Date_____

Mr. Ray McKinney, District Manager
Mine Safety and Health Administration
Post Office Box 560
Norton, Virginia 24273

Mr. Frank A. Linkous, Chief
Division of Mines
Department of Mines, Minerals and Energy
Commonwealth of Virginia
Post Office Drawer 900
Big Stone Gap, Virginia 24219

Re: Request for Approval, Proposed Roof Control Plan

Company or Corporate Name Name of Mine

MSHA I.D. Number State I.D. Number

Gentlemen:

The enclosed Roof Control Plan is hereby submitted for your approval. Should changes be needed, notify me at the following address:

Mine telephone number

Your prompt action is appreciated.

Sincerely,

_____
Signature of Company Official

ROOF CONTROL PLAN

General Information

Date Plan Submitted: _____

_____ _____
MSHA I.D. Number VA State I.D. Number

Company: _____

Mine Name or Number: _____

Address of Company: _____

Mine Location: _____ _____ **VA**
(Closest P.O.) (County) (State)

Reference (number of miles from nearest road, stream, hollow, branch, etc.) _____

Columnar Section Maximum Cover over Coal Bed (feet): _____

	Type Strata	Thickness (feet or inches)
Main Roof:	Sandstone	10' +
Immediate Roof:	Shale	0' to 10'
Name of Coal Bed:		
Floor:	Shale	10'

Type(s) of Plan: _____

_____

_____

_____

_____

_____

_____ _____ _____
Name of Company Official Responsible for Plan Title Date

Roof Control Plan Criteria

Standards for Plan. This is a minimum roof control plan and is formulated for normal roof and rib conditions while using the mining system(s) described.

- All underground active workings and travel ways will be secured and controlled to protect persons from falls of roof, face, or ribs.
- The method of mining will not expose miners to hazardous conditions.
- In areas where adverse roof or rib conditions are encountered or indicated, the operator will either remove those conditions or provide additional support where necessary.
- If changes are to be made in the mining system that necessitates any change in the roof control plan, the plan will be revised and approved prior to implementing the new mining system.

Instruction of Personnel. The operator or his agent will instruct all personnel assigned to install or remove roof supports (temporary and/or permanent) prior to personnel performing such work.

- This instruction will insure that such persons are familiar with both the functions of the support being used and the proper installation procedures of the support, along with all other details within the approved roof control plan.
- Persons in charge of miners who install supports will be familiar with the approved roof control plan as well as any revisions to the plan.
- All new miners will have training in hazards of mine roof and ribs and have the contents of this plan explained to them before they begin work.
- The approved roof control plan and any revisions will be available to the miners at the mine and a copy maintained on the working section.

Drawings and Schematics. Drawings indicating the width of openings, installation sequence and spacing of supports, size of pillars along with the method and sequence of pillar recovery etc., are to be attached for each method of mining.

Other Coverage. Sections 75.221, and 75.222, 30 CFR, are addressed as appropriate for the mining methods in use. Section 75.209 (c), 30 CFR, is addressed appropriate to the mining height of the mine.

Mining System Listing (i.e., equipment used):

1.	Continuous miner with remote
2.	Shuttle cars
3.	Dual head roof drills with atrs
4.	Scoops
5.	
6.	
7.	
8.	

Planned Mining Width and Projection Centers:

Entry Width (s) 20' Max. Centers: 60' +

Crosscut Width(s): 20' Max. Centers: 60' +

Supplemental Roof Supports to be installed when entry/crosscut widths exceed the maximums allowed in the Approved Roof Control Plan

When maximum allowable widths are exceeded due to mining, rib sloughage, etc. **on the working section where mobile equipment is required to regularly travel and no adverse roof conditions exist,** the excessive widths (more than 12 inches wider for a length of 5' or greater) will be corrected by installing supplemental roof bolts **of greater strength and of a length that is at least 2' longer than the primary roof supports being used** if the excessive width does not exceed 24 inches.

