

**MSHA Approval Number: 120M-01.3
120-psi STRATACRETE Plug Seal
Installation Manual**

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120 PSI STRATACRETE Plug Seal
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Seal Installation Guidelines for the Strata Plug Seal

1. Mine personnel choose the area where seals will be installed. Seal shall be located at least five (5) feet from the corner of any pillar. If seal is to be located less than 10 feet from the corner of the pillar, the rib will be reinforced by Shotcrete or Gunnite. If this occurs on the inby side of the seal, this will be done prior to seal installation. Corner-to-seal distances less than 10 feet and rib reinforcement methods must be approved by the governing MSHA District.
2. The chosen areas are measured to ensure the seal dimensions will not exceed dimensions in the approved plan.
3. Professional Engineer inspects and measures the area to ensure the seal chosen is appropriate for the area. Areas with roof, floor, and or rib fissures are not appropriate for installation of this seal without ring grouting of the area where the seal will be built. This generally is completed after the seal is installed.
4. The certified person designated by the mine should verify the seal is of the correct dimensions. The seal dimensions are based on the maximum height and width dimensions of the prepared (i.e. scaled and cleaned) seal footprint area. Please see attached table for dimensions.
5. Ensure the area is free from debris, loose material, excessive rock dust, and that the formwork specified is capable of supporting the loads applied. Forms can be of plywood and wood board construction, concrete blocks, or steel panels, to name a few of the types of forms that can be used. The form used will be stated in the approval package submitted by the mine. All forms, regardless of construction, will be adequately supported to withstand the horizontal loads which will be placed upon it. Forms will be trimmed or shaped to conform to the opening. Foam will be used to seal all openings around the perimeter of the seal.
6. The seal area is cleaned, removing loose materials from the roof, ribs, and floor. Examples of material removed are loose coal and roof, soft or broken floor or fireclay, thick rock or coal dust, and oily residue. Water sensitive material, such as fireclay that is highly sensitive to water, must be removed from the proposed seal location. Rib, roof, and floor must be deemed competent by the P.E. The immediate rib, roof, and floor must be inspected by a P.E. The certifying P.E. will

certify that the strata is competent or specify remedial treatment measures to remove weak materials. Minimum shear strength of strata is 115 psi.

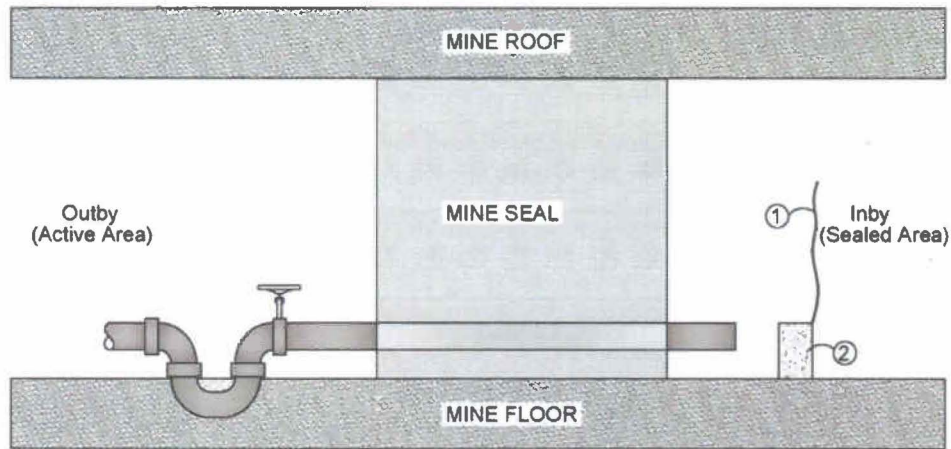
7. Any loose material must be removed a minimum of three (3) feet on each side of seal down to competent strata. If a weir is present in by the seal, loose material will be removed between the weir and the seal down to competent strata.
8. The strata at the seal perimeter should be as rough as practically possible and smooth surfaces shall be minimized. Ensure the rib lines and the roof and floor are roughly parallel. Surfaces with roughness less than 1 inch per 4 linear feet must be mechanically roughened to increase the shear resistance at the seal interface. Alternatively, undulations may be cut into the strata to increase the shear resistance along the plane.
9. Metal objects, such as mesh, straps, rails, etc., that extend through the seal, from one side of the roof, rib, or floor to the other shall be removed. Mesh, which does not extend through the complete seal thickness, can be left in place but the MEDIUM STRENGTH STRATACRETE shall be worked around the mesh so voids are eliminated.
10. A continuous supply of water with pressure adequate to flush grout lines will be available during all times that seals are being poured.
11. Any standing water shall be removed from the seal sites, however damp or wet locations are acceptable. Flowing water will be diverted or pumped from the seal sites for the first 24 hours or curing.
12. Measure the seal area once more after it is scaled down to competent strata to ensure the maximum dimensions of the entry do not exceed what is allowed in the seal design. See attached table for dimensions. Prior to the construction of the seal, the certified person designated by the mine operator to directly supervise construction of the seal should: verify the core of the seal is of the specified width; check that the cavity to be filled with MEDIUM STRENGTH STRATACRETE is free of loose material, dirt, debris, and rock dust; ensure the formwork is capable of supporting the loads applied; and ensure the cementitious materials, water, aggregates, admixtures, and pozzolans used in the concrete production are in accordance with the material requirements and mix design.
13. Deliver materials to the seal area. The certified person designated by the mine shall ensure the materials are as stated in the approval documents. This will include, but not be restricted to the material for the forms, sampling pipes, drainage pipes, valves, roof support supplies, rockdust, tools, etc
14. Admixtures which have been in storage at the project site for longer than 6 months or which have been subject to freezing shall not be used unless they are

retested and proven to meet the specified requirements. MEDIUM STRENGTH STRATACRETE may be delivered via mixing truck from a local concrete plant and delivered underground through a borehole(s) near the construction site. If mixed at a concrete plant, Strata representatives will ensure accurate and repeatable MEDIUM STRENGTH STRATACRETE batches are consistently produced. MEDIUM STRENGTH STRATACRETE will be mixed with the ratio of water, Portland, fly ash and sand as shown in table 1, appendix B of the application. Portland and fly ash weights can be increased from the amount shown. Water can be adjusted according to the moisture of the sand. MasterRoc® FLC 100 (formerly MEYCO Flowcable) will be used to reduce the mixing water requirements and produce a flowable, pumpable STRATACRETE material. Concrete blocks, if used, for formwork will be delivered in pallet form.

