripper blades
   - Utilizing a hydraulic hoe ram
   - Rock trenchers (Vermeer, Tesmec, Trencor)
   - S-Mite

5. If a pipeline contractor working for National needs to blast along a pipeline while it is in service, it is their responsibility to arrange for a seismograph to monitor the blast vibrations.

6. A similar situation exists for surface mines, quarries, developers, etc. who need to blast along our pipelines. They are responsible for conducting their blasting operations in a manner that insures our facilities will not be damaged. They should arrange for a certified blasting consultant to monitor all blasts within 100 feet of our pipeline. National must approve of the consultant.

7. Every pipeline is different. Pipelines 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.

8. 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. Pages 6-3 and 6-4 show examples of this.

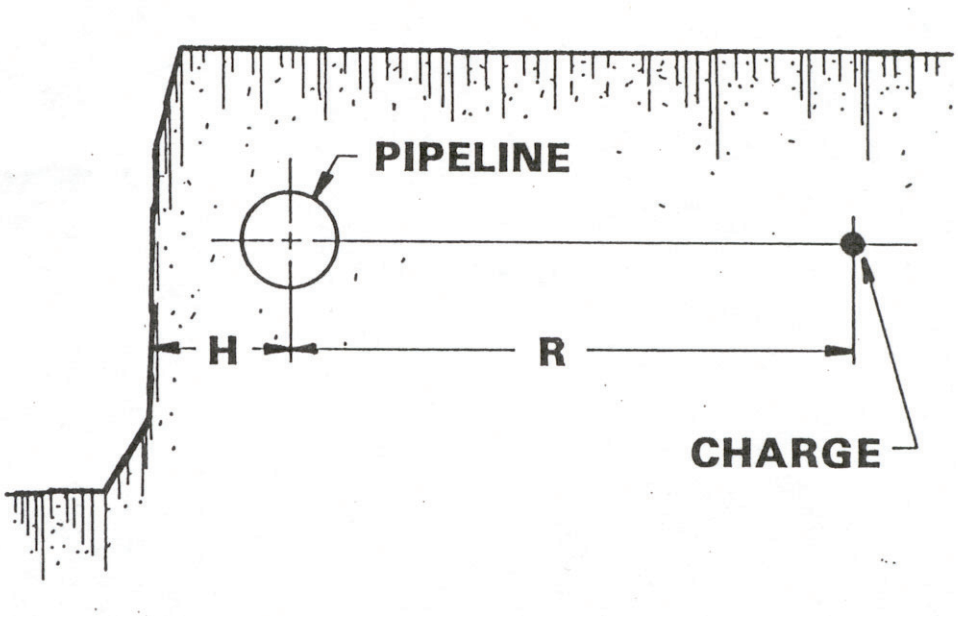
9. The distance from the nearest blast hole to the pipeline as well as the geometric pattern of a blast are important in predicting the resulting stress on the pipeline. Insure that these are properly shown on the blasting plan.

10. 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.

11. 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.