When the maximum allowable widths are exceeded by 24 inches **on the working section,** standing supports such as timbers, cribs, half-cribs, jacks or beams will be installed to reduce the width to the maximum allowable width.

When the maximum allowable widths are exceeded by more than 12 inches for more than 5' **in outby areas,** roof bolts of greater strength and at least 2' longer than the primary roof bolts or timbers, cribs, half-cribs, jacks, beams or a combination of these supports will be used to adequately support the area.

These requirements are minimums and the type of roof supports and spacings will be capable of adequately supporting the mine roof.

Portal Canopies. A substantially constructed canopy or shield of sufficient size, length and strength to protect workmen from falling material will be provided at each drift/slope. The first cut from the highwall in any entry may be mined prior to setting the canopy provided that mining is done with a remotely operated continuous miner and the operator is positioned away from falling material. The canopy must be installed prior to any other work being done in the cut.

Roof Support Materials

Minimum Materials. A sufficient quantity of support materials to be located on each working section is defined as follows:

- 20 roof bolts, 12 inches longer than the bolt length being used (does not apply to resin anchored systems) and;
- 20 posts of proper length with sufficient cap pieces and wedges.

Bearing plates. Minimum size bearing plate will be 6" by 6" and shall be installed firmly against the mine roof. Spherical washers or other angle compensating devices will be used to compensate for the angle when **tensioned** roof bolts are installed greater than 5 degrees from the perpendicular of the bearing plate. Roof caps of various designs/shapes may be used as additional bearing surface **if used in conjunction with a standard bearing plate.**

- When roof is susceptible to sloughing, pin boards of varying lengths, metal straps, half headers, roof caps, or oversize bearing plates (minimum of 60 square inches) will be used in conjunction with roof bolts.
- Bearing plate hole size will be compatible with roof bolt size and manufacturer's recommendations.

Posts. Posts should be solid straight grain wood with the ends sawed square and free from defects that would affect their strength and will be installed tight on solid footing.

- Clusters of two or more posts that provide equivalent strength may be used to meet these requirements. No post will have a minimum dimension less than a four inch round post or equivalent.
- The minimum dimensions for wooden posts will be as follows:

Post Length (inches)	Round Posts Min. Diameter (inches)	Split Posts Min. Area (sq. inches)	Square Posts Min. Dimension (inches)
60 or less	4	13	3 ¾" sq.
61 to 84	5	20	4 ½" sq.
85 to 108	6	28	5 ½" sq.
109 to 132	7	39	6 ¼" sq.
133 to 156	8	50	7 ¼" sq.
157 to 180	9	64	8" sq.
181 to 204	10	79	9" sq.
205 to 228	11	95	9 ¾" sq.
Over 228	12	113	10 ¾" sq.

Cap Blocks. Cap blocks and footers will have flat paralleled sides and be not less than 2" x 4" x 12" in size.

Crossbars. Wooden crossbars will be of straight grain solid wood and will be not less than three inches thick with a minimum cross-sectional area of twenty-four square inches and will be blocked to equally distribute the load across their length. All crossbars or beams in entries where mobile equipment regularly travels will be installed with some means of support that will prevent the beam or crossbar from falling in the event the supporting legs are accidentally dislodged.

Planks. Minimum plank dimensions will be one inch thick and six inches wide in varying lengths.

Crib Blocks. Crib blocks will have at least two flat paralleled sides and be adequate in size.

Temporary Roof Support. Metal jacks used for support will have a minimum bearing surface of not less than 36 square inches.

Where an ATRS roof bolting machine is installing roof bolts, at least two (2) safety posts or jacks suitable for the height being mined will be available in the place. (This requirement does not apply to inside control roof bolting machines or ring type ATRS system).

ROOF SUPPORT ARCHES

Roof support arches may be used as either primary or supplemental roof support.

Arches will be installed in accordance with the following procedures:

1. Arches will be installed on not more than 4' centers.

2. An arch must be assembled either under permanently supported roof or under previously erected arches.

3. Arches will be set and connecting rods loosely assembled until the lagging (wood, steel reinforced concrete crib block or metal) is installed. The arches will then be tightly secured.