15. Roof support according to all approved plans will be installed. All inby roof support must be completed before access is blocked.
16. All debris 50 feet inby and outby the seal location will be removed.
17. Build forms according to the plan approved by the local MSHA office. Attached is a drawing of a typical wood form using props for support. Cribbing or other suitable material may also be used for support. The typical sequence of building wood forms is as follows:
 - a. Set supports, (roc props, cribs etc.) Supports shall be equally spaced from rib to rib, the first support being no more than three (3) feet from the rib line. Supports shall be bolted to the roof and floor and or non conductive form ties can be used to keep the forms from moving during pouring.
 - b. Install framing lumber supports to the roc props or cribs, at roof line, floor line and equally spaced between floor and roof. If multiple lengths of framing lumber are used, lumber will be overlapped and fastened together.
 - c. Fasten plywood (3/4") to the framing lumber to create formwork for the seal from roof to floor and rib to rib.
 - d. Cut appropriate size holes in the formwork for the gas sampling pipe, water drainage pipe(s), breather pipes, and fill pipes as described below.
18. Formwork shall be designed to withstand the forces resulting from the placement of wet STRATACRETE with minimal deflection. Forms shall be mortar tight, properly aligned and adequately supported. Form ties, if necessary, shall be of a non-metallic design, will not permit form deflection and will not spall concrete upon removal. Supports shall be bolted to the roof and floor and or non-conductive form ties can be used to keep the forms from moving during pouring. Forms can be of concrete block, plywood, or wood board construction, to name a few types of construction. Forms will be constructed plumb within 1/4" per foot. Seals constructed in highly pitching seams may be constructed perpendicular to the roof and floor. If a form "kicks" during construction, remedial measures will

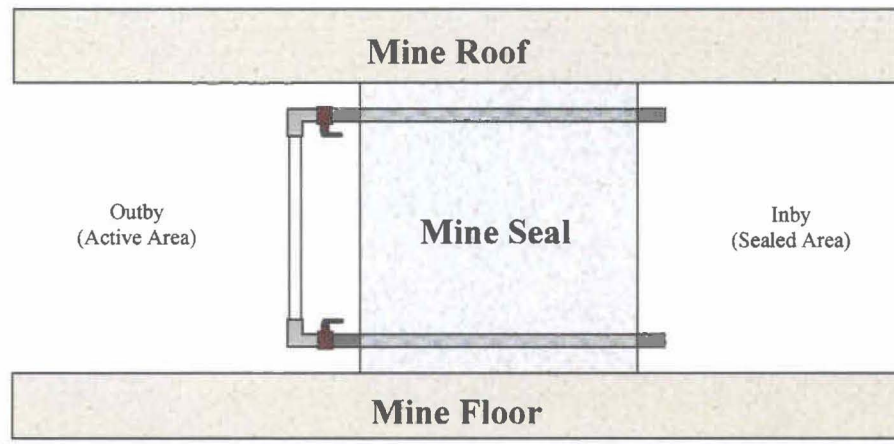
immediately be taken to contain the pour. If it is determined the seal integrity will not be compromised, the seal will be completed after corrections are made. Specific form requirements shall be determined by a registered professional engineer and submitted in the Ventilation Plan of the operator.

19. Install one gas sampling pipe that extends into the center of the first crosscut inby the seal. If an open crosscut does not exist, the sampling pipe shall extend one half the distance of the open entry inby the seal. The sampling pipe shall be approximately 12 inches from the roof, and at least six inches from the roof and ribs, when extending through the seal. The gas sampling tube shall be nominal 1/2-inch inside diameter, schedule 80 non-conductive, non-corrosive pipe with an internal burst pressure of 240 psi. The gas sampling pipes will be supported by hangers or by cribbing.
20. 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 240 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.
21. Install drainage pipe(s) as required and determined by the anticipated maximum flow rate at the seal location. The pipes used shall be non-conductive, corrosion resistant, and have an internal burst pressure of 240 psi. Drainage pipes shall be positioned at least three (3) feet from the nearest rib. If more than one drain pipe is installed in a seal, they shall be approximately three (3) feet from the nearest pipe. Pipes shall be installed so the depth of water against the seal is less than 12 inches. The water drainage system pipes should be a minimum of 4 inches above the floor along the entire length through the seal. The u trap may be recessed into the floor to accomplish this. A maximum of five (5) drainage pipes will be allowed in a seal. Drainage pipe can be between 4 inch and 8 inch nominal inside diameter. If the seal is installed outby an existing seal, drainage pipes as specified above will be added in the appropriate length and connected to the existing water drainage pipe. The water drainage pipe(s) will be placed in the lowest elevation seal(s) in the set. A valve and water trap with an internal burst pressure of 240 psi shall be installed on the outby side of the seal. A low weir(s) or catchment, no more than 12" high, may be constructed across the entry inby all seals with drainage pipes to trap sediment and debris that may clog the drainage pipe(s). A trash rack made of a porous material such as chain-link fencing or Tensar type material attached to the ribs and the floor will give extra protection to keep sediment out of the water drainage pipe.



- ① Trash rack - This rack is made of porous material such as chain-link fencing or Tensar type material. Rack will be affixed to the ribs and floor or weir. The top can be unattached.
- ② Low weir - This is less than 12 inches in height and goes from rib to rib.

21. Any individual seal with a water drainage system may also incorporate a water height measuring system. If used, this measuring system must be initially built into the seal in a manner that could establish the height of water on the inby side of the seal. A water height measuring system, incorporating a sight tube as shown below, shall consist of two horizontal 1 inch inside diameter non-metallic pipes installed through the seal. One pipe shall be securely installed through the seal at the approximate height of the top of the water trap and the other pipe shall be securely installed through the seal as close to the roof as possible. On the outby side of each pipe, a shut-off valve shall be installed. Each shut-off valve and pipe extending through the seal must have an internal pressure rating of 240 psi. Two 90 degree elbows shall be installed on the outby end of each pipe after the valves are in place. A clear plastic tube shall be securely placed between these elbows for viewing of the water elevation. The elbows and the clear plastic tubing must only have strength that would allow them to perform the functions for which they were installed.



22. Install a minimum of two (2) breather pipes in the highest location in each seal. The diameter will be sufficient to allow the air to vent, and then the pipe will be filled with the MEDIUM STRENGTH STRATACRETE. The vent pipes shall be configured so the end of the pipe in the seal is positioned close to the roof. The diameter of the pipe shall be adequate to let the air vent and then the pipe to fill with MEDIUM STRENGTH STRATACRETE. The gap between the roof and the end of the pipe shall be adequate to allow the pipe to fill with MEDIUM STRENGTH STRATACRETE, but as close to the roof as practical to assure the air is completely evacuated. Valves shall be provided on the filling ports to allow the flow of MEDIUM STRENGTH STRATACRETE to be stopped without the loss of MEDIUM STRENGTH STRATACRETE through the filling port. The filling ports must be completely filled with MEDIUM STRENGTH STRATACRETE when the placement is completed. Caps or valves shall also be provided on the vent pipes so the vent pipe can be shutoff once the vent pipes are returning concrete. The vent pipes must be filled in the final seal configuration. If the slump of the MEDIUM STRENGTH STRATACRETE is not adequate to flow through the vent pipes, the pipes shall be withdrawn or backfilled with an expansive grout. Where the roof is uneven such that it creates recessed pockets, a vent pipe shall be installed to allow air to evacuate and allow the MEDIUM STRENGTH STRATACRETE to contact the roof. Vent pipes shall also be placed wherever the roof line peaks or crowns.
23. Install fill pipe into the formwork for filling concrete into formwork. Installation of the fill pipe is the final step prior to lining the inside of the formwork with the line curtain. This pipe should be in the top one-third of the form and either near the middle of the seal or if a high void is present in the roof, in that area. Some installations may require more than one fill pipe. The fill pipe shall be equipped with a valve to allow the MEDIUM STRENGTH STRATACRETE to be stopped without the loss of material. The fill pipe must be filled or removed when the placement is complete.

