ITEM XII-7
ROOF CONTROL AND PILLAR RECOVERY PLAN

May 12, 1985
8185 S. Willow St.
Englewood, CO 80112

Mr. J. Stephen Miller
Supervisory Mining Engineer
USDOL-MSHA
Coal Mining Health and Safety
District 9
PO Box 25367-DFC
Denver, CO 80225

Dear Steve:

Enclosed is the pillar recovery plan for the Crandall Canyon Mine operating near Huntington, Utah. A complete roof control plan has also been submitted along with the ATRS forms including the pillar recovery plan for your review and approval.

During your review of the proposed plan if any additional information is needed or changes need to be made in the plan please contact me at 799-1045 and I will take care of it immediately. Please forward the approval of the plan to the mine directly at the address you have on file.

It has been a pleasure working with you and Mr. Kendzerski and your cooperation is appreciated. You will be notified before any secondary mining commences.

Sincerely,

Leonard Witkowski

Leonard Witkowski

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POST A COPY OF THIS PLAN NEAR EACH PORTAL WHERE WORKERS ENTER THE MINE IN SUCH A MANNER THAT SAID PLAN WILL BE AVAILABLE TO THE MINE WORKERS.

# ROOF CONTROL PLAN

## General Information

Date May 9, 1985 Mine I.D. No. 42-01715

A. Company GENWAL COAL COMPANY

Address P.O.Box 1201 HUNTINGTON, UTAH 84528
City State

B. Mine CRANDALL CANYON NO.1 MINE

Mine Location

HUNTINGTON EMERY UTAH
City County State

C. Location (reference to nearest highway route, direction, and distance)

1.5 Miles WEST Off Route No. 31

D. Type(s) of Plan FULL BOLTING, CONVENTIONAL, COMBINATION

E. Area(s) of mine covered by the plan

F. Maximum cover: 1500 Feet

Main Roof

Immediate Roof

| |
|---|
| LAMINATED SHALE |
| AND SANDSTONE |
| MASSIVE |
| SANDSTONE |

Coalbed
Bottom

G. Company Official's Signature ENGINEER Title 5-13-85 Date

Roof Control Investigator
The Roof Control Plan approved this date hereby supersedes all previously approved plans.

Approved by Date

Title

ROOF SUPPORT MATERIALS - All components of the roof bolt assembly shall comply with the American National Standards Institute "Specifications for Roof Bolting Materials in Coal Mines."

H. ROOF BOLTS

Manufacturer: CF&I CORP. ~~BIRMINGHAM BOLT CO~~ ~~MIKCO IND. (OR EQUIV.)~~

Manufacturer's Designation: NONE

Minimum Length: 48"

Diameter: 3/4" HS/ 5/8" EHS

Type Steel: HIGH STRENGTH

Type Thread: Rolled

Length of Thread: 8"MAX.

Type Head: STANDARD (Standard, Self-centering, Cone Neck)

Dimensions of Bolt Head: Nut: 1 1/2 Flange: 1 1/4

I. BEARING PLATES

Manufacturer: CF&I CORP. ~~MIKCO IND~~ ~~(OR EQUIVALENT)~~

Manufacturer's Designation: NONE

Dimensions: 6" X 6" X 1/2"

Shape: EMBOSSED (Donut Embossed, Bell Embossed, Flat)

Center Hole Size: 1"

J. WASHERS

Manufacturer: N/A

Manufacturer's Designation: N/A

*Type Steel: Hardened

Size: N/A

*Washers shall be through hardened to a hardness of 35 to 45 as measured on the Rockwell C Scale.

Shape: N/A

Hole Size: N/A

K. ANCHORAGE UNIT

Manufacturer: BIRMINGHAM BOLT ~~OHIO BRASS~~ ~~(OR EQUIVALENT)~~

Manufacturer's Designation: NONE

Type: EXPANSION

Size: 1 3/8"

Finishing Bit: +.030" minus zero

(Finishing bits shall be easily identifiable by sight or feel)

Installed Torque: 150 - 240 FT/LBS.

L. MATERIALS USED IN CONJUNCTION WITH ROOF BOLTS

Prior approval shall be obtained before making any changes in the material listed.