4. The area between the arches will be filled with wood, concrete crib block or metal lagging. The lagging will correspond with the web depth of the arch. Crib block, if used, will not be less than 4" square. If metal lagging is used, it will be at least 20 gauge. The steel reinforced concrete crib block will be no less than 4" square.

5. The size and type of arch will be determined by conditions present at the installation site but in no instance will the arch be less than 5" X 19 lbs./ft.

6. Arches may be supplied from different manufacturers.

7. A copy of the manufacturer's specifications will be kept at the mine, available upon request by MSHA, DMME and/or the representative of the miners.

Roof Bolts. Manufacturer certification that the material was manufactured and tested in accordance with ASTM F432-95 will be available at the mine.

Roof Bolt Materials List

Type of Bolting System	Min. Length	Type Steel	Bolt Head Type	Flange Size	Type Anchor	Size Finish Bit	Torque Requirements (ft-lbs)		Minimum Length of Grout
	(in.)			(in.)		(in.)	Install	Evaluation	(ins.)
Mech. Anchored Roof Bolts	N/A	5/8" HS	Std.	1 5/8 or larger	Expansion Shell	1 3/8	130-165	65-245 Wood 91-245 Rock	N/A
	N/A	5/8" HS	Std.	1 5/8 or larger	Expansion Shell	1	130-165	65-245 Wood 91-245 Rock	N/A
	N/A	5/8"EHS	Std.	1 5/8 or larger	Expansion Shell	1	180-240	90-360 Wood 126-360 Rock	N/A
Fully Grouted Resin Rods		#5 Rebar Grade 60	Std.	1 5/8 or larger	Fully Grouted Rebar	1	N/A	150	Fully Grout Hole
		#6 Rebar Grade 40	Std.	1 5/8 or larger	Fully Grouted Rebar	1	N/A	150	Fully Grout Hole
	120	.6 Cable bolt	Std./Hex	Approx. 2	Grouted cable	1 or 1 3/8	N/A	Non tensioned	4' Min. Partial Grouted Hole
Point Anchor or Combination Anchor Roof Bolts		#5 Rebar Grade 60	Tab/ Shear Dome Resistance etc.	1 5/8 or larger	#5 Rebar (May use two speeds of resin to fully grout rebar)	1	165-225	No torque test required on **previously** installed roof bolts	* 24"
		#6 Rebar Grade 40	Tab/Shear Dome Resistance etc.	1 3/4	#6 Rebar (May use two speeds of resin to fully grout rebar)	1 or 1 1/32	165-225	Same	* 24"
		3/4 " EHS	Std.	1 5/8 or larger	#7 Rebar with Coupler	1 3/8	275-325	Same	24"
		# 7 Rebar Grade 60	Std.	1 5/8 or larger	#7 Rebar with Coupler	1 3/8	275-325	Same	24"
		#6 Rebar Grade 40 **Bendable**	Tab/ Shear Dome Resistance Etc.	1 3/4	#6 Rebar- (May use two speeds of resin to fully grout rebar)	1 or 1 1/32	165-225	Same	* 24"
	**60 ***120	.677 Dia./ .804 Grade 75	Std.	1 5/8 or larger	D-8 or Equiv. Expansion Shell	1 3/8	275-325	Same	24"
		# 7 Rebar Grade 60	Std.	1 5/8 or larger	J-1 or Equiv. Expansion Shell	1 3/8	275-325	Same	24"
		.1" Dia. Grade 75	Std.	1 5/8 or larger	#8 Rebar or Resin assisted Expansion Shell	1 1/2	300 min.	Same	36"

Length of resin grout used for anchorage on point anchor or combination roof bolts will not exceed one-half the length of the roof bolt (i.e., 3' grout on a 6' roof bolt). The point anchor or combination roof bolt may be fully grouted using two speeds of resin

** Minimum length roof bolt when used as primary roof support

*** Minimum length roof bolt when used as supplemental roof support

Roof Bolting – General

Installing Temporary or Permanent Support. Only those persons engaged in the installation of temporary supports will be allowed to proceed beyond the last full row of permanent roof supports

- Before any person proceeds inby permanently supported roof to install supports, a thorough visual examination of the unsupported roof and ribs will be made. If the visual examination does not disclose any hazardous condition, persons proceeding inby permanent supports will do so with caution and, if conditions permit, will test the roof by the sound and vibration method as they advance into the area.
- When installing supports in the face area, personnel installing supports will be within five feet of a temporary or permanent support. If hazardous conditions are detected, corrective action will be taken to give adequate protection to personnel in the area. A bar of suitable length and design will be provided on all mobile face equipment except haulage equipment and will be used when prying down loose material.
- Unless otherwise specified in this plan, roof bolts will be installed in a reasonably straight line crosswise to obtain optimum protection from the ATRS and previously installed roof bolts.
- Roof bolts of different types (mechanical, fully grouted, point anchor, etc.), being installed in pattern as primary roof support, cannot be mixed without prior approval.
- All tensioned roof bolts will be installed with hardened washers.

Automated Temporary Roof Support System.

- All automated temporary roof support (ATRS) systems on roof drills that have not been previously approved for use in the State of Virginia and MSHA District 5 will be inspected and approved by MSHA and the Virginia Division of Mines personnel prior to being used in the face.
- Where the ATRS will effectively go against the mine roof, such ATRS will be used during roof bolt installation and will be positioned firmly against the mine roof not more than **4.5** feet inby permanent roof support with a single head roof bolting machine and not more than **5** feet inby permanent support with a dual head roof bolting machine.
- Where an ATRS equipped drill cannot be used as a result of mining conditions (i.e., a roof fall) a minimum of four (4) safety posts or jacks will be installed on not more than 5-foot centers.

Approaching Outcrop. When mining approaches within 150'of an outcrop, roof bolt lengths will be adequate to support the mine roof **and** be a minimum of 1-foot longer than the minimum length required in the roof control plan.

Test holes. In each active working place where roof bolts are being installed, at least one hole will be drilled into the mine roof at a depth of at least 12 inches deeper than the primary roof supports being installed to determine the nature of the strata. A minimum of one test

hole will be drilled each cut regardless of cut depth. Test holes will be drilled during the installation of the first row of roof supports and left open for evaluation.

Torque Checks on Tensioned Roof Bolts. A torque wrench, which indicates by direct reading the actual torque on the roof bolt installed, will be provided on each roof bolting machine installing tensioned roof bolts.

- In each roof bolting cycle, the actual torque or tension of the first **tensioned** (either point anchor, combination or mechanically anchored) roof bolt installed with each drill head will be measured immediately after it is installed. Thereafter, at least one roof bolt out of every four (4) installed by each drill head will be measured. When **resin assisted mechanically anchored tensioned** roof bolts are used, the installation torque will be checked on each shift by installing a dry roof bolt (no resin) with each drill head prior to beginning roof bolting to ensure that the torque is within the specified range. This roof bolt will not be a pattern roof bolt. If the torque or tension of any of the roof bolts measured is not within the range specified in the roof control plan, corrective action will be taken.

- In working places from which coal is produced during any portion of a 24-hour period, the actual torque or tension on at least one out of every ten previously installed **mechanically anchored** roof bolts will be measured from the outby corner of the last open crosscut to the face. Such torque checks are necessary only on advancing sections. Corrective action will be taken if the **majority** of the bolts tested do not maintain 70% of the minimum torque specified in the roof control plan, 50% if the bearing plate is against wood or if the **majority** of the bolts tested have exceeded the maximum torque by 50%. The results of these tests will be recorded in the on-shift examination book. The records will indicate the number of bolts tested and the number above and below the required range.

Fully Grouted Roof Bolts.

- For test purposes, the first installed **fully grouted resin rod** in each cycle of each working place will be checked for proper installation after installing the first line of permanent supports and prior to removing the temporary roof support system. The torque applied will be 150 foot-pounds. Should the rod rotate one full turn (360 degrees), a second rod will be tested in the same manner. If this rod also turns, resin installation will be discontinued until reasons for failure of the resin is determined. A click type torque wrench is recommended for the torque tests.

- During the installation of fully grouted resin rods, the entire length of the hole will be filled with resin.

Handling of Resin Persons responsible for the installation of resins will be instructed in safe handling precautions for such materials.

- Resin will not be used if the manufacturer's recommended shelf life is exceeded.

- Resin packages will be protected from excessive heat and cold during storage and will not be used in areas where the ambient temperature falls outside the range recommended by the manufacturer.

- Resins supplied to the working section will be controlled to prevent intermixing of resin from different manufacturers.
- Resin cartridges will be sized compatible to hole/roof bolt dimensions and installed according to manufacturer's recommendation.
- Excessive spinning or mixing of resin during installation may result in ineffective roof bolt installation.

Drilling and Installation Precautions. The hole dimensions (diameter, length, etc.) for roof bolt installations are critical. Drill steel will be adequately marked to ensure the proper depth hole.

Clean Up and Rehabilitation Work.

- Where roof material is being taken down, a minimum of 2 temporary supports on not more than 5-foot centers will be installed between the workmen and the material being taken down, unless such work can be done from an area supported adequately by permanent roof supports.
- Where rehabilitation work is to be performed, a plan to install roof supports will be approved. Where roof bolts are being replaced in isolated instances, 1 temporary support will be installed within a radius of two feet from each bolt to be replaced, unless an ATRS equipped roof bolting machine is utilized.
- Where crossbars, cribs, posts or roof bolts are being installed in an area where roof failure is indicated or has occurred, a minimum of one row of temporary supports will be installed on not more than 5' centers unless an approved ATRS system is used.
- All roof falls and other areas in the active workings where the mine roof material has been removed from it's natural location by any means and is not being cleaned up, will be posted off at each entrance to the area by a minimum of one row of posts, installed on not more than 5' centers across the opening, or equivalent,.
- Where roof falls have occurred, at all overcasts, boom holes, and other construction sites that require removal of mine roof material, by blasting, ripping with a continuous mining machine, cutting with a cutting machine, or other means, the roof will be considered unsupported. If miners are required to enter such area, either to travel over the fallen material, to clean it up, or to perform other duties, the roof will be supported adequately. Mine management will devise and have in writing at the scene of such unsupported roof, a plan incorporating the following procedures:
    - All work to be done will be performed by persons instructed and experienced in rehabilitation work.
    - Adequate temporary support on not more than 5' centers will be set at all entrances to the unsupported area except where clean-up and/or roof bolting operations are being conducted.
    - Temporary supports set on not more than 5' centers or an approved ATRS system will be used to support the roof prior to installing permanent roof supports. Temporary supports will be replaced by permanent roof supports,

such as roof bolts, posts, cribs, collars or a combination of these types of supports installed on centers not to exceed 4' maximum.

- When re-supporting these areas, either by bolting, timbering, cribbing, collaring, etc., each row of permanent roof supports will be completed prior to removing temporary supports and before other work is performed.
- Where necessary to remove material before supports can be set, such removal will be performed from under permanently supported roof at all times.

Mining System

Sight Line. A sight line or other method of directional control will be used to maintain the projected direction of mining in entries, rooms, and crosscuts.

Highwall Evaluation. Prior to starting drift or slope operations, a careful evaluation of the highwall and strata above the projected openings will be conducted. Any loose material will be removed or otherwise controlled. If necessary, the highwall strata will be benched or sloped to protect against slides and/or falls of material.

Cut depths. The maximum allowable cut depth in this plan is:

- ____ The maximum allowable *cut depth for a manually operated continuous miner is 20 feet, or the distance as measured from the most inby manually operated control (hand or foot) to the inby end of the continuous mining machine, whichever is less. **At no time will any manually operated control (hand or foot) be advanced inby the last <u>full</u> row of permanent supports.**
- ___The maximum allowable *cut depth for a remotely operated continuous miner is 20'. **Before the maximum allowable cut depth can exceed 20', specific safety precautions for a "deep cut" will be approved as part of this plan. The continuous miner will be operated remotely when developing a deep cut.**

* Cut depth is measured from the last full row of permanent roof supports to the point of deepest penetration.

Working Places.

- A working face will not be mined through into an unsupported area of active workings, except when the unsupported area is inaccessible.
- All working faces will be permanently supported on the next regularly scheduled bolting cycle after the working face is exposed.
- Should conditions exist that prohibit the installation of roof bolts within the prescribed distance from the face (i.e. water, draw rock, etc.), the condition will be corrected and roof supports installed as prescribed on the next regular mining cycle.
- Upon completion of the loading cycle, a readily visible warning device or physical barrier will be conspicuously placed at or near the last row of permanent support to warn persons approaching any area that is not supported.

- Line curtains will be extended remotely without exposure of any person inby permanent support.
- In working faces where draw rock has fallen and such material has to be removed prior to installing roof supports, the removal will be accomplished by loading out with mechanical equipment with no workers exposed inby the last full row of permanent roof supports.

Crosscuts

- Crosscuts will be started only in areas that are supported with permanent roof supports. When headings and crosscuts are to be simultaneously developed, a minimum of three (3) rows of permanent roof supports will be installed inby the proposed crosscut prior to starting the crosscut.

  The heading cannot be advanced inby the next projected crosscut until the crosscut being developed is completed. Roof bolting operations and coal extraction will not be performed simultaneously in an entry and an interconnected crosscut except when roof bolting on the intake side.

- **Openings** that create an intersection will be supported with a minimum of one row of temporary or permanent roof supports installed on not more than 5-foot centers across the opening before any other work or travel in the intersection. No work other than making examinations required by the Mine Safety Laws of Va. or 30 CFR or work to correct hazardous conditions will be conducted in or inby the openings if these supports are not installed.
- Crosscuts may be developed to the right and left simultaneously from the same mine opening, however no crosscut will be created by development in more than one direction from adjacent entries. Once a crosscut being developed holes through into an entry, the adjacent crosscut may not interconnect the same entry until the original hole through has been permanently supported. Once a crosscut has been started off an entry or room, it will be permanently supported prior to the adjacent crosscut interconnecting into the same entry.

  When these crosscuts are to be developed right and left from the same opening, the initial cut of the first crosscut mined will be permanently supported prior to beginning the second crosscut.

Continuous Mining Machine Recovery Plan. Should the continuous mining machine break down or otherwise become disabled inby the last row of permanent roof supports during mining, the following procedures will apply:

- A minimum of two rows of timbers or jacks will be installed in accordance with the approved roof control plan to provide a safe walkway to the point adjacent to the continuous mining machine where work to repair the machine can be performed, or to the rear of the machine to enable remote recovery. Where conditions warrant, cribs or other appropriate supports will be installed.
- No more that 5 ft. spacing will be allowed between supports.

- Only work to enable the machine to be trammed to or pulled under permanent support will be performed.
- The area will be continuously monitored by a certified mine foreman. Should it become evident that roof conditions are deteriorating, all persons will be removed from the area until additional measures can be made to safely perform recovery work.
- Temporary supports will be removed remotely.

Remote Control Operation Procedures of Continuous Mining Machines. As a definition, remote control will be accomplished by operating in the following manner:

- While using remote controls, the continuous mining machine operator and other persons will position themselves:
    - Under permanently supported roof
    - No closer than the second full row of roof bolts outby the face. A full row of roof bolts is a row in which roof bolts have been installed on a pattern required by the Approved Roof Control Plan across the working place from rib to rib. If any of the roof bolts are sheared or otherwise rendered ineffective, or if the complete row of roof bolts was not installed as a result of an off-set in the working face, the next outby full row of roof bolts installed on pattern required by the Approved Roof Control Plan will be used as the reference point.
    - The continuous mining machine will be operated from a safe location away from pinch points created by either the continuous mining machine and/or haulage equipment.
- The continuous mining machine will be operated by the machine's on-board controls when the continuous mining machine operator is positioned within the machine's deck.
- At anytime the continuous mining machine is being trammed by remote control, no persons will be positioned between the continuous mining machine and the coal rib while tramming the machine from place to place or while repositioning the machine during the cutting/loading cycle. All persons will remain in a safe location away from pinch points created by either the continuous mining machine and/or other equipment.
- Where the continuous mining machine is not equipped with a deck and the machine is being operated by remote control, all persons will be positioned as required in the previous paragraph.
- At anytime the continuous mining machine is being operated using a remote control unit, the unit will be equipped with an emergency stop switch or panic bar that will permit the machine to be de-energized quickly in the event of an emergency. The emergency stop switch or panic bar will be prominent and readily accessible.
- All persons will be positioned in a safe location, outby the continuous mining machine operator, while coal is being cut, mined or loaded. The number of persons

positioned at the continuous mining machine will be limited to those necessary to facilitate the mining process. When persons other than those necessary to facilitate the mining process enter the area, the mining process will stop. Persons will not be allowed to congregate in the area surrounding the continuous mining machine when coal is being cut, mined or loaded.

- The pump motor of the continuous mining machine will be de-energized during loading or unloading of the trailing cable that supplies electrical power to the continuous mining machine.

CABLE ROOF BOLT INSTALLATION INSTRUCTIONS

- Drill the hole approximately 1" longer than the bolt to be installed. Measure the distance from where the plate touches the roof to the top of the bolt.

- Insert the appropriate length resin cartridge(s) into the hole (a minimum grout length of ½ of the bolt length or the minimum amount specified in the roof control plan). Insure that the resin cartridge(s) is inserted to the top of the hole without breaking.

- Insert the cable bolt into the hole with the button or birdcaged end first. Insert the cable bolt as far as possible into the borehole by hand.

- With the roof bolt head in the bolt wrench, push the cable bolt to the top of the hole. Insure that the stiffner tube enters the hole smoothly. When the stiffner tube is collared in the borehole, start slow rotation of the cable bolt to aid in the ease of insertion and provide mixing of the resin.

- Do not thrust the roof plate tight against the roof.

- Keeping the roof plate slightly from the roof and without excessive upward boom pressure, rotate the roof bolt for 5-10 seconds or as recommended by the resin manufacturer.

- When the proper resin mix time has been achieved, stop rotation, thrust the head of the cable roof bolt and plate tight against the mine roof and hold until the resin hardens.

NOTE: Cable bolts with buttons are for 1" diameter holes.
Cable bolts with birdcages are for 1" or 1 3/8" diameter holes.

CABLE ROOF BOLTS MAY BE USED AS SUPPLEMENTAL ROOF SUPPORT ONLY.

Refuge Alternatives

The roof support requirements in the existing Approved Roof Control Plan are sufficient to protect refuge alternatives at the mine.

If required examinations of the refuge alternatives indicate that additional roof supports are necessary, supplemental roof supports, adequate to protect the refuge alternatives, will be installed as needed.

The supplemental roof supports will consist of either cable roof bolts, super bolts, safety jacks, cribs or alternate crib supports (acs) or a combination of any of the above supports.

RIB CONTROL

Adverse ribs will be either taken down or supported.

When **adverse ribs are to be supported,** supplemental supports will be installed to adequately support the ribs. These supports will include but not be limited to:

- angle brackets
- * timbers
- cribs
- * steel supports (acs's, jacks, etc.)
- mesh
- wire ropes
- screen
- rib bolts
- any combination of these materials

* When timbers/jacks are used as rib supports and the ribs are exerting pressure against these supports, such rib supports will be secured against falling.

The rib supports will be installed when adverse rib conditions are detected and are not taken down. The type of supports and spacing will be dependent on the conditions present.