24. Line the inside of the formwork with line curtain, overlapping the roof, floor, and ribs making the formwork as fluid tight as possible. The maximum lap onto the strata is 4 inches.
25. Begin pumping of the MEDIUM STRENGTH STRATACRETE material. A variety of concrete pumps can be used for the seal installation. MEDIUM STRENGTH STRATACRETE can be pumped a maximum of 3,500 feet horizontally with existing style of pump. The MEDIUM STRENGTH STRATACRETE material is a very high slump material and does not require vibration. The material from each batch will be tested using ASTM C1611 Standard Test Method for Slump Flow of Self-Consolidating Concrete. The slump cone is turned upside down on a level board and filled with MEDIUM STRENGTH STRATACRETE, and then the slump cone is raised off of the board. A measurement is made of the spread across the board. The spread will be between 18 inches and 32 inches. This test will be performed when the mixed material arrives at the mine site. A batch is an uninterrupted pour unless changes are made in aggregate, cement or water settings. The cylinder is emptied onto a flat surface if material does not meet the spread test, a plasticizer or water may be added to the truck according to the plasticizer manufacturer's recommendation. If the spread is greater than 32 inches, the material will be tested again. If subsequent tests are still greater than 32 inches, the truck shall be rejected. Admixtures will meet ASTM C494, 494M Standard Specification for Chemical Admixtures for Concrete. Water will conform to ASTM C1602 / C1602M-06 –Standard Specifications for Mixing Water Used in Hydraulic Cement Concrete. If mine water is used for seal construction, it will be sampled to determine if it meets ASTM standard specifications.
26. Pumping can be done from the surface, using bulk concrete trucks or pumped from underground using pre-packaged material.
27. The STRATACRETE may be poured in multiple lifts or in a continuous pour. When the seal is placed in multiple lifts, the time between lifts must be adequate to allow the MEDIUM STRENGTH STRATACRETE to attain adequate strength to support the next lift. The time will be a minimum of four (4) hours. In the event a cold joint surfaces with roughness less than 1 inch per 4 linear feet must be mechanically roughened to increase the shear resistance at the seal interface. This will be done through doors or windows in the formwork.
28. Take samples as specified in the approved plan. The samples will be collected in three (3) inch diameter by six (6) inch tall cylinders. A minimum of three sets of samples containing seven (7) cylinders each will be taken from each seal site and field cured for seven days at the seal site. Sample sets will be taken at 1/3 completion, 2/3 completion, and final completion of the seal. Three (3) field cured samples from each set will be tested at approximately seven (7) days. The remaining samples are to be held in reserve in the event the first three (3)

samples do not achieve design strength. The design strength is 3,000 psi in a uniaxial compression test. The minimum compressive strength of any one sample shall be 3,600 psi with the average of 4,200 psi for all samples. Samples will be prepared in accordance with ASTM C31, C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field and ASTM C470-02A Standard Specification for Molds for Forming Concrete Test Cylinders Vertically. Samples will be tested within seven (7) days of leaving the seal site. The certified person designated by the mine operator to directly supervise construction of the seal will certify the samples are taken and cured as per design and delivered in a timely manner to the lab. No enhanced curing methods will be used. Seals are not considered to reach design strength until acceptable sample results have been received and reviewed by the MSHA District.

29. Once material is "roofed" and concrete is exiting the vent pipes, cap pipes or close valves to prevent excessive material from leaking out the pipes.
30. After pumping is completed, check the sealed area for any air leakage. If there is loss of contact between the seal and the roof, or ribs, the voids shall be filled with grout, with shear strength equivalent to the shear strength of the MEDIUM STRENGTH STRATACRETE, according to the approved plan.
31. If the temperature during seal construction is below 32 degrees, measures shall be taken, such as use of a protective enclosure, to ensure the air temperature at the seal is kept above 40 degrees for at least 72 hours. Normally a seal form made of 3/4" plywood or concrete blocks will achieve this protection.
32. The formwork shall stay in place for a minimum of seven (7) days to allow for proper curing. Formwork can stay on the seals indefinitely. If the formwork is removed, repair any spalling caused by form removal with a non-shrinking cementitious or epoxy grout with shear strength equivalent to the MEDIUM STRENGTH STRATACRETE. Curing shall be in accordance with ASTM C171 Standard Specification for Sheet Materials for Curing Concrete or C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete. Membrane-forming curing compounds shall not be used on the top surface of lifts since this may interfere with the concrete bond between lifts.
33. During the construction of the seal, the person certifying construction of the seal should: ensure the concrete is thoroughly consolidated, completely fills the void between the forms, and is tight against the ribs and roof; and verify all construction joints are cleaned and adequately prepared if the concrete is placed in multiple lifts.
34. Following the construction of the seal, the certified person designated by the mine operator to directly supervise construction of the seal should: ensure the

MEDIUM STRENGTH STRATACRETE is properly cured using formwork, sheeting, and or a sprayable curing compound.