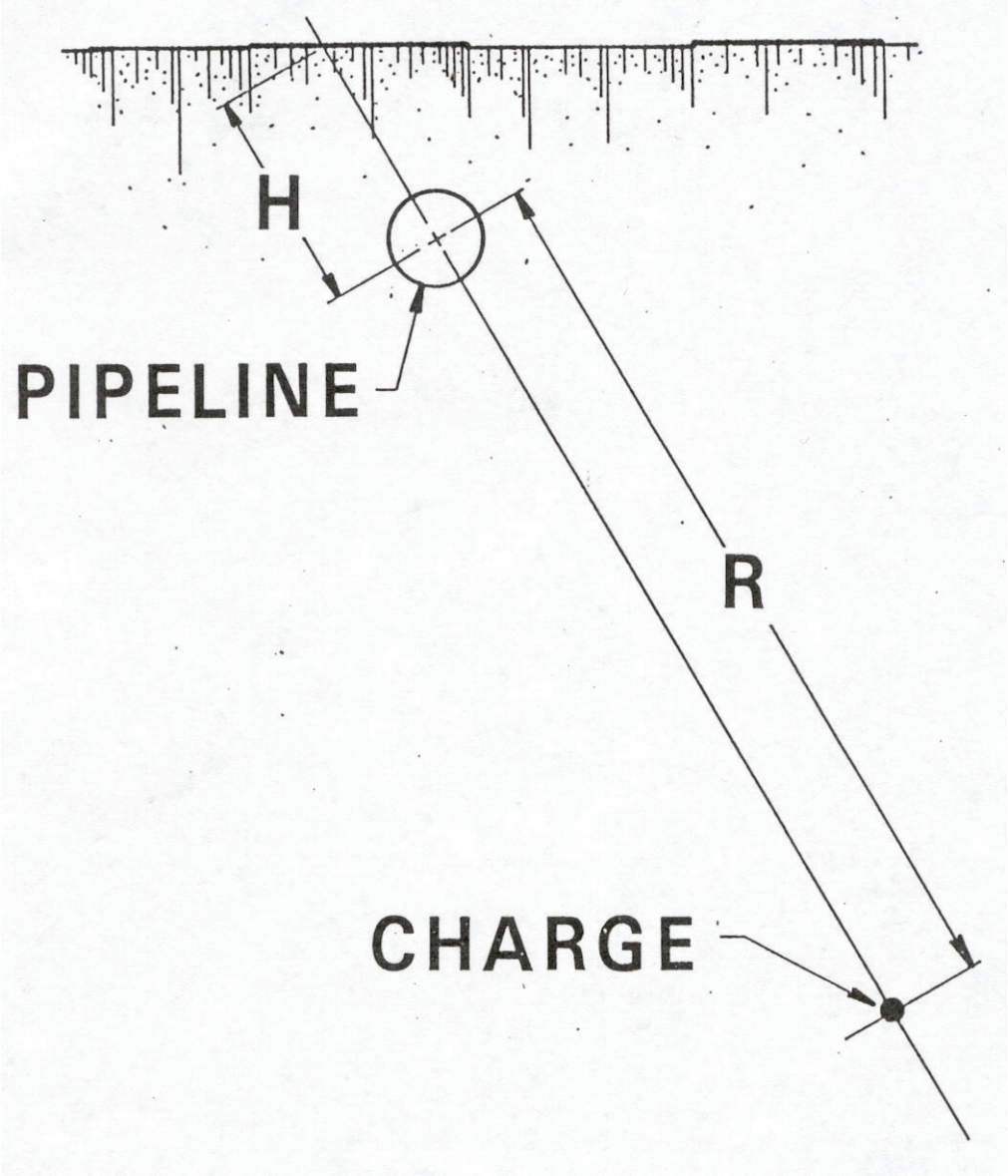
12. After blasting is completed, a leak survey is recommended.

13. Blasting in streams, agricultural fields, near residences, etc. require special precautions. The Project Engineer should be consulted if blasting in these or similar situations.



R = Distance from blast hole to pipeline

H = Distance from pipeline to free face



R = Distance from blast hole to pipeline

H = Distance from pipeline to free face

SEISMOGRAPHS

Notes on the use of 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 NFG 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 NFG's Blasting Specifications and require changes to the blasting plan before continuation of blasting.

rmit Number_____ Date_____

TYLER BLASTING INC.

