

b. Measurement and Payment

Payment for drilling core borings will be made at the unit price per linear foot stated in the Bid Proposal for the number of linear feet of boring drilled and accepted by the Engineer. This price shall include all labor, equipment and materials required to drill the borings, and backfill the borings with cement grout (1:1; water:cement).

TECHNICAL SPECIFICATION NUMBER 5 - CURTAIN GROUTING

5.1 Location of Grout Curtain

A watertight grout curtain shall be installed across the seals at locations and to depths shown on the Plans or as directed by the Engineer. Each grout curtain shall extend approximately 50 feet from the outside edge of a mine seal in any one group, shall pass through the center of all seals in the particular entry complex, and continue approximately 50 feet past the outside edge of the opposite outer seal in that complex.

5.2 Grout Holes

Grout hole locations and sequence of drilling shall be based on the split-spacing method with primary holes on 20-foot centers. Secondary holes shall split the spacing between primaries. Tertiary holes shall split the spacing between adjacent secondaries and primaries. In areas of mine seals, a primary hole shall be located over the center of the mine seal and the primary hole on either side of the seal shall be ten (1) feet from each edge of the mine seal. Holes may be added or holes deleted from this pattern by the Engineer, if necessary, to obtain the desired result.

Drill holes for the curtain grouting shall be AX size (1-15/16 inches in diameter) minimum and may be drilled by rotary or percussion drilling techniques. Larger diameter holes may be required if voids are discovered, as specified under Section 5.7. All grout holes shall extend below the bottom of the coal seam far enough to permit placement of the lower packer below the coal to assure grouting of the lower contact of the coal and underlying rock. If an open mine void or large open fracture is encountered during drilling, the Engineer shall be notified immediately and the depth and thickness of the void shall be recorded. The void shall be sealed as specified in Section 5.7.

Accurate records shall be kept by the Contractor, including the location and depth of grout holes, method of installation, and other pertinent data, such as water loss during rotary drilling, difficulties encountered during drilling or pipe driving, and blow count data, if hand drivers are used.

5.3 Pressure Testing and Washing of Grout Holes

Prior to grouting, selected grout holes shall be pressure tested to determine the quality of the rock and to estimate expected grout takes. Pressure testing of a hole shall be done using the same packer arrangement and in the same sequence as the grouting. The Contractor shall provide

water pumps for the pressure testing, with a minimum capacity of 50 gpm at a discharge pressure of 150 psi. Suitable pressure gages and water meters shall be provided by the Contractor. If, in the opinion of the Engineer, either the condition of the testing equipment or its assembly and arrangement appear to be faulty, the Contractor may be required to make a series of check tests at his own expense.

At the direction of the Engineer, selected grout holes shall be thoroughly washed with clean water. Washing of a grout hole shall consist of inserting a hose or pipe to the bottom of the hole and injecting water until the water flowing to the surface is clear and contains no cement or rock particles.

Following grouting, NX size (minimum) core borings and pressure tests will be required by the Engineer to demonstrate the effectiveness of the grouting operation. The Engineer shall designate the location and depths of the test holes. Drilling and pressure testing shall be as specified above.

#### 5.4 Grout Mixes

Grout mixes shall consist of water, Type V Portland Cement, fly ash and such admixtures as are approved or requested by the Engineer. The Engineer shall have the option of specifying sand-cement grout, if required.

#### 5.5 Grouting Equipment

All equipment used for mixing and injecting grout shall be furnished by the Contractor, shall be of a type and capacity approved by the Engineer, and shall be maintained in first-class operating condition at all times. All oil or other rust inhibitors shall be removed from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout before the mixers are used.