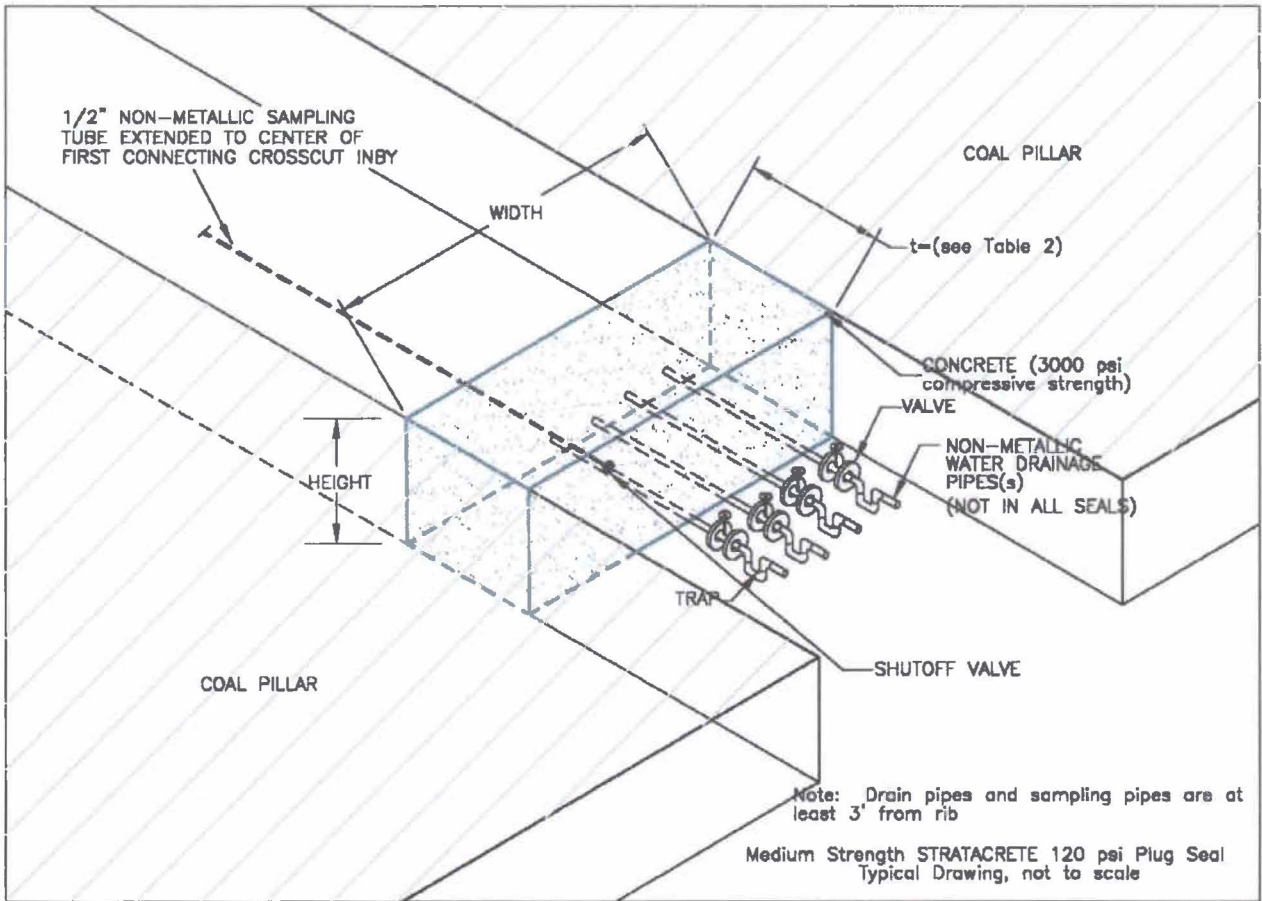
35. If shrinkage is encountered that causes the seal to not contact the roof or ribs, grout will be injected in the voids. Acceptable grouts for shrinkage are BASF Meyco 364 Flex Urea Silicate Grout or DeNeef Organosol NP. Grouting due to shrinkage will be used only up to the time when the testing results are accepted by the MSHA District.
36. The maximum allowable convergence this seal design can withstand before structural integrity of the seal is compromised is up to 0.26 inches, dependent on the height of the seal. This is the physical convergence of the seal, and not the surrounding strata. The strata surrounding the seal may show more convergence than what is actually happening to the seal. The seal remains elastic if the maximum allowable convergence is not exceeded and continues to fulfill its designed purpose. "Pogo" sticks will be installed within one (1) foot of the face of the seal for measurements to be taken. An alternate and more accurate way to determine convergence of the seal is to use pins installed in the face of the seal and record the distance between pins. Measurements will be recorded to determine if the seal converges. A Professional Engineer must evaluate the seal for structural degradation when total convergence reaches the allowed maximum. Refer to the average convergence in the attached table to determine the allowable convergence.

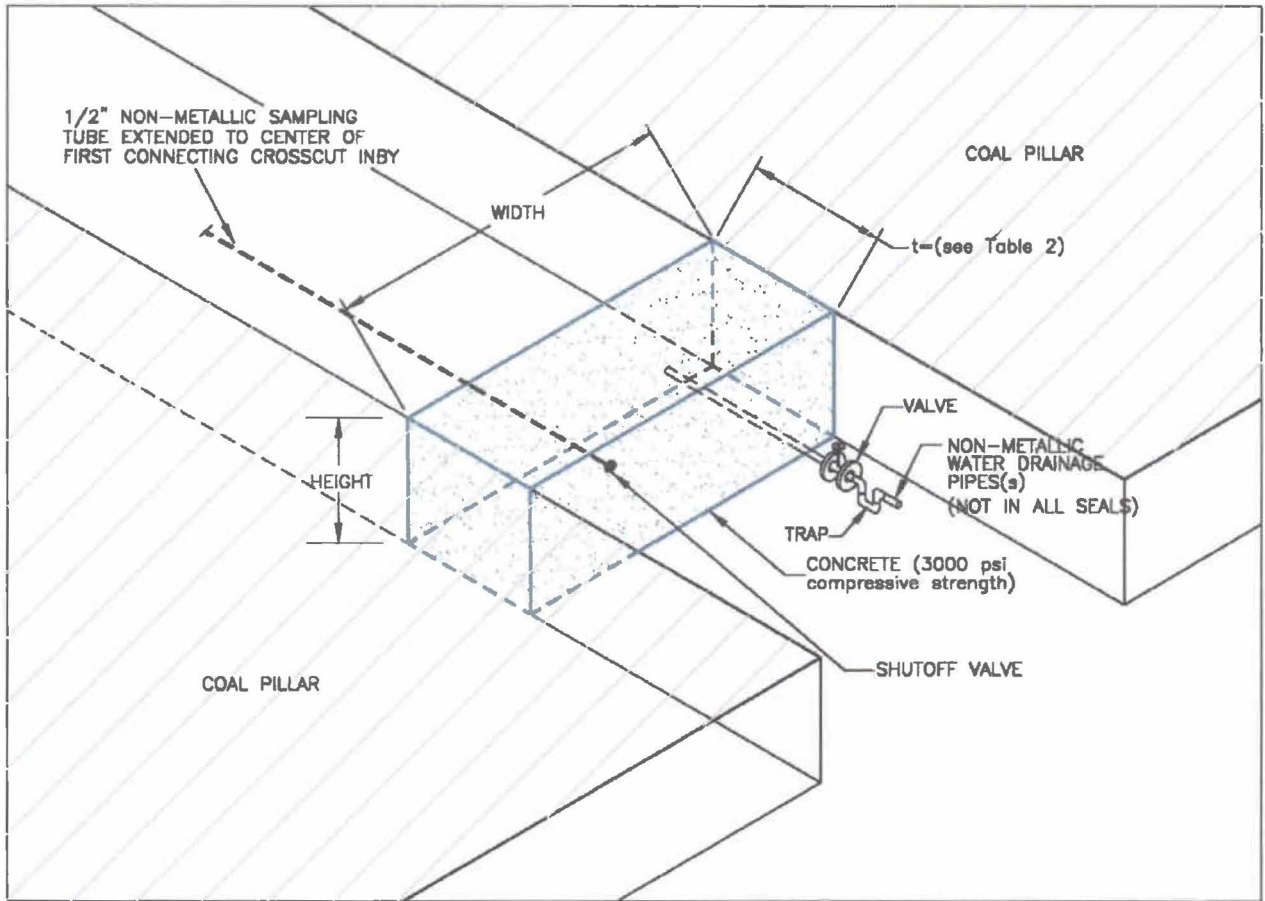
Convergence With Safety Factor for Varying Seal Heights			
<i>Seal Height (feet)</i>	<i>Safety Factor =</i>		<i>1.50</i>
	<i>Convergence (inches)</i>		
	<i>+ One Std. Dev.</i>	<i>Average</i>	<i>- One Std. Dev.</i>
3	0.03	0.05	0.17
4	0.04	0.06	0.23
5	0.05	0.08	0.29
6	0.06	0.10	0.35
7	0.07	0.11	0.40
8	0.08	0.13	0.46
9	0.09	0.15	0.52
10	0.09	0.16	0.58
11	0.10	0.18	0.64
12	0.11	0.19	0.69
13	0.12	0.21	0.75
14	0.13	0.23	0.81
15	0.14	0.24	0.87
16	0.15	0.26	0.93

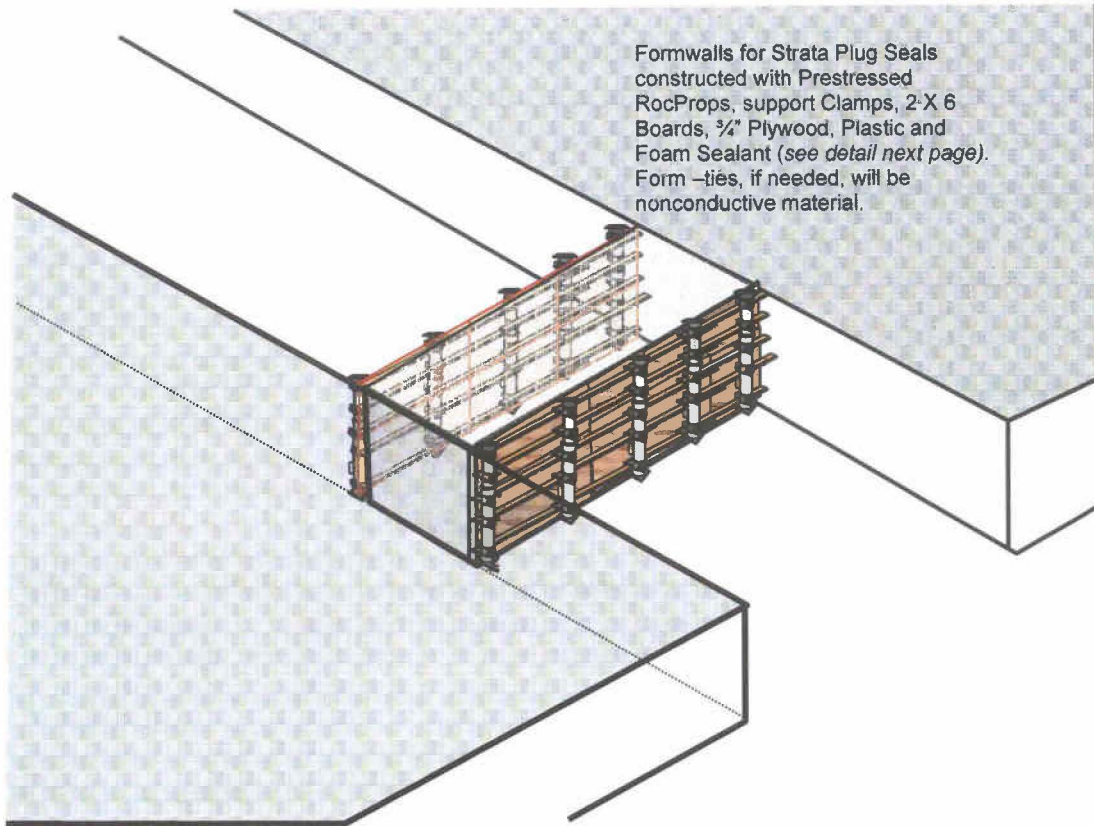
37. Seals will be examined for convergence every six months. If visible convergence is seen in the area, the area will be examined to see if maximum convergence is exceeded in the seal. If after one year, maximum convergence is not exceeded, examinations will be made on a yearly basis unless convergence in excess of maximum is suspected. If convergence is suspected, a P.E. must be immediately contacted to evaluate the effects of the convergence. The P.E. will certify the structural integrity of the seal or determine the proper repairs and submit that information to the MSHA District.
38. The certified person in charge of the construction of the seal will direct the construction project. All employees will be trained in their assigned tasks. Employees will be given a MSHA 5000.23 document showing their training. Copies of training records will be maintained on-site during seal construction. Questions and observations will be used to verify task training. A copy of the construction manual will be available at all times to the workers constructing the seal