M. ROOF SUPPORT MATERIAL--CONVENTIONAL OR TEMPORARY AND SUPPLEMENTAL

Dimensions of Post--The length of post shall be as required and the diameter must be at least 1 inch for each 15 inches in length but not less than 4 inches--Split posts shall have a cross-sectional area equal to that required for round posts of equivalent length. Smaller posts may be used provided they are set in clusters to provide equivalent support.

Type of Post--Round or split of solid straight grain wood with the ends sawed square and free from defects which would affect their strength.

*Cap blocks, size, and shape--Cap Blocks and footers shall have flat paralleled sides and be not less than 2" X 6" X 12" in size.
(Insert Minimum)

Wedges, size and shape--1/0" x 3½" x 10" Minimum

*Crossbars, type and size--Crossbars shall be of straight grain solid wood and they shall be not less than 3-inches thick by 8-inches wide of varying length.

*Planks, size--A minimum of 1-inch thick by 8-inches wide of varying length.

Cribbing blocks, size and shape--Cribbing blocks shall have flat paralleled sides and be not less than 30-inches in length.

*Note: Where wood material is used between roof bolt bearing plates and the roof for additional bearing surface, the use shall be limited to short life openings (not to exceed 3 years) unless treated.

# ROOF SUPPORT MATERIALS FOR RESIN GROUTED RODS

## RODS

Manufacturer's

Manufacturer BIRMINGHAM
PATTEN-WEST
MIKCO IND (OR EQUIV.)

Designation BIRMINGHAM EB-6L

Minimum Length 48" Diameter #6 REBAR-1"/#7 REBAR-1 1/8"

Type Steel GRADE 40 Type Head STANDARD SQUARE

Minimum Yield 43,000 PSI

Dimensions of Rod: Head 1 1/8" Flange 1 1/2 - 2"

## BEARING PLATES

Dimensions 6"X 6"X1/4"

Shape EMBOSSED OR FLAT Center Hole Size 1"

## RESIN

Manufacturer's

Manufacturer DUPONT
CELITE
CARBOLY

Designation FAS LOC
MV001-37

Type POLYESTER RESIN & CATALYST

Size of Finishing Bit 1"- 6 +.030
1 1/8"- #7

Prior approval shall be obtained before making any changes in the materials listed.

N. FACE EQUIPMENT AND SECTION HAULAGE EQUIPMENT ASSOCIATED WITH EACH:

1. JOY 12CM MINER
2. JOY 21 & 10 SC SHUTTLE CAR
3. LEE NORSE TD1-43
4. S&S SCOOP
5. JOY CUTTING MACHINE
6. JOY LOADER

O. SEQUENCE OF MINING AND INSTALLATION OF SUPPORTS INCLUDING TEMPORARY SUPPORTS:

Drawings shall be attached showing the maximum width of entries, rooms, inter-sections, crosscuts, and (if applicable) pillar splits; the sequence of support installation--including temporary supports; the spacing of supports; and where applicable the sequence of mining pillars, including cut sequence in those pillars necessary to establish a unifrom pillar line that eliminates pillar points and pillars that project inby the breakline.

SIGHT LINES SHALL BE ESTABLISHED TO ASSURE THAT MINING PROJECTIONS IN ENTRIES, ROOMS, CROSSCUTS, AND PILLAR SPLITS ARE FOLLOWED.

| | | | | |
|---|---|---|---|---|
| Entry Width | 20' | Centers | 150' MAX | 60' MIN |
| Crosscut Width | 20' | Centers | 150' MAX | 60' MIN |
| Room Width | 20' | Centers | 150' MAX | 60' MIN |
| Room Crosscut Width | 20' | Centers | 150' MAX | 60' MIN |

Slope Width (anthracite) N/A

Gangway Width (anthracite) N/A

## SAFETY PRECAUTIONS FOR FULL BOLTING AND COMBINATION PLANS

1. This is the minimum roof control plan and was formulated for normal roof conditions while using the mining system(s) described. In areas where subnormal roof conditions are encountered, indicated, or anticipated, the operator shall 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 shall be revised and approved prior to implementing the new mining system.

2. All personnel required to install roof supports shall be trained by a qualified supervisor designated by mine management before being assigned to perform such work. This training shall insure that such persons are familiar with the functions of the support being used, proper installation procedures, and the approved roof control plan.