The equipment shall include, but not be limited to, the following items:

- a. A specially equipped, air-driven or gasoline-driven duplex, double-acting grout pump, or other type of pumping equipment, specifically approved in writing by the Engineer, capable of operating at a maximum discharge pressure of 200 psi, with a flow of eight cubic feet per minute, and especially designed for grouting service, including pumping of a sand-cement grout mix, if required.
- b. A power-operated grout mixer with screens, specifically designed for the proper mixing of a pumpable slurry.
- c. A mechanically agitated sump or hold-over tank with provisions for 100 mesh vibrating screens, to maintain uninterrupted grout supply.
- d. A tank for auxiliary water supply to be used in pressure testing, flushing, and pressure washing operations.
- e. A suitable water meter graduated in cubic feet and tenths.

200-200 gpm  
11/2 # / ft"

- f. Such valves, pressure gages, pressure hose, supply lines, packers, and small tools as may be necessary to provide a continuous supply of grout and accurate pressure control.
- g. Adequate air and water supply in order that all equipment may be operated at maximum efficiency.

5.6 Grouting Procedure

Primary holes shall be drilled to full depth, as specified elsewhere herein or designated by the Engineer, and packer stage grouting, using five-foot stages, shall be utilized, beginning from the bottom of the hole and progressing upwards to the elevation shown on the Plans or directed by the Engineer. Grouting in the soil zone will not be required. Packers shall be of the ~~double-element~~ <sup>single</sup> type to permit grouting of a five-foot interval. Following grouting of one five-foot zone, the packer shall be moved to the next higher zone. This procedure shall be followed until the last packer setting is at the top elevation designated for the grout curtain. The packer shall not be moved until the back pressure has dissipated. After completion of grouting of primary holes, secondary holes shall be drilled to the full depth and grouted in stages from the bottom to the top. Tertiary holes shall be drilled in a similar manner after grouting of secondary holes. There shall be at least three holes drilled ahead of the grouting operations. Drilling for the next order of holes shall remain at least 50 feet behind those holes being actively grouted.

In general, the initial grout mix for grouting any interval shall be five to one (5:1) water-cement ratio by volume. However, the water-cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation. Fly ash may be substituted for cement up to a ratio of 3:1, fly ash to cement, subject to the approval of the Engineer. In general, if drill water action or pressure tests indicate a relatively tight hole, grouting shall be started with a thin mix. If an open hole condition exists, as determined by loss of drill water, then grouting shall be started with a thicker mix and with the grout pump operating as nearly as practicable at constant speed at all times. The water-cement ratio will be decreased, if necessary, until the required pressure has been reached. If large voids are discovered during drilling, the hole shall be grouted as specified elsewhere herein. Grout shall not be indiscriminately pumped into such voids.

If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly, as either may produce a water hammer effect which may promote stoppage. The grouting of any hole shall not be considered complete until the hole refuses to take grout at the maximum pressure required for that interval of that hole. The maximum grouting pressure shall be one pound per square inch per foot of overburden.

During initial grout application in primary, secondary or tertiary holes, the maximum amount of cement grout to be pumped into any interval of rock being grouted shall be as follows:

not double-element packers shall be available on-site in the event that Engineer requests their use as determined by field conditions.

Primary Holes..... 5 bags of cement per foot  
Secondary Holes..... 3 bags of cement per foot  
Tertiary Holes..... 1 bag of cement per foot

However, the average amount of grout pumped into any hole over its entire length shall be governed by the following limits:

Primary Holes..... 2 bags of cement per foot  
Secondary Holes..... 1 bag of cement per foot  
Tertiary Holes..... 1/2 bag of cement per foot

The water-cement ratio shall be varied as directed by the Engineer prior to use of the maximum amount of grout in any one interval. These limitations should be followed as closely as possible, consistent with sound grouting procedures.

If no pressure buildup occurs, after the use of the maximum amount of grout, grouting of this hole shall be temporarily terminated unless otherwise directed by the Engineer in writing.

All holes of any given order shall be grouted to refusal within the above quantities before the next order holes are drilled.

If grout communication develops between holes during any grouting, a packer with a valve on it shall be set in the open hole. The valve shall be closed initially but may be subsequently opened to determine if the communicating seam, joint or fracture has been effectively grouted. If so, the packer will be removed from the hole. No extra payment will be made for this.

If communication develops to an ungrouted hole, it shall be washed within two hours after grouting of the hole which communicated to it has reached refusal. If grouting of the hole is stopped by the Engineer, this hole shall be washed before the grout hardens, to permit regrouting this hole at some future date.

### 5.7 Sealing of Large Voids in Rock

#### a. General

If during construction of a mine seal or drilling of the grout curtain large voids or areas of mine roof cave are discovered, construction of the grout curtain through these areas shall be accomplished as specified herein below. A six (6) inch nominal diameter hole shall be drilled to a depth of the void or roof fall and the area treated as stipulated below, depending on the size of the void. The aggregate shall be Pennsylvania Department of Transportation Specification Gradation Size No. 2B.

b. Voids - One to Four Feet in Height

A grout pipe shall be placed to the bottom of the boring at the location of the void followed by not more than 15 feet of aggregate placed above the bottom of the pipe. During placement of the gravel, tamping, vibration or flusing shall be done to spread the aggregate. A measured quantity shall be pumped. The amount of grout to be pumped into each interval will be determined by the Engineer. The grout pipe shall then be raised one foot and another measured quantity shall then be pumped. Any grout pumped above the quantity specified by the Engineer shall be at the Contractor's expense. The grouting procedure shall be followed throughout the zone to be grouted by this procedure. The ratios of cement to water shall be determined in the field by the Engineer and the Contractor shall provide and inject the grout mix stipulated. However, pressure shall not exceed 50 psi.

c. Voids - One Foot in Height or Less

A grout pipe shall be placed to the void area or to the top of the previously grouted material. Aggregate shall be placed above the tip of the pipe to a height directed by the Engineer but no more than 15 feet, and grouting shall progress from the bottom up in one-foot increments. The amount of grout used will be determined by the Engineer. Any grout pumped above the quantity specified by the Engineer shall be at the Contractor's expense. The Engineer shall have the option of specifying ~~sand-cement~~ grout if he so desires. Pressures shall not be in excess of ~~one~~ pound per square inch per foot of overburden, with grout mixes being determined in the field.

d. Grouting above Filled Voids in Four-Inch-Diameter Holes

This method shall be used only when the remainder of the hole contains no other voids and appears to be fairly tight. Packers shall be used during this grouting. A single packer shall be set ten feet below top of competent rock, as stipulated by the Engineer, and a cement and water grout shall be used. Pressures shall not be in excess of one pound per square inch per foot of overburden, with grout mixes being determined in the field.

Following grouting with the packer located ten feet below top of competent rock, the packer shall be raised to top of competent rock or may be sealed at the base of the casing if the casing shall have sufficient resistance to prevent grout from coming to the surface. The amount of grout injected into the hole shall be controlled by the bag limitations stipulated for AX size (minimum) holes, with the limitation depending on whether the hole is primary, secondary or tertiary.

If voids or fractures exist above the filled area, the hole shall be grouted using aggregate control as specified under Paragraph 5.7c above.

5.8 Finish Work

When a hole has been grouted to the satisfaction of the Engineer, the boring shall be backfilled with a 1:1 water-cement mix to the surface and casing removed.

5.9 Measurement and Payment

Payment for drilling the AX size (minimum) grout or test holes will be made at the unit price per linear foot stated in the Bid Proposal for the actual length of holes drilled and accepted by the Engineer. Payment for placement of grout will be made at the unit price per grout hole connection plus the unit price per ton of cement, sand and/or fly ash used in placing grout approved and accepted by the engineer. Payment quantities for cement and fly ash will be based on certified weight ticket delivery slips bearing the name, signature and seal of a weighmaster certified by the Department of Agriculture. Payment for admixtures required by the Engineer will be made at the unit prices stated in the Bid Proposal.

Payment for pressure testing, whether in test holes or grout curtain holes, will be made at the unit price per hour of testing stated in the Bid Proposal for the elapsed testing time accepted by the Engineer, excluding lapse time due to equipment failure or other conditions causing an interruption of continuous testing. Testing time will be measured from the time the packers are in place at the bottom of the boring until pressure testing is complete and the packers are ready for removal from the boring. Payment for washing grout holes will be at the unit price per hour for the elapsed time directed and approved by the Engineer.

Payment for constructing the grout curtain through large void areas in the rock shall be based on the quantity of materials placed in the grout holes and footage of six-inch-diameter holes drilled. Payment for placement of grout will be as specified above.

The bid prices for these items will include all costs for labor, equipment and materials for the curtain grouting and no additional payments will be made for this Work.

TECHNICAL SPECIFICATION NUMBER 6 - PIEZOMETERS

6.1 Installation

Piezometer standpipes shall be installed in borings which intercept the mine openings at the locations shown on the Plans. The pipe for the standpipes shall be 2-inch I.D. Schedule 80, PVC Type I. The pipes shall be open at the lower end and slotted or perforated over the bottom two feet of length. The slots may be horizontal saw cuts, one-half-inch long on alternate sides of the pipe on four-inch centers. The perforations may be 3/16-inch-diameter drilled holes, spaced six per foot of pipe length. The pipes shall be grouted into place with neat cement (water:cement ratio 1:1). A cement basket, as manufactured by Halliburton Company, or approved equal, shall be attached to the 2-inch pipe, as shown on the Plans.

b. Measurement and Payment

Payment for drilling core borings will be made at the unit price per linear foot stated in the Bid Proposal for the number of linear feet of boring drilled and accepted by the Engineer. This price shall include all labor, equipment and materials required to drill the borings, and backfill the borings with cement grout (1:1; water:cement).

TECHNICAL SPECIFICATION NUMBER 5 - CURTAIN GROUTING

5.1 Location of Grout Curtain

A watertight grout curtain shall be installed across the seals at locations and to depths shown on the Plans or as directed by the Engineer. Each grout curtain shall extend approximately 50 feet from the outside edge of a mine seal in any one group, shall pass through the center of all seals in the particular entry complex, and continue approximately 50 feet past the outside edge of the opposite outer seal in that complex.

5.2 Grout Holes

Grout hole locations and sequence of drilling shall be based on the split-spacing method with primary holes on 20-foot centers. Secondary holes shall split the spacing between primaries. Tertiary holes shall split the spacing between adjacent secondaries and primaries. In areas of mine seals, a primary hole shall be located over the center of the mine seal and the primary hole on either side of the seal shall be ten (1) feet from each edge of the mine seal. Holes may be added or holes deleted from this pattern by the Engineer, if necessary, to obtain the desired result.

Drill holes for the curtain grouting shall be AX size (1-15/16 inches in diameter) minimum and may be drilled by rotary or percussion drilling techniques. Larger diameter holes may be required if voids are discovered, as specified under Section 5.7. All grout holes shall extend below the bottom of the coal seam far enough to permit placement of the lower packer below the coal to assure grouting of the lower contact of the coal and underlying rock. If an open mine void or large open fracture is encountered during drilling, the Engineer shall be notified immediately and the depth and thickness of the void shall be recorded. The void shall be sealed as specified in Section 5.7.

Accurate records shall be kept by the Contractor, including the location and depth of grout holes, method of installation, and other pertinent data, such as water loss during rotary drilling, difficulties encountered during drilling or pipe driving, and blow count data, if hand drivers are used.

5.3 Pressure Testing and Washing of Grout Holes

Prior to grouting, selected grout holes shall be pressure tested to determine the quality of the rock and to estimate expected grout takes. Pressure testing of a hole shall be done using the same packer arrangement and in the same sequence as the grouting. The Contractor shall provide

water pumps for the pressure testing, with a minimum capacity of 50 gpm at a discharge pressure of 150 psi. Suitable pressure gages and water meters shall be provided by the Contractor. If, in the opinion of the Engineer, either the condition of the testing equipment or its assembly and arrangement appear to be faulty, the Contractor may be required to make a series of check tests at his own expense.

At the direction of the Engineer, selected grout holes shall be thoroughly washed with clean water. Washing of a grout hole shall consist of inserting a hose or pipe to the bottom of the hole and injecting water until the water flowing to the surface is clear and contains no cement or rock particles.

Following grouting, NX size (minimum) core borings and pressure tests will be required by the Engineer to demonstrate the effectiveness of the grouting operation. The Engineer shall designate the location and depths of the test holes. Drilling and pressure testing shall be as specified above.

#### 5.4 Grout Mixes

Grout mixes shall consist of water, Type V Portland Cement, fly ash and such admixtures as are approved or requested by the Engineer. The Engineer shall have the option of specifying sand-cement grout, if required.

#### 5.5 Grouting Equipment

All equipment used for mixing and injecting grout shall be furnished by the Contractor, shall be of a type and capacity approved by the Engineer, and shall be maintained in first-class operating condition at all times. All oil or other rust inhibitors shall be removed from the mixing drums, stirring mechanisms, and other portions of the equipment in contact with the grout before the mixers are used.

The equipment shall include, but not be limited to, the following items:

- a. A specially equipped, air-driven or gasoline-driven duplex, double-acting grout pump, or other type of pumping equipment, specifically approved in writing by the Engineer, capable of operating at a maximum discharge pressure of 200 psi, with a flow of eight cubic feet per minute, and especially designed for grouting service, including pumping of a sand-cement grout mix, if required.
- b. A power-operated grout mixer with screens, specifically designed for the proper mixing of a pumpable slurry.
- c. A mechanically agitated sump or hold-over tank with provisions for 100 mesh vibrating screens, to maintain uninterrupted grout supply.
- d. A tank for auxiliary water supply to be used in pressure testing, flushing, and pressure washing operations.
- e. A suitable water meter graduated in cubic feet and tenths.

200-200 gpm  
1 1/2" / 1 ft



- f. Such valves, pressure gages, pressure hose, supply lines, packers, and small tools as may be necessary to provide a continuous supply of grout and accurate pressure control.
- g. Adequate air and water supply in order that all equipment may be operated at maximum efficiency.

5.6 Grouting Procedure

Primary holes shall be drilled to full depth, as specified elsewhere herein or designated by the Engineer, and packer stage grouting, using five-foot stages, shall be utilized, beginning from the bottom of the hole and progressing upwards to the elevation shown on the Plans or directed by the Engineer. Grouting in the soil zone will not be required. Packers shall be of the ~~double~~ <sup>double</sup> element type to permit grouting of a five-foot interval. Following grouting of one five-foot zone, the packer shall be moved to the next higher zone. This procedure shall be followed until the last packer setting is at the top elevation designated for the grout curtain. The packer shall not be moved until the back pressure has dissipated. After completion of grouting of primary holes, secondary holes shall be drilled to the full depth and grouted in stages from the bottom to the top. Tertiary holes shall be drilled in a similar manner after grouting of secondary holes. There shall be at least three holes drilled ahead of the grouting operations. Drilling for the next order of holes shall remain at least 50 feet behind those holes being actively grouted.

In general, the initial grout mix for grouting any interval shall be five to one (5:1) water-cement ratio by volume. However, the water-cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation. Fly ash may be substituted for cement up to a ratio of 3:1, fly ash to cement, subject to the approval of the Engineer. In general, if drill water action or pressure tests indicate a relatively tight hole, grouting shall be started with a thin mix. If an open hole condition exists, as determined by loss of drill water, then grouting shall be started with a thicker mix and with the grout pump operating as nearly as practicable at constant speed at all times. The water-cement ratio will be decreased, if necessary, until the required pressure has been reached. If large voids are discovered during drilling, the hole shall be grouted as specified elsewhere herein. Grout shall not be indiscriminately pumped into such voids.

If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly, as either may produce a water hammer effect which may promote stoppage. The grouting of any hole shall not be considered complete until the hole refuses to take grout at the maximum pressure required for that interval of that hole. The maximum grouting pressure shall be one pound per square inch per foot of overburden.

During initial grout application in primary, secondary or tertiary holes, the maximum amount of cement grout to be pumped into any interval of rock being grouted shall be as follows:

Engineer requests their use as determined by field conditions. on-site in the event that double-element packers shall be available

Primary Holes..... 5 bags of cement per foot  
Secondary Holes..... 3 bags of cement per foot  
Tertiary Holes..... 1 bag of cement per foot

However, the average amount of grout pumped into any hole over its entire length shall be governed by the following limits:

Primary Holes..... 2 bags of cement per foot  
Secondary Holes..... 1 bag of cement per foot  
Tertiary Holes..... 1/2 bag of cement per foot

The water-cement ratio shall be varied as directed by the Engineer prior to use of the maximum amount of grout in any one interval. These limitations should be followed as closely as possible, consistent with sound grouting procedures.

If no pressure buildup occurs, after the use of the maximum amount of grout, grouting of this hole shall be temporarily terminated unless otherwise directed by the Engineer in writing.

All holes of any given order shall be grouted to refusal within the above quantities before the next order holes are drilled.

If grout communication develops between holes during any grouting, a packer with a valve on it shall be set in the open hole. The valve shall be closed initially but may be subsequently opened to determine if the communicating seam, joint or fracture has been effectively grouted. If so, the packer will be removed from the hole. No extra payment will be made for this.

If communication develops to an ungrouted hole, it shall be washed within two hours after grouting of the hole which communicated to it has reached refusal. If grouting of the hole is stopped by the Engineer, this hole shall be washed before the grout hardens, to permit regrouting this hole at some future date.

### 5.7 Sealing of Large Voids in Rock

#### a. General

If during construction of a mine seal or drilling of the grout curtain large voids or areas of mine roof cave are discovered, construction of the grout curtain through these areas shall be accomplished as specified herein below. A six (6) inch nominal diameter hole shall be drilled to a depth of the void or roof fall and the area treated as stipulated below, depending on the size of the void. The aggregate shall be Pennsylvania Department of Transportation Specification Gradation Size No. 2B.

b. Voids - One to Four Feet in Height

A grout pipe shall be placed to the bottom of the boring at the location of the void followed by not more than 15 feet of aggregate placed above the bottom of the pipe. During placement of the gravel, tamping, vibration or flusing shall be done to spread the aggregate. A measured quantity shall be pumped. The amount of grout to be pumped into each interval will be determined by the Engineer. The grout pipe shall then be raised one foot and another measured quantity shall then be pumped. Any grout pumped above the quantity specified by the Engineer shall be at the Contractor's expense. The grouting procedure shall be followed throughout the zone to be grouted by this procedure. The ratios of cement to water shall be determined in the field by the Engineer and the Contractor shall provide and inject the grout mix stipulated. However, pressure shall not exceed 50 psi.

c. Voids - One Foot in Height or Less

A grout pipe shall be placed to the void area or to the top of the previously grouted material. Aggregate shall be placed above the tip of the pipe to a height directed by the Engineer but no more than 15 feet, and grouting shall progress from the bottom up in one-foot increments. The amount of grout used will be determined by the Engineer. Any grout pumped above the quantity specified by the Engineer shall be at the Contractor's expense. The Engineer shall have the option of specifying ~~and cement~~ grout if he so desires. Pressures shall not be in excess of one pound per square inch per foot of overburden, with grout mixes being determined in the field.

d. Grouting above Filled Voids in Four-Inch-Diameter Holes

This method shall be used only when the remainder of the hole contains no other voids and appears to be fairly tight. Packers shall be used during this grouting. A single packer shall be set ten feet below top of competent rock, as stipulated by the Engineer, and a cement and water grout shall be used. Pressures shall not be in excess of one pound per square inch per foot of overburden, with grout mixes being determined in the field.

Following grouting with the packer located ten feet below top of competent rock, the packer shall be raised to top of competent rock or may be sealed at the base of the casing if the casing shall have sufficient resistance to prevent grout from coming to the surface. The amount of grout injected into the hole shall be controlled by the bag limitations stipulated for AX size (minimum) holes, with the limitation depending on whether the hole is primary, secondary or tertiary.

If voids or fractures exist above the filled area, the hole shall be grouted using aggregate control as specified under Paragraph 5.7c above.

5.8 Finish Work

When a hole has been grouted to the satisfaction of the Engineer, the boring shall be backfilled with a 1:1 water-cement mix to the surface and casing removed.

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Payment for constructing the grout curtain through large void areas in the rock shall be based on the quantity of materials placed in the grout holes and footage of six-inch-diameter holes drilled. Payment for placement of grout will be as specified above.

The bid prices for these items will include all costs for labor, equipment and materials for the curtain grouting and no additional payments will be made for this Work.

TECHNICAL SPECIFICATION NUMBER 6 - PIEZOMETERS

6.1 Installation

Piezometer standpipes shall be installed in borings which intercept the mine openings at the locations shown on the Plans. The pipe for the standpipes shall be 2-inch I.D. Schedule 80, PVC Type I. The pipes shall be open at the lower end and slotted or perforated over the bottom two feet of length. The slots may be horizontal saw cuts, one-half-inch long on alternate sides of the pipe on four-inch centers. The perforations may be 3/16-inch-diameter drilled holes, spaced six per foot of pipe length. The pipes shall be grouted into place with neat cement (water:cement ratio 1:1). A cement basket, as manufactured by Halliburton Company, or approved equal, shall be attached to the 2-inch pipe, as shown on the Plans.

COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF ENVIRONMENTAL RESOURCES

OFFICE OF RESOURCES MANAGEMENT, EBENSBURG DISTRICT

ORIGINAL CONTRACT PRICE \$854,994.00

PROJECT NO. SL 138-3-101.1

Deep Mine Sealing, Cucumber Run Wa

WITH PLANS ORDER (3)

PROJECT TITLE AND LOCATION Ohiovyle State Park, Stewart Twp, Fayette Cou

CONTRACTOR GAL Construction Incorporated, P.O. Box 127, Belle Vernon, PA

ESTIMATE NO. 5 FOR PERIOD FROM 6/30/79 TO

APPROPRIATION SYMBOL 39-35-02-73-3-38-03-500-56210-470

APPROPRIATION SYMBOL 39-35-02-73-3-38-03-500-56210-470

No.	Description	Total Cost of Item	Estimated Quantity and Unit	Unit Price	Estimate of Work Performed-Units			Do
					This Period	Previous Total	To Date	
1.	Mobilization and Demobilization	\$ 66,690.00	Job Job	L.S.	5%	35%	40%	This # 33
2.	Concrete Mine Seals							
	a. Seal	\$ 24,500.00	7 Each	\$3,500.00	8 EACH		8 EACH	# 28
	b. Timber Roof Support	\$ 25,375.00	145 SETS	\$ 175.00	-	78.00 SETS	78.00 SETS	
	c. Ventilation	\$ 11,200.00	560 Hrs	\$ 20.00	13 HRS.	147 HRS.	160 HRS	# 2
3.	Core Drilling (NX Size)	\$ 5,800.00	290 L.F.	\$ 20.00				
4.	Grout Curtain							
	a. AX(min.) Drilled Holes	\$ 58,800.00	4,900 L.F.	\$ 12.00				
	b. Grout Hole Connections	\$ 2,500.00	50 Each	\$ 50.00				
	c. Pressure Grout-Cement	\$ 26,550.00	90 Ton	\$ 295.00				
	d. Pressure Grout- Fly Ash	\$ 29,000.00	145 Ton	\$ 200.00				
	e. Admixtures:							
	AM-9 or Equal	\$ 1,050.00	35 lbs	\$ 30.00				
	SIKA No. 4 or Equal	\$ 1,050.00	35 Gal	\$ 30.00				
	SIRCO or Equal	\$ 1,050.00	35 Gal.	\$ 30.00				
	f. Pressure Test	\$ 4,950.00	30 Hrs	\$ 165.00				
	g. Washing Holes	\$ 1,200.00	10 Hrs	\$ 120.00				
	h. 6" Diameter Boring	\$ 1,050.00	35 L.F.	\$ 30.00				
5.	Piezometers							
	a. Nx(min.) Drilled Holes	\$ 6,600.00	330 L.F.	\$ 20.00				

REPORT ON HYDRAULIC PRESSURE TESTING

Boring No. \_\_\_\_\_ of \_\_\_\_\_  
 Sheet No. \_\_\_\_\_  
 Date \_\_\_\_\_

Project Location \_\_\_\_\_  
 Boring Location \_\_\_\_\_  
 Elev. Top of Boring \_\_\_\_\_  
 No. of Meter \_\_\_\_\_  
 Driller \_\_\_\_\_

PART I DATA ON FLOW TEST

Section of hole tested		From To	From To	Press. Lbs. / Sq. In.	Time Start-Stop	Time Stop-Stop	Time At Min-utes	Meter Readings	
Depth	Elevation							At	Test o.f.
								Total C.F. Water	Used
								Per C.F. Water	Min.

PART II

HOLDING TEST - MAXIMUM PRESSURE 50 p.s.i.

Data on Pressure		Section of hole tested		From To	From To	Elevation	Gage pressure at test intervals from 10-0	Time on Each 10 lb. Drop
Depth	Elevation	From	To					
							50-40 lb.	
							40-30 lb.	
							30-20 lb.	
							20-10 lb.	
							(or higher pressures if necessary)	

DESCRIPTION OF OPERATIONS AND GENERAL INFORMATION:

Elev. Top Rock \_\_\_\_\_  
 Bottom Boring \_\_\_\_\_

REMARKS:

Inspector's Signature \_\_\_\_\_

REPORT ON HYDRAULIC PRESSURE TESTING

Boring No. \_\_\_\_\_ of \_\_\_\_\_  
 Sheet No. \_\_\_\_\_ of \_\_\_\_\_  
 Date \_\_\_\_\_  
 Project Location \_\_\_\_\_  
 Boring Location \_\_\_\_\_  
 Driller \_\_\_\_\_  
 Project No. \_\_\_\_\_  
 Elev. Top of Boring \_\_\_\_\_  
 No. of Meter \_\_\_\_\_

PART I DATA ON FLOW TEST

Section of hole tested		From To	From To	Press. / Sq. In.	Time Started	Time Stopped	Time At Min-Start	Time At Start	At End of Test	Total C.F. Water Per Min.
Depth	Elevation	From	To							

PART II HOLDING TEST - MAXIMUM PRESSURE 50 p.s.i.

Data on Pressure		Section of hole tested		Gage pressure at test intervals from	Time on Each 10 lb. Drop
From To	From To	Depth	Elevation		

DESCRIPTION OF OPERATIONS AND GENERAL INFORMATION:

Elev. Top Rock \_\_\_\_\_  
 Bottom Boring \_\_\_\_\_

REMARKS:

Inspector's Signature \_\_\_\_\_