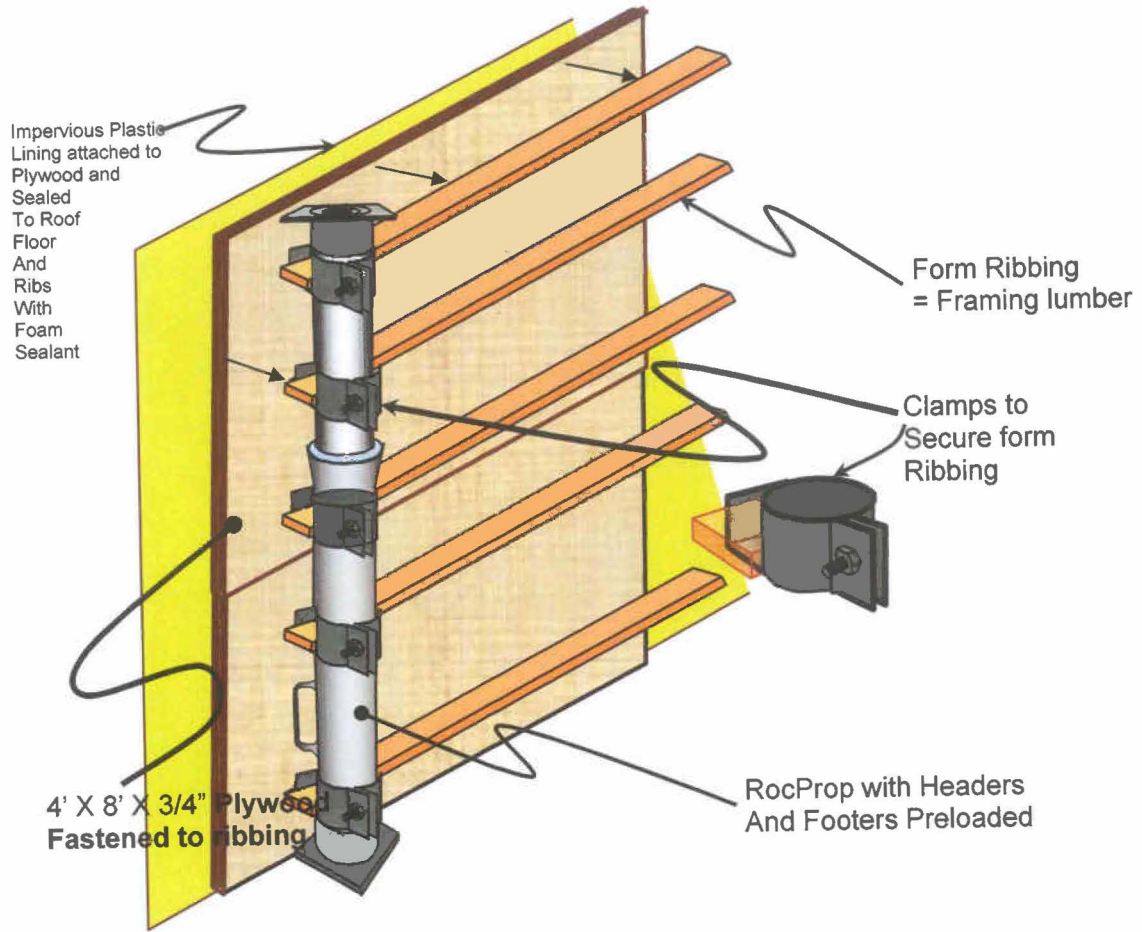
39. MATERIAL LIST

1. MSHA approved sealant.
2. MEDIUM STRENGTH STRATACRETE mix.
3. STRATACRETE mixer and pump.
4. Grout for shrinkage: BASF Meyco 364 Flex Urea Silicate Grout or De Neef Organosol NP.
5. Foam Kits for perimeter sealing (example: Fomo Silent Seal 20 psi Comp. Strength).









4" Curtain Overlap on Strata

Seal Design Table – 120 psi MEDIUM STRENGTH STRATACRETE Plug Seal

Seal Design Number	Seal Width	Seal Height	Seal Thickness	Seal Design Strength	Uniaxial Compressive Strength	Minimum Shear Strength	Dynamic Load Factor	Seal Safety Factor
	feet W	feet H	feet & inches t	psi P	psi σ_c	psi τ_s	DLF	FS
1	20	4.0	5 ' 10 "	120	3000	115	2	1.5
2	20	4.5	6 ' 4 "	120	3000	115	2	1.5
3	20	5.0	7 ' 0 "	120	3000	115	2	1.5
4	20	5.5	7 ' 6 "	120	3000	115	2	1.5
5	20	6.0	7 ' 10 "	120	3000	115	2	1.5
6	20	6.5	8 ' 4 "	120	3000	115	2	1.5
7	20	7.0	8 ' 9 "	120	3000	115	2	1.5
8	20	7.5	9 ' 2 "	120	3000	115	2	1.5
9	20	8.0	9 ' 7 "	120	3000	115	2	1.5
10	20	8.5	10 ' 0 "	120	3000	115	2	1.5
11	20	9.0	10 ' 4 "	120	3000	115	2	1.5
12	20	9.5	10 ' 9 "	120	3000	115	2	1.5
13	20	10.0	11 ' 1 "	120	3000	115	2	1.5
14	20	10.5	11 ' 7 "	120	3000	115	2	1.5
15	20	11.0	12 ' 1 "	120	3000	115	2	1.5
16	20	11.5	12 ' 7 "	120	3000	115	2	1.5
17	20	12.0	13 ' 2 "	120	3000	115	2	1.5
18	20	12.5	13 ' 8 "	120	3000	115	2	1.5
19	20	13.0	14 ' 2 "	120	3000	115	2	1.5
20	20	13.5	14 ' 8 "	120	3000	115	2	1.5
21	20	14.0	15 ' 3 "	120	3000	115	2	1.5
22	20	14.5	15 ' 9 "	120	3000	115	2	1.5
23	20	15.0	16 ' 3 "	120	3000	115	2	1.5
24	20	15.5	16 ' 9 "	120	3000	115	2	1.5
25	20	16.0	17 ' 4 "	120	3000	115	2	1.5
26	25	4.0	6 ' 1 "	120	3000	115	2	1.5
27	25	4.5	6 ' 8 "	120	3000	115	2	1.5
28	25	5.0	7 ' 2 "	120	3000	115	2	1.5
29	25	5.5	7 ' 9 "	120	3000	115	2	1.5
30	25	6.0	8 ' 3 "	120	3000	115	2	1.5
31	25	6.5	8 ' 9 "	120	3000	115	2	1.5
32	25	7.0	9 ' 3 "	120	3000	115	2	1.5
33	25	7.5	9 ' 8 "	120	3000	115	2	1.5
34	25	8.0	10 ' 2 "	120	3000	115	2	1.5
35	25	8.5	10 ' 7 "	120	3000	115	2	1.5
36	25	9.0	11 ' 1 "	120	3000	115	2	1.5
37	25	9.5	11 ' 6 "	120	3000	115	2	1.5
38	25	10.0	11 ' 10 "	120	3000	115	2	1.5
39	25	10.5	12 ' 3 "	120	3000	115	2	1.5
40	25	11.0	12 ' 8 "	120	3000	115	2	1.5
41	25	11.5	13 ' 0 "	120	3000	115	2	1.5
42	25	12.0	13 ' 4 "	120	3000	115	2	1.5
43	25	12.5	13 ' 8 "	120	3000	115	2	1.5
44	25	13.0	14 ' 2 "	120	3000	115	2	1.5
45	25	13.5	14 ' 8 "	120	3000	115	2	1.5
46	25	14.0	15 ' 3 "	120	3000	115	2	1.5
47	25	14.5	15 ' 9 "	120	3000	115	2	1.5
48	25	15.0	16 ' 3 "	120	3000	115	2	1.5
49	25	15.5	16 ' 9 "	120	3000	115	2	1.5
50	25	16.0	17 ' 4 "	120	3000	115	2	1.5

4" Curtain Overlap on Strata

Seal Design Table – 120 psi MEDIUM STRENGTH STRATACRETE Plug Seal

Seal Design Number	Seal Width	Seal Height	Seal Thickness	Seal Design Strength	Uniaxial Compressive Strength	Minimum Shear Strength	Dynamic Load Factor	Seal Safety Factor
	feet W	feet H	feet & inches t	psi P	psi σ_c	psi τ_s	DLF	FS
51	30	4.0	6 ' 2 "	120	3000	115	2	1.5
52	30	4.5	6 ' 9 "	120	3000	115	2	1.5
53	30	5.0	7 ' 4 "	120	3000	115	2	1.5
54	30	5.5	8 ' 0 "	120	3000	115	2	1.5
55	30	6.0	8 ' 6 "	120	3000	115	2	1.5
56	30	6.5	9 ' 1 "	120	3000	115	2	1.5
57	30	7.0	9 ' 7 "	120	3000	115	2	1.5
58	30	7.5	10 ' 1 "	120	3000	115	2	1.5
59	30	8.0	10 ' 7 "	120	3000	115	2	1.5
60	30	8.5	11 ' 1 "	120	3000	115	2	1.5
61	30	9.0	11 ' 6 "	120	3000	115	2	1.5
62	30	9.5	12 ' 0 "	120	3000	115	2	1.5
63	30	10.0	12 ' 4 "	120	3000	115	2	1.5
64	30	10.5	12 ' 10 "	120	3000	115	2	1.5
65	30	11.0	13 ' 3 "	120	3000	115	2	1.5
66	30	11.5	13 ' 8 "	120	3000	115	2	1.5
67	30	12.0	14 ' 1 "	120	3000	115	2	1.5
68	30	12.5	14 ' 6 "	120	3000	115	2	1.5
69	30	13.0	14 ' 10 "	120	3000	115	2	1.5
70	30	13.5	15 ' 3 "	120	3000	115	2	1.5
71	30	14.0	15 ' 7 "	120	3000	115	2	1.5
72	30	14.5	16 ' 0 "	120	3000	115	2	1.5
73	30	15.0	16 ' 4 "	120	3000	115	2	1.5
74	30	15.5	16 ' 9 "	120	3000	115	2	1.5
75	30	16.0	17 ' 4 "	120	3000	115	2	1.5
76	40	4.0	6 ' 4 "	120	3000	115	2	1.5
77	40	4.5	7 ' 0 "	120	3000	115	2	1.5
78	40	5.0	7 ' 8 "	120	3000	115	2	1.5
79	40	5.5	8 ' 3 "	120	3000	115	2	1.5
80	40	6.0	8 ' 10 "	120	3000	115	2	1.5
81	40	6.5	9 ' 6 "	120	3000	115	2	1.5
82	40	7.0	10 ' 0 "	120	3000	115	2	1.5
83	40	7.5	10 ' 7 "	120	3000	115	2	1.5
84	40	8.0	11 ' 1 "	120	3000	115	2	1.5
85	40	8.5	11 ' 8 "	120	3000	115	2	1.5
86	40	9.0	12 ' 2 "	120	3000	115	2	1.5
87	40	9.5	12 ' 8 "	120	3000	115	2	1.5
88	40	10.0	13 ' 2 "	120	3000	115	2	1.5
89	40	10.5	13 ' 8 "	120	3000	115	2	1.5
90	40	11.0	14 ' 2 "	120	3000	115	2	1.5
91	40	11.5	14 ' 8 "	120	3000	115	2	1.5
92	40	12.0	15 ' 1 "	120	3000	115	2	1.5
93	40	12.5	15 ' 7 "	120	3000	115	2	1.5
94	40	13.0	16 ' 1 "	120	3000	115	2	1.5
95	40	13.5	16 ' 6 "	120	3000	115	2	1.5
96	40	14.0	16 ' 10 "	120	3000	115	2	1.5
97	40	14.5	17 ' 4 "	120	3000	115	2	1.5
98	40	15.0	17 ' 9 "	120	3000	115	2	1.5
99	40	15.5	18 ' 2 "	120	3000	115	2	1.5
100	40	16.0	18 ' 7 "	120	3000	115	2	1.5

4" Curtain Overlap on Strata

Seal Design Table – 120 psi MEDIUM STRENGTH STRATACRETE Plug Seal

Seal Design Number	Seal Width	Seal Height	Seal Thickness	Seal Design Strength	Uniaxial Compressive Strength	Minimum Shear Strength	Dynamic Load Factor	Seal Safety Factor
	feet W	feet H	feet & inches t	psi P	psi σ_c	psi τ_s	DLF	FS
101	50	4.0	6' 6"	120	3000	115	2	1.5
102	50	4.5	7' 2"	120	3000	115	2	1.5
103	50	5.0	7' 9"	120	3000	115	2	1.5
104	50	5.5	8' 6"	120	3000	115	2	1.5
105	50	6.0	9' 1"	120	3000	115	2	1.5
106	50	6.5	9' 8"	120	3000	115	2	1.5
107	50	7.0	10' 3"	120	3000	115	2	1.5
108	50	7.5	10' 10"	120	3000	115	2	1.5
109	50	8.0	11' 6"	120	3000	115	2	1.5
110	50	8.5	12' 1"	120	3000	115	2	1.5
111	50	9.0	12' 7"	120	3000	115	2	1.5
112	50	9.5	13' 2"	120	3000	115	2	1.5
113	50	10.0	13' 8"	120	3000	115	2	1.5
114	50	10.5	14' 3"	120	3000	115	2	1.5
115	50	11.0	14' 9"	120	3000	115	2	1.5
116	50	11.5	15' 3"	120	3000	115	2	1.5
117	50	12.0	15' 9"	120	3000	115	2	1.5
118	50	12.5	16' 4"	120	3000	115	2	1.5
119	50	13.0	16' 9"	120	3000	115	2	1.5
120	50	13.5	17' 3"	120	3000	115	2	1.5
121	50	14.0	17' 9"	120	3000	115	2	1.5
122	50	14.5	18' 3"	120	3000	115	2	1.5
123	50	15.0	18' 9"	120	3000	115	2	1.5
124	50	15.5	19' 2"	120	3000	115	2	1.5
125	50	16.0	19' 8"	120	3000	115	2	1.5
126	60	4.0	6' 7"	120	3000	115	2	1.5
127	60	4.5	7' 3"	120	3000	115	2	1.5
128	60	5.0	7' 10"	120	3000	115	2	1.5
129	60	5.5	8' 7"	120	3000	115	2	1.5
130	60	6.0	9' 2"	120	3000	115	2	1.5
131	60	6.5	9' 10"	120	3000	115	2	1.5
132	60	7.0	10' 6"	120	3000	115	2	1.5
133	60	7.5	11' 1"	120	3000	115	2	1.5
134	60	8.0	11' 8"	120	3000	115	2	1.5
135	60	8.5	12' 4"	120	3000	115	2	1.5
136	60	9.0	12' 10"	120	3000	115	2	1.5
137	60	9.5	13' 6"	120	3000	115	2	1.5
138	60	10.0	14' 1"	120	3000	115	2	1.5
139	60	10.5	14' 8"	120	3000	115	2	1.5
140	60	11.0	15' 2"	120	3000	115	2	1.5
141	60	11.5	15' 9"	120	3000	115	2	1.5
142	60	12.0	16' 4"	120	3000	115	2	1.5
143	60	12.5	16' 10"	120	3000	115	2	1.5
144	60	13.0	17' 4"	120	3000	115	2	1.5
145	60	13.5	17' 10"	120	3000	115	2	1.5
146	60	14.0	18' 6"	120	3000	115	2	1.5
147	60	14.5	19' 0"	120	3000	115	2	1.5
148	60	15.0	19' 6"	120	3000	115	2	1.5
149	60	15.5	20' 0"	120	3000	115	2	1.5
150	60	16.0	20' 6"	120	3000	115	2	1.5

4" Curtain Overlap on Strata

Seal Design Table – 120 psi MEDIUM STRENGTH STRATACRETE Plug Seal

Seal Design Number	Seal Width	Seal Height	Seal Thickness	Seal Design Strength	Uniaxial Compressive Strength	Minimum Shear Strength	Dynamic Load Factor	Seal Safety Factor
	feet W	feet H	feet & inches t	psi P	psi σ_c	psi t_s	DLF	FS
151	70	4.0	6 ' 7 "	120	3000	115	2	1.5
152	70	4.5	7 ' 3 "	120	3000	115	2	1.5
153	70	5.0	8 ' 0 "	120	3000	115	2	1.5
154	70	5.5	8 ' 8 "	120	3000	115	2	1.5
155	70	6.0	9 ' 3 "	120	3000	115	2	1.5
156	70	6.5	10 ' 0 "	120	3000	115	2	1.5
157	70	7.0	10 ' 8 "	120	3000	115	2	1.5
158	70	7.5	11 ' 3 "	120	3000	115	2	1.5
159	70	8.0	11 ' 10 "	120	3000	115	2	1.5
160	70	8.5	12 ' 7 "	120	3000	115	2	1.5
161	70	9.0	13 ' 2 "	120	3000	115	2	1.5
162	70	9.5	13 ' 9 "	120	3000	115	2	1.5
163	70	10.0	14 ' 4 "	120	3000	115	2	1.5
164	70	10.5	15 ' 0 "	120	3000	115	2	1.5
165	70	11.0	15 ' 7 "	120	3000	115	2	1.5
166	70	11.5	16 ' 2 "	120	3000	115	2	1.5
167	70	12.0	16 ' 8 "	120	3000	115	2	1.5
168	70	12.5	17 ' 3 "	120	3000	115	2	1.5
169	70	13.0	17 ' 10 "	120	3000	115	2	1.5
170	70	13.5	18 ' 4 "	120	3000	115	2	1.5
171	70	14.0	19 ' 0 "	120	3000	115	2	1.5
172	70	14.5	19 ' 6 "	120	3000	115	2	1.5
173	70	15.0	20 ' 0 "	120	3000	115	2	1.5
174	70	15.5	20 ' 7 "	120	3000	115	2	1.5
175	70	16.0	21 ' 1 "	120	3000	115	2	1.5
176	80	4.0	6 ' 8 "	120	3000	115	2	1.5
177	80	4.5	7 ' 4 "	120	3000	115	2	1.5
178	80	5.0	8 ' 1 "	120	3000	115	2	1.5
179	80	5.5	8 ' 9 "	120	3000	115	2	1.5
180	80	6.0	9 ' 4 "	120	3000	115	2	1.5
181	80	6.5	10 ' 1 "	120	3000	115	2	1.5
182	80	7.0	10 ' 9 "	120	3000	115	2	1.5
183	80	7.5	11 ' 4 "	120	3000	115	2	1.5
184	80	8.0	12 ' 1 "	120	3000	115	2	1.5
185	80	8.5	12 ' 8 "	120	3000	115	2	1.5
186	80	9.0	13 ' 4 "	120	3000	115	2	1.5
187	80	9.5	14 ' 0 "	120	3000	115	2	1.5
188	80	10.0	14 ' 7 "	120	3000	115	2	1.5
189	80	10.5	15 ' 2 "	120	3000	115	2	1.5
190	80	11.0	15 ' 9 "	120	3000	115	2	1.5
191	80	11.5	16 ' 4 "	120	3000	115	2	1.5
192	80	12.0	17 ' 0 "	120	3000	115	2	1.5
193	80	12.5	17 ' 7 "	120	3000	115	2	1.5
194	80	13.0	18 ' 2 "	120	3000	115	2	1.5
195	80	13.5	18 ' 9 "	120	3000	115	2	1.5
196	80	14.0	19 ' 3 "	120	3000	115	2	1.5
197	80	14.5	19 ' 10 "	120	3000	115	2	1.5
198	80	15.0	20 ' 6 "	120	3000	115	2	1.5
199	80	15.5	21 ' 0 "	120	3000	115	2	1.5
200	80	16.0	21 ' 7 "	120	3000	115	2	1.5

4" Curtain Overlap on Strata

Seal Design Table – 120 psi MEDIUM STRENGTH STRATACRETE Plug Seal

Seal Design Number	Seal Width	Seal Height	Seal Thickness	Seal Design Strength	Uniaxial Compressive Strength	Minimum Shear Strength	Dynamic Load Factor	Seal Safety Factor
	feet W	feet H	feet & inches t	psi P	psi σ_c	psi t_s	DLF	FS
201	90	4.0	6' 8"	120	3000	115	2	1.5
202	90	4.5	7' 4"	120	3000	115	2	1.5
203	90	5.0	8' 1"	120	3000	115	2	1.5
204	90	5.5	8' 9"	120	3000	115	2	1.5
205	90	6.0	9' 6"	120	3000	115	2	1.5
206	90	6.5	10' 2"	120	3000	115	2	1.5
207	90	7.0	10' 10"	120	3000	115	2	1.5
208	90	7.5	11' 6"	120	3000	115	2	1.5
209	90	8.0	12' 2"	120	3000	115	2	1.5
210	90	8.5	12' 10"	120	3000	115	2	1.5
211	90	9.0	13' 6"	120	3000	115	2	1.5
212	90	9.5	14' 1"	120	3000	115	2	1.5
213	90	10.0	14' 9"	120	3000	115	2	1.5
214	90	10.5	15' 4"	120	3000	115	2	1.5
215	90	11.0	16' 0"	120	3000	115	2	1.5
216	90	11.5	16' 8"	120	3000	115	2	1.5
217	90	12.0	17' 3"	120	3000	115	2	1.5
218	90	12.5	17' 10"	120	3000	115	2	1.5
219	90	13.0	18' 6"	120	3000	115	2	1.5
220	90	13.5	19' 1"	120	3000	115	2	1.5
221	90	14.0	19' 8"	120	3000	115	2	1.5
222	90	14.5	20' 2"	120	3000	115	2	1.5
223	90	15.0	20' 9"	120	3000	115	2	1.5
224	90	15.5	21' 4"	120	3000	115	2	1.5
225	90	16.0	22' 0"	120	3000	115	2	1.5
226	100	4.0	6' 8"	120	3000	115	2	1.5
227	100	4.5	7' 4"	120	3000	115	2	1.5
228	100	5.0	8' 2"	120	3000	115	2	1.5
229	100	5.5	8' 10"	120	3000	115	2	1.5
230	100	6.0	9' 7"	120	3000	115	2	1.5
231	100	6.5	10' 3"	120	3000	115	2	1.5
232	100	7.0	10' 10"	120	3000	115	2	1.5
233	100	7.5	11' 7"	120	3000	115	2	1.5
234	100	8.0	12' 3"	120	3000	115	2	1.5
235	100	8.5	13' 0"	120	3000	115	2	1.5
236	100	9.0	13' 7"	120	3000	115	2	1.5
237	100	9.5	14' 3"	120	3000	115	2	1.5
238	100	10.0	14' 10"	120	3000	115	2	1.5
239	100	10.5	15' 7"	120	3000	115	2	1.5
240	100	11.0	16' 2"	120	3000	115	2	1.5
241	100	11.5	16' 9"	120	3000	115	2	1.5
242	100	12.0	17' 6"	120	3000	115	2	1.5
243	100	12.5	18' 1"	120	3000	115	2	1.5
244	100	13.0	18' 8"	120	3000	115	2	1.5
245	100	13.5	19' 3"	120	3000	115	2	1.5
246	100	14.0	19' 10"	120	3000	115	2	1.5
247	100	14.5	20' 6"	120	3000	115	2	1.5
248	100	15.0	21' 1"	120	3000	115	2	1.5
249	100	15.5	21' 8"	120	3000	115	2	1.5
250	100	16.0	22' 3"	120	3000	115	2	1.5