PENFIELD, PENNSYLVANIA 15849

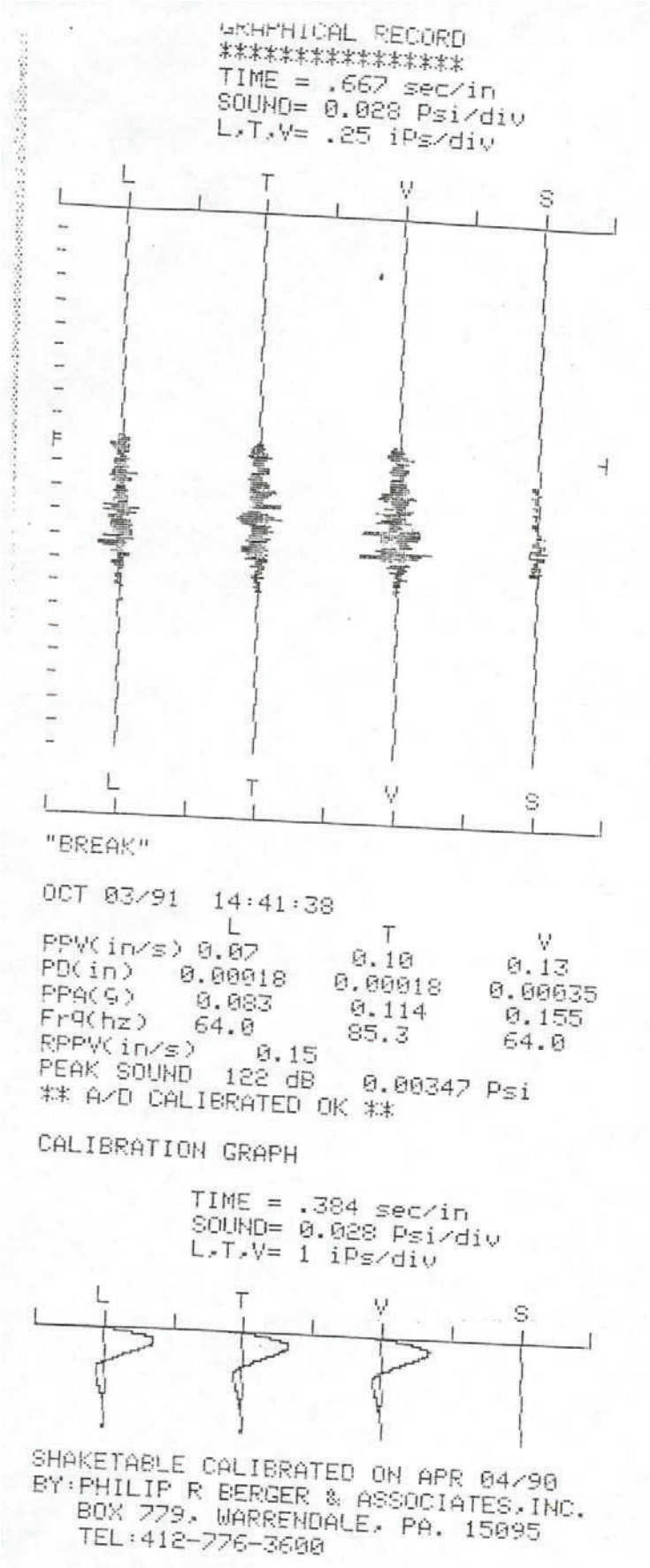
ustomer:_____ Del. Ticket Number:_____

ddress:_____ Job Location: 528 Link K

ome Lisc. Blaster: Patsy Grasso Customer Signature:_____

IME SHOT:			
IGNATURE BLASTER: & NUMBER	Paty Dyn 860-A	——	——
LASTER HELPER:	DANNY		
LASTER HELPER:			
O. HOLES	9	7	4
IA HOLES:	3 inch	3 inch	3 inch
EPTH HOLES	6 ft	4-6 ft	6 ft
URDEN:			
PACING:			
TEM:	2 ft	2 ft	2 ft
YPE STEM:	Drill Shavings	Drill Shavings	Drill Shavings
ECKS PER HOLE	ONE	ONE	ONE
OTAL AMOUNT EXP USED	10 lbs	12	9
AX EXPLOS PER DELAY	3 lb	3 LB	3 lb
IETHOD OF FIRING	NON elec	NON ELEC	NO elec
YPE & NUMBER OF CIRCUIT	ONE	ONE	ONE
IST TO NEAREST STRUCT.			
IRECTION TO NEAREST STRUCT.			
CALE DIST			
EATHER COND. & TEMP.	Cloudy 67°	Cloudy 65°	Cloudy
PEED & DIRECTION OF WIND	NW 5 mph	NW - 5 mph	NW - 5 mph
LAST MATS USED:	NONE	NONE	NONE
YPE OF BLAST CAPS	E.B.	E.B.	E.B.
ELAY PERIODS USED:	12	12	12
YPE OF MATERIAL BLAST:	SAND ROCK	SAND ROCK	SAND ROCK
EQUENTIAL SET			
EISMOGRAPH LOCATION	LINE K	LINE K	LINE K
NAME OF OPERATOR	Patsy	Patsy	Patsy
EIS NUMBER	2223 9	2239	2239
APE NUMBER	Utility	Utility	Utility
IR READ	NONE	NONE	NONE
ART READ	.7	3.5	2.0
YPE EXPLOS USED			
	Pipe K	Pipe K	Pipe K

Typical Blast Plan for Pipeline Construction



Typical Seismograph Tape Printout

Pre-Blasting Data Sheet Form

National Fuel

PRELIMINARY DATA

Work Location:

Description of Work:

Closest Point to NFG Line is ft [direction]

Line: Size: W.T.: Yield: Operating Class: Design Class: MAOP:

Line: Size: W.T.: Yield: Operating Class: Design Class: MAOP:

Line: Size: W.T.: Yield: Operating Class: Design Class: MAOP:

Line: Size: W.T.: Yield: Operating Class: Design Class: MAOP:

Alignment Sheet No.: DOT Sheet No.:

Is the existing pipeline installed in a ditch blasted from rock? ☐Yes ☐No

Inspector: Phone #: Date:

CONTRACTOR DATA

Type of explosives: Stick size: Weight per stick:

Energy Value (cal/gm): Delay Time (≥ 25 ms): Lbs. explosives per delay:

No. of holes: Depth: Pattern: ☐ Straight ☐ Staggered

Predominant Soil Type: Proposed Blasting Date(s):

Company: by:

Phone #: Fax #:

ENGINEERING REVIEW

Blasting calculations performed by: [engineer]

National Fuel has no objections to the plans as presented: ☐Yes ☐No Date:

Remarks: