

# Performance Coal Company

P.O. Box 69

Naoma, WV

25140

February 17, 2010

Mr. Robert G. Hardman  
Mine Safety and Health Administration  
100 Bluestone Road  
Mount Hope, WV 25880

Re: Performance Coal Company  
Upper Big Branch Mine  
MSHA ID : 46-08436  
State ID: U-3042-92  
Seal Construction Notification

Dear Sir:

Performance Coal Company will be building frames and pumping 50psi seals to replace existing seals in Seal Set #3 at the Upper Big Branch Mine. The seals to be replaced are No.'s 14, 15, 17, and 18. This work is expected to begin on Monday, February 22, 2010.

This mine currently has no miner's representative. If you have any questions or comments, feel free to contact me at (304) 854-3516.

Respectfully Submitted,  
Performance Coal Company, Inc.

Eric Lilly  
Mine Engineer

MSHA  
MOUNT HOPE, WV

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JAN 25 2010

Mr. Chris Blanchard  
President  
Performance Coal Company  
POB 69  
Naoma, WV 25140

Dear Mine Operator:

Subject: Mine Ventilation Plan, Section 75.370, 30 CFR 75, Upper  
Big Branch Mine-South, I.D. No. 46-08436, Performance  
Coal Company, Montcoal, Raleigh County, West Virginia

This will acknowledge receipt of a revision to the ventilation plan, dated December 10, 2009, and received by MSHA on December 14, 2009, for the subject mine. The revision requests to construct four (4) 50-PSI Minova Seal, MSHA Seal approval #50M-02.0 on East Mains. The seals will be constructed in front of the existing Strata Packsetter seal numbers 14, 15, 17 and 18 which are required to be replaced.

The revision is approved and will be made a part of the approved ventilation plan for this mine. This approval is limited to the requested change as described in the submittal letter and shown on the attached map of the subject mine. **All ventilation changes will be made in accordance with 30 CFR 75.324.**

Should you have any questions concerning this matter, please contact the Ventilation Department at (304) 877-3900/Ext. 142.

Sincerely,

/s/ ROBERT G. HARDMAN

Robert G. Hardman  
District Manager  
Coal Mine Safety and Health, District 4

cc: Mt. Hope Field Office (3incl.)/ Files/nlc

SUPERVISORY ACKNOWLEDGEMENT

Initials RLC Date 1/25/10  
Initials gm Date 1/25/10



JAN 25 2010

Mr. Chris Blanchard  
President  
Performance Coal Company  
POB 69  
Naoma, WV 25140

Dear Mine Operator:

Subject: Mine Ventilation Plan, Section 75.370, 30 CFR 75, Upper  
Big Branch Mine-South, I.D. No. 46-08436, Performance  
Coal Company, Montcoal, Raleigh County, West Virginia

This will acknowledge receipt of a revision to the ventilation plan, dated December 10, 2009, and received by MSHA on December 14, 2009, for the subject mine. The revision requests to construct four (4) 50-PSI Minova Seal, MSHA Seal approval #50M-02.0 on East Mains. The seals will be constructed in front of the existing Strata Packsetter seal numbers 14, 15, 17 and 18 which are required to be replaced.

The revision is approved and will be made a part of the approved ventilation plan for this mine. This approval is limited to the requested change as described in the submittal letter and shown on the attached map of the subject mine. **All ventilation changes will be made in accordance with 30 CFR 75.324.**

Should you have any questions concerning this matter, please contact the Ventilation Department at (304) 877-3900/Ext. 142.

Sincerely,

A handwritten signature in black ink that reads "Robert G. Hardman".

Robert G. Hardman  
District Manager  
Coal Mine Safety and Health, District 4



# Performance Coal Company

P.O. Box 69

Naoma, WV

25140

December 10, 2009

**Mr. Robert G. Hardman  
Mine Safety and Health Administration  
100 Bluestone Road  
Mt. Hope, West Virginia 25880**

**Re: Upper Big Branch Mine  
MSHA ID 46-08436  
State Permit U-3042-92  
Ventilation Plan Revision**

Dear Sir:

Please find the enclosed revision to our ventilation plan. This revision requests the ability to construct four (4) 50-psi Minova Seal at the Upper Big Branch Mine. These seals will be constructed in front of existing Strata Packsetter seals that require replacement. The MSHA Seal Approval Number for this design is 50M-02.0.

This revision is divided into two sections. The first section contains the Minova seal installation guidelines and the certification of this seal design from Environmental Resources Management Consulting Company, LLC. The original seal certification can be obtained from MSHA Technical Support at the MSHA District Manager's Request. The second section includes supplemental information required for seal construction under 30 CFR 75.335(c)(3).

At this time, Performance Coal Company, Inc. does not have a miners' representative at this operation. If you have any questions or concerns on this matter, please feel free to contact me at your convenience.

Respectfully submitted,  
Performance Coal Company, Inc.

Eric Lilly  
Mine Engineer

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## Supplemental Ventilation Plan Information

**30 CFR § 75.335 (c)(3): [The mine operator shall --] Provide the following information for approval in the ventilation plan –**

- (i) *The MSHA Technical Support Approval Number:*  
50M – 02.0
- (ii) *A summary of the installation procedures:*  
A copy of the installation procedures has been attached.
- (iii) *The mine map of the area to be sealed and proposed seal locations that include the deepest points of penetration prior to sealing. The mine map shall be certified by a professional engineer or a professional land surveyor:*  
A 1 in. = 500 ft. scale certified mine map of the area has been attached.
- (iv) *Specific mine site information, including:*
  - (A) *Type of seal:*

The type of seal to be used is the 50-psi Minova Main Line Tekseal. The 50-psi Minova Main Line Tekseal is intended for mine openings from 4 to 30 ft high and up to 30 ft wide. The largest opening where the seals are to be constructed is 23.5 ft wide and 5.5 ft high. More information on this design is included in the first part of this plan.

**(B) *Safety precautions taken prior to seal achieving design strength:***

The seals will achieve full design strength within 28 days of completion. Therefore, the atmosphere behind the seals will be monitored each working day until the seals reach the achieved design strength, the quality control tests have been confirmed, and the final seal certification is submitted. Air will be sampled from the five existing sample locations (Seals 5, 10, 13, 21, and 26) that are part of the same sealed area. Samples will be taken using an MSHA approved detector and pump with capabilities necessary to draw and analyze samples from the atmosphere behind the seals. An airtight connection from the sample tube to the pump/detector will be made. Adequate purge times for each sampling location will be calculated and made available to certified persons conducting sampling. In the event any sample obtained indicates the atmosphere behind the seals is not inert (4.5%-17% methane and 10% or greater oxygen), men will be withdrawn from the entire mine, and State and Federal agencies will be notified. The area around the seal location will be adequately rock dusted.

**(C) *Methods to address site-specific conditions that may affect the strength and applicability of the seals including set-back distances:***

Site-specific conditions that may affect the strength and applicability of the seal have been evaluated by Environmental Resources Management Consulting to determine that they fit within the seal design criteria. A

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## Supplemental Ventilation Plan Information

**30 CFR § 75.335 (c)(1):**

The mine operator shall retain the seal design, approval, and installation information for as long as the seal is needed to serve the purpose for which it was built.

**30 CFR § 75.335 (c)(2):**

The mine operator shall designate a professional engineer to conduct or have oversight of seal installation and certify that the provisions in the approved seal design have been addressed and are applicable to conditions at the mine. A copy of the certification shall be submitted to the District Manager with the information required by 30 CFR § 75.335 (c) (3). A copy of this certification shall be retained for as long as the seal is needed to serve the purpose for which it was built.

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copy of this certification is attached. As stated in 30 CFR § 75.335 (c)(2), a professional engineer shall be designated to conduct or have oversight of seal installation and certify that the provisions in the approved seal design have been addressed. At this time, Todd Beavan of Environmental Resources Management Consulting (a West Virginia Professional Engineer) has been designated for this certification. A copy of this certification will be forwarded to MSHA. If any seal is to be located less than 10ft from the edge of a pillar, the ribs will be reinforced with Tekflex or an equivalent material. A pogo stick or similar device marked with measurements will be installed in the entry containing the seals. This device will be used to measure convergence.

**(D) *Site Preparation:***

The site preparations articles listed on Pages 1 and 2 of the attached Seal Installation Guidelines will be followed. The seal locations will be cleaned and all loose material removed from the roof, ribs, and floor. The surfaces at the seal perimeter will be as rough as practically possible, a minimum of 1 inch per 4 feet. The exposed surfaces will be cleared to minimize dust and rock dust will be removed from the strata within the seal form. If any seal is to be located less than 10ft from the edge of a pillar, the ribs will be reinforced with Tekflex or an equivalent material. Two cribs will be installed on the outby side of the seal location. The form will be constructed using the wood and brattice method described in the guidelines.

**(E) *Sequence of seal installations:***

The area is currently sealed off by existing Micon and Strata Packsetter seals. Seals 14, 15, 17, and 18 are the only seals to be constructed.

**(F) *Projected date of completion of each set of seals:***

Upon approval of this plan, the construction of the seals will begin at the first available time that the seal construction company is available. The seals should be completed approximately 3 days after commencement of construction. In accordance with 30 CFR § 75.337 (e)(1), the District Manager will be notified between two and fourteen days prior to the commencement of seal construction. The District Manager will also be notified of any changes to the time frame of completion. In accordance with 30 CFR § 75.337 (e)(2), notification of completion will be sent in writing within five days of the completion of the seals.

**(G) *Supplemental roof support inby and outby each seal:***

The seal location was developed in August of 1995. Roof supports were installed per the approved mine roof control plan. Additional supports will be installed by constructing two cribs outby the seals.

Seal Number	Height (ft)	Width (ft)	Current Distance from Corner (ft)		Depth of Seal (ft)	Distance from Corner (ft) After Construction	
			Left	Right		Left	Right
14	5	22	15	11	4.9	10.1	6.1
15	4	19	23	20	4.1	18.9	15.9
17	4	20.5	12	10	4.2	7.8	5.8
18	5	22.5	15	12	4.9	10.1	7.1



**(H) *Water flow estimation and dimensions of the water drainage system through the seals:***

None of the seals currently in place contain a water drainage system, therefore the newly constructed seals will not contain a water drainage system.

**(I) *Methods to ventilate the outby face of seals once completed:***

The method to ventilate the outby face of the seals will not change from the currently approved ventilation plan. Return air will ventilate the seals and will exit the mine at the portal. If any seal is greater than 20 feet from the rib corner, a check curtain will be maintained to within no more than 10 feet of the face of the seal.

**(J) *Methods and materials used to maintain each type of seal:***

Weekly inspections will be conducted to ensure the integrity of the seals. Any repairs will be in accordance with 30 CFR § 75.337 and pages 8 and 9 of the attached seal installation guidelines.

**(K) *Methods to address shafts and boreholes in the sealed area:***

This submittal is for the replacement of four (4) existing seals in a set of eight seals. The new seals will be constructed directly in front of existing seals. Therefore, this section does not apply to the construction of the proposed seals.

**(L) *Assessment of potential for overpressures greater than 120 psi in sealed area:***

The sealed area does not contain a homogeneous mixture of methane between 4.5 percent and 17.0 percent and oxygen exceeding 17.0 percent throughout the entire area. Sealed atmosphere sample results at this set show the oxygen content to be 20.8 percent and the methane concentration to be 0.0 percent. There is no potential for pressure piling to result in overpressures greater than 120 psi in the sealed area. There is no likelihood of a detonation in the area to be sealed.

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*(M) Additional sampling locations:*

The entire sealed area will contain the newly constructed 50-psi seals, one (1) previously constructed 50psi seal and 27 other existing 20-psi seals. There are 5 sample locations in the existing seals that are currently being sampled daily (24 hours). There is no sampling tube in any of the new seals, therefore these 5 existing sampling locations will continue to be monitored until a plan is submitted to the district manager and approved for a different frequency of sampling.

*(N) Additional information required by the District Manager:*

Performance Coal Company, Inc. has designated Environmental Resources Management Consultants, who is familiar with the approved design of the seal, to certify that the seal design meets the criteria of the application and is adequate for this site (certification is attached). A final certification will be submitted to the district manager after the seals have been completed and the quality control tests results are verified.

The existing seals that will be replaced do not contain sampling pipes. The existing seals will be utilized as back walls for the new seals. No space will exist between the existing seals and the new seals. Therefore, no air sampling pipes will be installed in the new seals.

The following certified persons will be designated in accordance with 30 CFR 75.337(c) to directly supervise seal construction: Gary May and Rick Foster. Other certified persons may be designated provided they are trained in the plan prior to the construction of seals. Gary May will be designated as the senior management official who will certify the construction, installation and materials were used in accordance with approved ventilation plan. The training certifications will be retained at the mine site for a period of one year.

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2265 Harrodsburg Road • Suite 200 • Lexington, Kentucky • 40504  
phone (859) 381-1000 • fax (859) 381-1005

ENVIRONMENTAL RESOURCES MANAGEMENT CONSULTING COMPANY, LLC

December 11, 2009

Mr. Eric Lilly  
Marfork Coal Company  
PO Box 457  
Whitesville, WV 25209

Re: 50-psi, Minova seals (MSHA Approval No. 50M-02.0)  
Upper Big Branch Mine, Seals #14, 15, 17, 18

Dear Mr. Lilly:

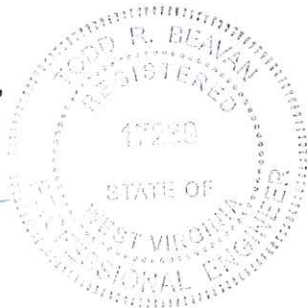
On December 7<sup>th</sup>, 2009, we examined the proposed site locations for the proposed Minova Mine Seals. After our initial site visit and examination, the approved Minova Mine Seal is applicable for use at these locations.

The measured dimensions at each site fall within the approved guidelines for construction of the Minova Seal. At the locations where the seal will be located within 10 feet of an outby pillar corner, the outby ribs will be reinforced with Tekflex or some other similar material in accordance with manufacturer recommendations. In areas where floor heave has occurred, the floor must be removed to competent strata prior to construction. The proposed seal dimensions will have to be verified after site preparation by the professional engineer certifying construction.

I, Todd R Beavan, to the best of my knowledge and belief hereby certify that the proposed sites observed at seal locations 14, 15, 17, and 18 at the Upper Big Branch Mine are adequate for construction of the Minova Mine Seal (MSHA Approval No. 50M-02.0). No warranty is made as to the accuracy of the approved Minova 50 PSI mine seal and its ability to withstand a 50-psi mine explosion.

Respectfully Submitted,

Todd R Beavan, PE  
Manager - Engineering



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Homer MI  
 Title  
 Superintendent  
 Street Address OR P.O. Box  
 69  
 City State Zip Code  
 Naoma WV 25140 -  
 Country Foreign State Foreign Zip Code  
 USA  
 E-mail Address

**All Health & Safety 10**

**10. Person with Overall responsibility for a Health and Safety Program at ALL of the Operator's Mines, if the Operator is Not Directly Involved in the Daily Operation of the Mine:**

Last Name  
 Cornett  
 First Name MI  
 Berman  
 Title  
 Safety Director  
 Street Address OR P.O. Box  
 69  
 City State Zip Code  
 Naoma WV 25140 -  
 Country Foreign State Foreign Zip Code  
 USA

E-mail Address  
 berman.cornett@masseyenergyco.com

**Address of Record 11**

**11. Address of Records and Telephone Number:**

Last Name  
 Blanchard  
 First Name MI  
 Chris  
 Title  
 President  
 Street Address  
 130 Frontier Street  
 City State Zip Code  
 Montcoal WV 25140 -  
 Country Foreign State Foreign Zip Code  
 USA  
 P.O. Box Address



The information contained herein is protected under the Privacy Act and should be handled accordingly.



**Legal ID Report**

**EDocument Submission**

Notice Type: Update

Effective Date: 03/09/2009

**Mine Information 1-8**

<b>1. Federal Mine Identification Number:</b>	4608436		
<b>2. Mine Name:</b>	Upper Big Branch Mine-South		
<b>3. Directions To Mine:</b>	Rt. 3 South, to Montcoal		
<b>4. Mine Location Address</b>	<b>Street Address</b> 130 Frontier Street		
	<b>City</b> Montcoal	<b>State</b> WV	<b>Zip Code</b> 25140 -
	<b>County</b> Raleigh		
<b>5. Official Business Name of Operator:</b>	Performance Coal Company		
<b>6. Principal Office Address for this Operator</b>	<b>Street Address</b> 130 Frontier Street		
	<b>City</b> Naoma	<b>State</b> WV	<b>Zip Code</b> 25140 -
	<b>Country</b> USA	<b>Foreign State</b>	<b>Foreign Zip Code</b>
<b>7. Telephone number for this mine:</b>	<b>Area Code</b> 304	<b>Telephone Number</b> 854 - 1762	<b>Extension</b>
<b>8. Commodity</b>	<b>Type of Product</b> Coal - Coal (Bituminous)		<b>Type of Operation</b> Underground

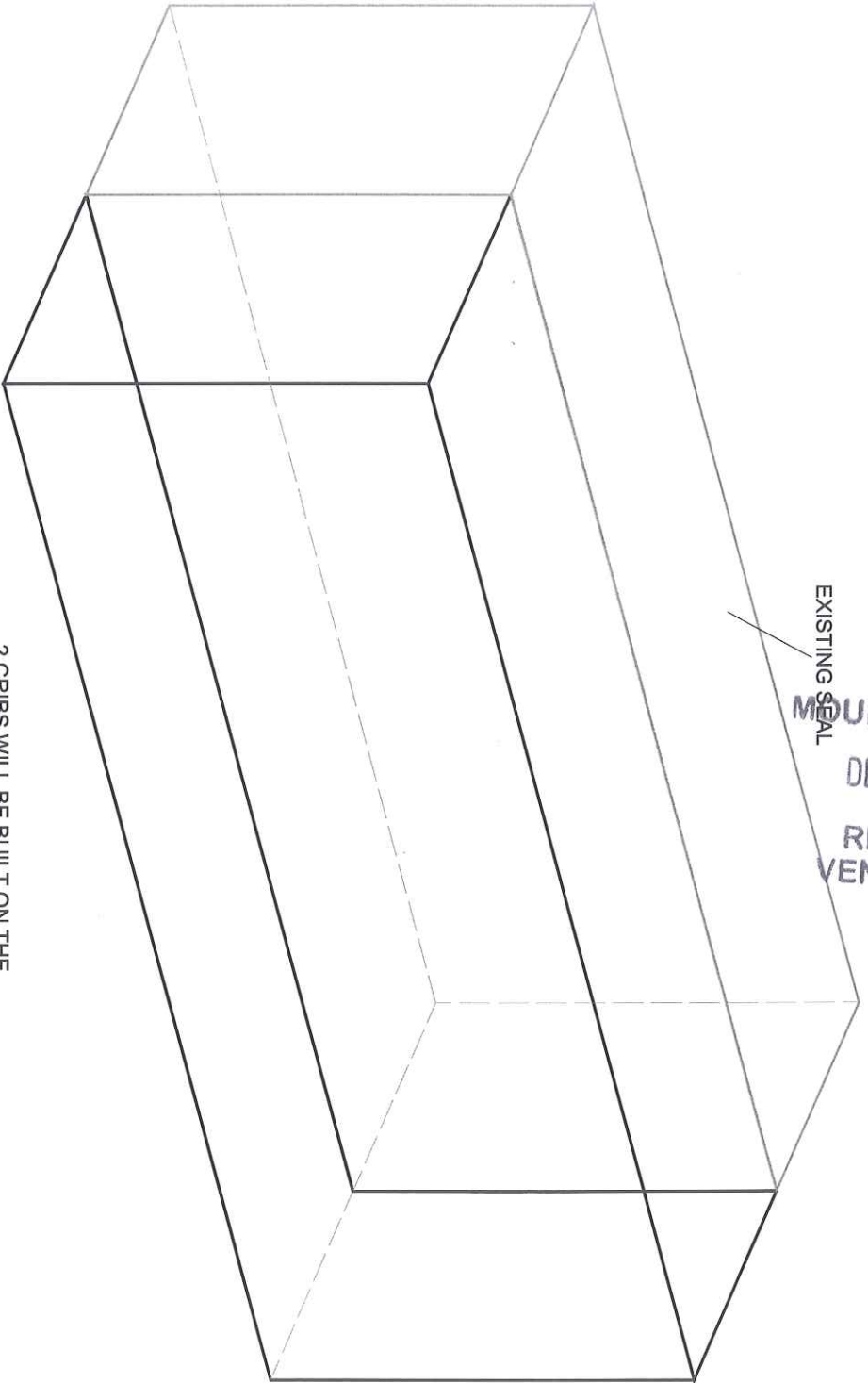
**Health & Safety 9**

**9. Person at Mine in Charge of Health and Safety:**

Last Name  
Wallace  
First Name

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EXISTING SEAL



2 CRIBS WILL BE BUILT ON THE  
OUTBY SIDE OF SEAL  
AS PER 75.335(c)(3)(iv)(g)



PREPARED BY



PERFORMANCE COAL COMPANY  
P.O. BOX 69, NAOMA, WV 25140

UPPER BIG BRANCH MINE

M.S.H.A. ID No. 46-08436

WV ID No. U-3042-92

DATE: 12-11-09

SCALE: NTS

DWG No. 1 of 1

DRAWN BY: RL 3 Staff

CHECKED BY:

TYPICAL SEAL INSTALLATION

**MSHA Approval Number: 50M-02.0**  
**50 psi MINOVA MAIN LINE TEKSEAL®**  
**Minova, USA, Inc.**

**For information, contact David Himes at (800) 626-2948**  
**Or, for customers west of the Mississippi, contact**  
**Joe Burdette at (970) 245-4007**

**SEAL INSTALLATION GUIDELINES FOR THE MINOVA MAIN LINE TEKSEAL**

**A. Site Preparation:**

1. Tekseal is palleted in polyethylene-lined bags, or as a bulk pack. The entire pallet is then covered with an impervious plastic wrap, or raincoat, which completely covers the pallet. This packaging enables outside storage in all conditions. Bagged material must not be stored directly on the ground in areas with standing water.
2. The seal must be located in stable conditions. Pillar stability shall be judged by the Certifying Professional Engineer (CPE) during the seal installation. To minimize air leakage, Minova recommends that the seal shall not be located less than 5 feet from the corner of any pillar. If the seal is to be located less than 10 feet from the corner of the pillar, Minova recommends that the ribs be reinforced with Tekflex® or some other, similar material. (If this occurs on the inby side of the seal, this will be done prior to seal installation.)
3. The ribs, floor, and roof will be scaled to competent strata prior to placement of the seal. All loose material must be removed from the seal location for a distance of 3 feet ± 6 inches on each side of the seal.
4. Rock dust should be removed from the strata within the seal form by compressed air, high pressure water, or mechanical means.
5. The strata at the seal perimeter should be as rough as practically possible, minimizing smooth surfaces. Surface roughness should not be less than 1 inch per 4 feet. This can be established by placing a 4-foot long straight edge against the strata and measuring the surface variation perpendicular to the edge. Surfaces smoother than this requirement must be mechanically roughened, at the designation of the CPE, during the seal installation.
6. Surfaces upon which Tekseal is to be placed do not have to be dry but must be reasonably free from standing or running water. All debris, oil, and unsound material must be removed, at the designation of the CPE, during the seal installation. Flowing water will be diverted or pumped away from the seal sites.
7. Supplemental roof support must be provided by the mine operator, consistent with any approved plans on both the outby and inby sides of the seal.

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8. Good housekeeping practices should be observed, such as removing any debris within 50 feet of the area being sealed.

**B. Form Sequence Guidelines – Wood & Brattice:**

1. Each pair of forms shall be constructed to ensure the minimum thickness of the Tekseal, as indicated in the table titled "Form Thickness Specification Table – Wood and Brattice Forms". The minimum seal thickness is based on the maximum height and width of the entry after loose strata has been removed. When the opening height or width is between values on the appropriate design table, the next larger thickness should be used. The forms can be constructed to any thickness, as long as it meets the minimum required thickness outlined in the "Form Thickness Specification Table - Wood and Brattice Forms".

The minimum thickness of the seal and the formwork is based on the maximum height and width of the entry once the area is prepped for construction, subject to the judgment of the CPE, during the seal installation.

2. For wood and brattice seal walls, vertical site specific posts and/or cribs shall be used. Posts should be 4" x 4" or larger and shall be installed in each wall on typical centers of thirty (30) inches ± 6 inches. Cribs shall be a typical 6" X 6" X 30" or larger and installed with no more than 36 inches from crib to crib. Minova recommends using cribs for wall supports but understands that it may not be practical in all circumstances.
3. Rib-to-rib fly boards (1"x 6" ± 2 inches or equivalent) will be horizontally attached to the inner face of the posts or cribs on centers of 18 inches ± 6 inches.
4. For wood frame and brattice cloth walls, a brattice cloth shall be hung over the interior of the formwork, leaving no more than a 3-inch ± 1 inch overlap on the roof, rib, and floor.

The brattice cloth overlap must be kept to a minimum, in order to maximize contact of the Tekseal with the strata. The brattice cloth and framing shall be maintained in place for the duration of the seal life. In the event the brattice cloth is damaged to the extent that the Tekseal material is visible, it will be the responsibility of the operator to replace the damaged cloth.

5. The front/outby wall shall have one or more temporary hatches that will allow access to the inside of the forms during the construction process.

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6. A water drainage system must be installed during seal construction in the lowest elevation seal(s) of the set. This seal is not designed to impound water, other than to a minimal, unavoidable depth. The actual size and number of pipes must be based on the anticipated maximum flow rate at the seal location. Recommended pipe sizes will range between 4 inches and 8 inches in diameter. The pipes used must be non-metallic and corrosion resistant and have an internal pressure rating of at least 240 psi. If more than one drainage pipe is installed in the seal, the horizontal distance between the pipes must not be less than 2 ½ times their diameter. The distance between the ribs and the drainage pipes shall not be less than 2 ½ times their diameter. Pipes must be installed as low as practical, to minimize the depth of water against the inby side of the seal. A minimum of 4 inches will be maintained between the bottom of the pipe and the floor. The actual height of the pipe in the seal will depend upon the gradient of the floor and allow gravity drainage of water inby the seal.

Pipe sections must be joined in accordance with the pipe manufacturer's installation recommendations. Pipe joints and couplers must have resistance to internal pressure of at least 240 psi.

The drainage system must be equipped to prevent the exchange of air through the pipe(s). A water trap and valve will be installed on the outby side of each drainage pipe. The valve and its connections must have blast resistance equivalent to at least 240 psi. The valve must be installed on the inby side of the water trap. Water traps must be U-shaped, and the vertical depth of the U-portion of the trap must be large enough that a sufficient quantity of water can be maintained in the trap to prevent evaporation prior to the scheduled periodic examination. The U-portion of the water trap may be recessed into the mine floor to minimize the depth of water against the seal and to strengthen its blast resistance.

A low weir catchment, no more than 12 inches high, must be constructed across the total width of the entry.

7. Each newly constructed seal shall have one (1) non-metallic sampling tube, extending into the next connecting crosscut, as described in 30 CFR §75.337(g)(1). The diameter and material for the sampling pipe will be submitted to the MSHA District Manager by the mine operator in the Mine Ventilation Plan, and it will be between ¼ and 1 inch diameter, with a pressure rating of 240 psi. The inby end of the sampling tube will be placed at not more than 12 inches from the roof.

If the new seal is placed on the outby side of an existing seal, non-metallic gas sampling pipes, rated at 240 psi, shall be connected to each sampling pipe in each seal. The new gas sampling pipe will have a new 50 psi shutoff valve installed outby the seal. If there is any space between the new and existing seal, that area will also be provided with a sampling pipe of the same specifications.

At the discretion of the mine, inertization pipe(s) may be installed for injecting an inert gas into the sealed mine area. If inertization pipes are used, the CPE shall specify the size, rating, location and spacing of such pipes in the seal.

8. Three (3) pressurization fill pipes, 1¼-inch diameter PVC, shall be inserted through the brattice cloth and/or fly boards. The first will be located in the center of the seal  $\pm$  2 feet and as close to the roof as possible. The two (2) remaining fill pipes shall be placed 3 feet  $\pm$  1 foot from each rib and as close to the roof as possible.

Bleeder pipes, 1¼ inches to 2 inches in diameter, can be used to confirm complete filling of any roof void greater than 2.5 feet in height. The bleeder pipes will be plugged with rags after the material flow is evident and prior to final pressurization.

Any seal that exceeds 10 feet in thickness, based on the "Form Thickness Specification Table - Wood and Brattice Forms", shall have six (6) pressurization fill pipes in two rows of three. Each row will terminate  $2/3 \pm 1$  foot and  $1/3 \pm 1$  foot of the thickness from the front/outby wall.

9. Approved PUR/foam pack or equivalent can be used around the perimeter of the brattice cloth and pipe annular openings in curtain to minimize leakage during the material pressurization.

**C. Form Sequence Guidelines – Kennedy & CMU Block:**

1. Position form walls to insure the minimum thickness stated in the table, "Thickness Specification-Installation Table - Kennedy or Block Forms". This is achieved rib to rib and floor to roof.

The minimum thickness is based on the maximum height and width of the entry, once the area is prepped for construction.

The forms can be constructed to any thickness, as long as it meets the minimum required thickness outlined in the "Thickness Specification-Installation Table - Kennedy or Block Forms".

2. For Kennedy forms, install horizontal rails no more than 24 inches apart or away from floor or roof.

Install panels on rails, again insuring the seal's interior thickness meets or exceeds the minimum thickness requirement.

Leave desired number of Kennedy panels lowered from the roof to be used as a window for filling the seal.

Form ties can be used as long as they are non-conductive. Standing support on the outside of the seal is a good alternative to form ties, as long as the standing support will resist any form movement.

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3. A water drainage system must be installed during seal construction in the lowest elevation seal(s) of the set. This seal is not designed to impound water, other than to a minimal, unavoidable depth. The actual size and number of pipes must be based on the anticipated maximum flow rate at the seal location. Recommended pipe sizes will range between 4 inches and 8 inches in diameter. The pipes used must be non-metallic and corrosion resistant and have an internal pressure rating of at least 240 psi. If more than one drainage pipe is installed in the seal, the horizontal distance between the pipes must not be less than 2 ½ times their diameter. The distance between the ribs and the drainage pipes shall not be less than 2 ½ times their diameter. Pipes must be installed as low as practical to minimize the depth of water against the inby side of the seal. A minimum of 4 inches will be maintained between the bottom of the pipe and the floor. The actual height of the pipe in the seal will depend upon the gradient of the floor and allow gravity drainage of water inby the seal.

Pipe sections must be joined in accordance with the pipe manufacturer's installation recommendations. Pipe joints and couplers must have resistance to internal pressure of at least 240 psi.

The drainage system must be equipped to prevent the exchange of air through the pipe(s). A water trap and valve will be installed on the outby side of each drainage pipe. The valve and its connections must have blast resistance equivalent to at least 240 psi. The valve must be installed on the inby side of the water trap. Water traps must be U-shaped, and the vertical depth of the U-portion of the trap must be large enough that a sufficient quantity of water can be maintained in the trap to prevent evaporation prior to the scheduled periodic examination. The U-portion of the water trap may be recessed into the mine floor to minimize the depth of water against the seal and to strengthen its blast resistance.

A low weir catchment, no more than 12 inches high, must be constructed across the total width of the entry.

4. Each newly constructed seal shall have one (1) non-metallic sampling tube, extending into the next connecting crosscut, as described in 30 CFR §75.337(g)(1). The diameter and material for the sampling tube will be submitted to the MSHA District Manager by the mine operator in the Mine Ventilation Plan, and it will be between ¼ and 1 inch in diameter, with a pressure rating of 240 psi. The sampling tube will be placed at not more than 12 inches from the roof.

If the new seal is placed on the outby side of an existing seal, non-metallic gas sampling pipes, rated at 240 psi, shall be connected to each sampling pipe in each seal. The new gas sampling pipe will have a new 50 psi shutoff valve installed outby the seal. If there is any space between the new and existing seal, that area will also be provided with a sampling pipe of the same specifications.

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At the discretion of the mine, inertization pipe(s) may be installed for injecting an inert gas into the sealed mine area. If inertization pipes are used, the CPE shall specify the size, rating, location and spacing of such pipes in the seal.

5. Three (3) pressurization fill pipes, 1¼-inch diameter PVC, shall be inserted through the Kennedy panels. The first will be located in the center of the seal  $\pm$  2 feet and as close to the roof as possible. The two (2) remaining fill pipes shall be placed 3 feet  $\pm$  1 foot from each rib and as close to the roof as possible.

Any seal that exceeds 10 feet in thickness, as required by the "Thickness Specification-Installation Table - Kennedy or Block Forms", shall have six (6) pressurization fill pipes positioned in two rows of three. One row will extend 2/3 into the seal  $\pm$  2 feet, and the other row will terminate 1/3 into the seal  $\pm$  2 feet.

Bleeder pipes, 1¼ inches to 2 inches in diameter, can be used to confirm complete filling of any roof void greater than 2.5 feet in height. The bleeder pipes will be plugged with rags after the material flow is evident and prior to final pressurization.

6. For best results, use approved foam pack or equivalent to seal the perimeter and seams.

**D. Tekseal Placement:**

Minova's Tekplacer is the only machine currently approved for placement of Tekseal, and no alternative pumps may be used for the placement of Tekseal without Minova's prior approval. Additionally, Minova reserves its right to introduce new or modified equipment for the purpose of Tekseal placement.

1. Prior to placement of the Tekseal material in between the prepared forms, the Minova Tekplacer will be calibrated in accordance with the following procedure:

During the initial start-up of the seal project and the start of each pumping sequence, the Tekplacer machine will be calibrated to insure that the Tekseal material is proportionally correct. The following is an example of the information that will be documented during the calibration process.

Water Temperature: 69.4 °F  
Hose Length: 600'  
Hose Diameter: 1¼"

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**Calibration**

Time to dump 5 bags (min & sec): 1 min 50 sec = min + (sec/60) = 1.83 min  
(powder pounds = 5 x 45 lbs = 225 lbs)

**Throughput** (powder pounds ÷ time): 123.0 **lbs/min**

**Water to Solids** (lbs/min X 1.25 for Tekseal divided by 8.34 = 18.4 **gpm**

Drum Dimensions (Dia" x H"): 20" x 30" Volume = (Dia. x Dia. x H) ÷ (2,200): 5.46 ft<sup>3</sup>

Time to fill drum (min & sec): 55 sec = min + (sec/60) = .92 min

**Output** (volume ÷ time): 5.93 **ft<sup>3</sup>/min**

Powder pounds per Cubic Yard = (throughput ÷ output) x (27): 560.0 lbs/yd<sup>3</sup>

**Mix Strength** = (lbs/yd<sup>3</sup>) ÷ (45): 12.4 **bags/yd<sup>3</sup>**

2. The existing mine water supply of at least 25 gpm at 50 psi is sufficient for the preparation of the Tekseal material. Should there be concerns about the quality of the mixing water, Minova will evaluate it to ensure compatibility with Tekseal and make chemical adjustments to the water if necessary.

Should the mixing water show excessive foaming when tested with Tekseal, then the amount of liquid defoamer required to reduce foaming to a normal level will have to be determined. Once this dosage level has been determined, the standard Tekseal QC test procedure will be carried-out using the mixing water dosed with an appropriate level of defoamer.

In the field, the liquid defoamer will be dosed at the predetermined controlled rate into the mixing water prior to its contact with the Tekseal.

3. The hose will be moved and positioned, as necessary, during placement, to provide uniform and complete filling of the form. Care must be taken to direct the flow of Tekseal along the back of the form wall and into the corners of the formed area to assure complete filling against the formwork and at the roof and rib contacts.

Tekseal's unique design allows for cold joints due to pumping interruptions. In the event pumping is interrupted for more than eight (8) hours, the roughness of the cold joint will be documented. If the surface roughness is less than 2 inches over 4 feet, measures will be taken to mechanically roughen the surface of the cold joint.

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4. A minimum of nine (9) samples from each seal will be taken, as follows: The first three (3) samples from the bottom will be taken once the entire floor is covered; the next three (3) samples will be taken from the middle once the Tekseal material reaches half the height of the seal; and, the last three (3) samples will be taken from the upper third of the seal height. Sampling for the test specimens must be done in a completely random and unbiased manner.

Each of the samples in the testing stages outlined above will be taken directly from a tap on the seal manifold or the end of the material discharge hose and placed into a Minova-supplied testing cup. Each sample will be filled to the top of the supplied cup, making sure that large air pockets are not entrapped during the sampling process. Any excess material will be screed off with a straight edge, the lid will be secured in place, and the sample stored in an upright position. The samples are to remain in the mine to cure under approximately the same conditions as the seal for 28 days.

If the minimum 400 psi is required in less than 28 days, an additional nine (9) samples can be taken and tested at the desired time period.

All samples will be crushed to determine the unconfined compressive strength. The average compressive strength must be greater than 400 psi with not more than two (2) samples testing below 400 psi, and no samples testing below 300 psi.

5. Whenever possible, the Tekseal discharged from the hose should be observed. Any changes from the normal appearance and consistency are sufficient reason to cease pumping and investigate the cause of the change

**E. Time Required for Seal to Reach Design Strength:**

The standard Tekseal mixture (typically 517 lbs/yd<sup>3</sup>) will reach its intended strength (400 psi) after 28 days. Adding more pounds of Tekseal per cubic yard will achieve the minimum design 400 psi strength in a shorter time period. This is controlled by standard calibration procedures, as previously described. If an evaluation of the design strength is required at an earlier curing time, additional samples, per the sampling protocol, are necessary.

**F. Surface Drying Effects:**

The surface drying effects are only an issue if the brattice or form material is damaged and the Tekseal surface is exposed to the atmosphere. Drying effects are not rapid, and the weekly inspection cycles provide more than adequate time intervals to re-establish surface protection. Examiners will be instructed to verify the brattice is intact. If the brattice or form is damaged, or the Tekseal is otherwise exposed to the atmosphere, the brattice will be repaired or other measures will be taken to cover the exposed Tekseal.

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**G. Seal Voids:**

If there is any loss of contact with the roof, rib, or wall, a direct Minova Field Repair certified technician will propose a repair procedure, which will be subject to MSHA's approval before its implementation. The procedure will specify that the voids shall be filled with a non-shrinking material, with a minimum cured strength of 400 psi. It will also state that, before injection, any dried Tekseal material must be removed from the vicinity of the void. The grout shall be pumped into the voids using open-ended injection pipes until it is apparent the void is filled, as witnessed by grout flowing back past the injection pipe. The seal shall then be checked for air leakage to ensure the void has been completely filled. This procedure is applicable to any size or position of a seal void.

If the leaks are determined to be only on the outby face of the seal, and there is no loss of contact with the surrounding rock or coal, the leak(s) may be filled with a low-density polyurethane foam, such as Silent Seal<sup>®</sup> or equivalent. The manufacturer's instructions shall be adhered to. Again, the seal must be checked for air leakage afterwards to ensure the job has been successful.

**H. Strata Fracture**

If the strata surrounding the seal are badly fractured, or other factors indicate the shear strength of such strata or coal is less than the shear strength of Tekseal, then reinforcement of the strata will be evaluated. The strata can be ring-grouted with a minimum 400 psi grout such as Minova's Tekgrout injection grout, an equivalent cement-based grout, or 20-70 lbs. per-cubic-foot density polyurethane grout. In addition, the strata can be reinforced with additional bolting or the seal should be hitched into the strata. Check the seal afterwards to ensure the grouting has been successful by the use of typical air leakage detection tools such as smoke tubes or other approved detection devices.

Sometimes it may be better to undertake seal voids and strata fractures as one repair project. The grout used to make seal repairs will migrate into the surrounding strata, sealing and strengthening it.

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**I. Maximum Allowable Convergence:**

The Tekseal system was specifically designed for deep, high-convergence mines, and it has repeatedly demonstrated its ability to accept significant levels of entry closure. An independent laboratory confirmed, during the triaxial compression tests, that Tekseal exhibits increasing compressive and shear strengths as the confinement pressure is increased. Further, under confinement of less than hydrostatic pressure, Tekseal deforms through the development of micro-fractures and not along planes of weakness associated with the internal angle of friction. These ductile properties (deformation under load) indicate the seal could accept as much as 20% convergence (18% under laboratory tests) and possibly maintain shear, tensile, and compressive strengths above its unconfined values. Values of maximum acceptable convergence (roof to floor closure as measured vertically at the midpoint of the entry at the outby face of the seal) are shown in the attached tables for the various entry heights contained therein. The actual convergence may be measured at the outby entry using extensometers, "pogo" sticks or any other approved measuring device.

**J. Storage Conditions for Construction Materials:**

Tekseal is palletted in polyethylene-lined bags and then the entire pallet is covered with an impervious plastic wrap, or raincoat, which completely covers the pallet or as a bulk pack. This packaging enables outside storage in all conditions. Hardened material will be discarded. Bagged material must not be stored directly on the ground in areas with standing water. Tekseal has a shelf life of three months. A "use by" date of each batch is clearly indicated on each corresponding pallet. **Beyond this period, and depending on storage conditions, it may become a little slower to gel. Standard Tekseal QC test procedure will be carried-out on expired material to determine if it still passes all the tests, with the exception of the long-term strength test. Minova may grant shelf life extensions of 30 days beyond the "use by" date, depending on the results of those tests.**

**K. Contact Information**

For detailed information on the use and application of this seal, contact Mr. David Himes, Project Manager, Minova USA, Inc., 150 Carley Court, Georgetown, Kentucky, 40324, phone number 800-626-2948. For more detailed information for customers west of the Mississippi, contact Mr. Joe Burdette, Vice President - Sales Western Division, 2306 Highway 6 & 50, Grand Junction, CO, 81505, phone number 970-245-4007.

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Minova USA, Inc.  
 Thickness Specification - Installation Table - Kennedy or Block Seal  
 50-psi Blast Loading Seal  
 (Based on the seal design described in the Seal Approval Information Template)

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Entry Height ft	Maximum Acceptable Convergence in	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
4	9.60	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
4.5	10.80	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.1	4.1
5	12.00	4.0	4.0	4.0	4.0	4.1	4.1	4.2	4.2	4.2	4.3	4.3	4.3	4.4	4.4	4.4	4.4	4.5
5.5	13.20	4.1	4.2	4.3	4.3	4.4	4.4	4.5	4.5	4.6	4.6	4.7	4.7	4.7	4.8	4.8	4.8	4.8
6	14.40	4.4	4.5	4.5	4.6	4.7	4.8	4.8	4.9	4.9	5.0	5.0	5.1	5.1	5.1	5.2	5.2	5.2
6.5	15.60	4.6	4.7	4.8	4.9	5.0	5.0	5.1	5.2	5.2	5.3	5.3	5.4	5.4	5.5	5.5	5.5	5.6
7	16.80	4.9	5.0	5.1	5.2	5.3	5.3	5.4	5.5	5.5	5.6	5.7	5.7	5.8	5.8	5.8	5.9	5.9
7.5	18.00	5.1	5.2	5.3	5.4	5.5	5.5	5.6	5.8	5.8	5.9	6.0	6.0	6.1	6.1	6.2	6.2	6.3
8	19.20	5.3	5.4	5.6	5.7	5.8	5.9	6.0	6.0	6.1	6.2	6.3	6.3	6.4	6.4	6.5	6.5	6.6
9	21.60	5.7	5.9	6.0	6.1	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.0	7.1	7.2	7.2	7.2
10	24.00	6.1	6.3	6.4	6.6	6.7	6.8	6.9	7.1	7.2	7.3	7.4	7.4	7.5	7.6	7.7	7.7	7.8
11	26.40	6.4	6.6	6.8	7.0	7.1	7.3	7.4	7.5	7.6	7.8	7.9	8.0	8.1	8.1	8.2	8.3	8.4
12	28.80	6.7	6.9	7.1	7.3	7.5	7.7	7.8	8.0	8.1	8.2	8.3	8.4	8.6	8.7	8.8	8.8	8.9
13	31.20	7.0	7.3	7.5	7.7	7.9	8.0	8.2	8.4	8.5	8.7	8.8	8.9	9.0	9.1	9.2	9.4	9.4
14	33.60	7.3	7.5	7.8	8.0	8.2	8.4	8.6	8.8	8.9	9.1	9.2	9.3	9.5	9.6	9.7	9.8	9.9
15	36.00	7.8	8.1	8.3	8.5	8.7	8.8	8.9	9.1	9.3	9.5	9.6	9.8	9.9	10.0	10.2	10.3	10.4
16	38.40	8.3	8.6	8.8	9.0	9.2	9.3	9.3	9.5	9.6	9.8	10.0	10.2	10.3	10.5	10.6	10.7	10.9
17	40.80	8.8	9.1	9.3	9.5	9.6	9.6	9.6	9.8	10.0	10.2	10.4	10.5	10.7	10.9	11.0	11.2	11.3
18	43.20	9.1	9.4	9.6	9.8	9.9	9.9	9.9	10.1	10.3	10.5	10.7	10.9	11.1	11.3	11.4	11.6	11.7
19	45.60	9.5	9.8	10.0	10.2	10.3	10.4	10.4	10.6	10.8	11.0	11.2	11.4	11.6	11.8	12.0	12.1	12.1
20	48.00	9.9	10.2	10.4	10.6	10.7	10.8	10.8	11.1	11.3	11.5	11.7	11.9	12.1	12.3	12.5	12.5	12.5
21	50.40	10.4	10.7	10.9	11.1	11.2	11.3	11.3	11.6	11.8	12.0	12.2	12.4	12.6	12.8	12.9	12.9	12.9
22	52.80	10.8	11.1	11.3	11.5	11.6	11.7	11.7	12.0	12.2	12.4	12.6	12.8	13.0	13.2	13.4	13.4	13.4
23	55.20	11.3	11.6	11.8	12.0	12.1	12.2	12.2	12.5	12.7	12.9	13.1	13.3	13.5	13.7	13.9	13.9	13.9
24	57.60	11.8	12.1	12.3	12.5	12.6	12.7	12.7	13.0	13.2	13.4	13.6	13.8	14.0	14.2	14.4	14.4	14.4
25	60.00	12.3	12.6	12.8	13.0	13.1	13.2	13.2	13.5	13.7	13.9	14.1	14.3	14.5	14.7	14.8	14.8	14.8
26	62.40	12.8	13.1	13.3	13.5	13.6	13.7	13.7	14.0	14.2	14.4	14.6	14.8	15.0	15.1	15.1	15.1	15.1
27	64.80	13.3	13.6	13.8	14.0	14.1	14.2	14.2	14.5	14.7	14.9	15.1	15.3	15.5	15.6	15.6	15.6	15.6
28	67.20	13.8	14.1	14.3	14.5	14.6	14.6	14.6	14.9	15.1	15.3	15.5	15.7	15.8	15.8	15.8	15.8	15.8
29	69.60	14.3	14.6	14.8	15.0	15.1	15.1	15.1	15.4	15.6	15.8	16.0	16.2	16.3	16.3	16.3	16.3	16.3
30	72.00	14.8	15.1	15.3	15.5	15.6	15.6	15.6	15.9	16.1	16.3	16.5	16.7	16.8	16.8	16.8	16.8	16.8

Note: Direct shear strength of grout on rock from lab test results as provided by Minova USA