   Supervisors in charge and miners who install supports shall be informed of an approved roof control plan and any changes in a previously approved roof control plan not later than their first working shift following receipt of the approved plan. As soon as possible but no later than three weeks after receipt of this approved plan, all provisions contained herein shall be fully explained to all miners whose duties require them to be on a "working section." All new miners shall have the hazards of mine roof and ribs and the content of this plan explained to them before they start to work.

3. (a) Upon completion of the loading cycle, a reflectorized warning device, such as a "stop" sign, shall be conspicuously placed to warn persons approaching any area that is not permanently supported. It is to be emphasized that the warning device has been placed to cause the person to stop, examine, and evaluate the roof and rib conditions prior to entering the area--even after temporary supports have been installed.

   (b) Where required, temporary supports shall be installed immediately after the loading cycle is completed unless roof bolting machines are equipped with acceptable automated temporary supports.

   (i) Except when the District Manager has determined that more than 5 minutes are needed, "immediately" is inerpreted to mean that the installation of such temporary supports shall be started no later than 5 minutes after mining of the cut is completed and, after the installation of such supports is started, the installation of supports shall be continued until at least the minimum number are installed as required in the approved plan. If the installation of permanent supports is not started within 30 minutes after the loading cycle is completed, temporary supports shall be installed in the entire cut on 5 foot centers.

(c) Only those persons engaged in installing temporary supports shall be allowed to proceed beyond the last row of permanent supports until temporary supports are installed. Before any person proceeds inby permanently supported roof, a thorough visual examination of the unsupported roof and ribs shall be made. If the visual examination does not disclose any hazardous condition, persons proceeding inby permanent supports for the purpose of testing the roof by the sound and vibration method and installing supports shall do so with caution and shall be within 5 feet (less if indicated on Sketch Nos. ) of a temporary or permanent support. If hazardous conditions are detected, corrective action shall be taken to give adequate protection to the workmen in the area involved.

4. When installing permanent supports, temporary supports may be repositioned in the sequence indicated on the attached sketch (Nos. ). However, if it is necessary to remove temporary supports (other than those specified above) before permanent supports are installed, such temporary supports shall be removed by some remote means, or another temporary support shall be installed in such a manner that the workman removing the support remains in a supported area. Means of removal of such supports shall be approved by the District Manager.

5. Work such as extending line curtains, other ventilating devices or making methane tests inby the roof bolts shall not be done unless a minimum of two temporary supports are installed. This minimum is applicable only if they are within 5 feet of the face or rib and the work is done between such supports and the nearest face or rib. Other methods of providing temporary supports for this work will be accepted if equivalent protection is provided.

6. Where rehabilitation work is being done, the following temporary support pattern shall apply:

   a. Where bolts are being replaced in isolated instances (such as where equipment has knocked bolts loose) one temporary support shall be installed within a radius of 2 feet from each bolt to be replaced.

   b. Where crossbars or roof bolts are being installed in an area where roof failure is indicated, a minimum of two rows of temporary supports shall be installed on not more than 5 foot centers across the place so that the work in progress is done between the installed temporary supports and adequate permanent supports in sound roof.

7. (a) Where loose material is being taken down, a minimum of two temporary supports on not more than 5 foot centers shall be installed between the miner and the material being taken down unless such work can be done from an area supported adequately by permanent roof supports.

(b) To enable miners to perform their duties from a safe position without exposure to falling material, a bar of suitable lenght and design shall be provided on all mobile face equipment, except haulage equipment, and such bar shall be used when prying down loose material. (The length of bar shall be suitable for the area involved in its use, i.e., construction areas, rooffall areas, and other mining areas require a bar of suitable length.)

8. All metal jacks shall be installed with a cap block between the jack and the roof unless an oversize bearing plate of not less than 36 square inches is provided.

9. In each active working place where roof bolts are installed, at least one roof bolt hole shall be drilled to a depth of at least 12 inches above the anchorage horizon of the bolts being used to determine the nature of the strata. Such test holes shall be drilled at intervals not to exceed 200' feet. The test hole shall be either left open for examination or a roof bolt of a length equal to (or greater than) the required test hole depth may be installed and tightened provided adequate anchorage is obtained.

10. (a) Sidecuts shall be started only in areas that are supported with permanent roof supports. Where the installation of additional supports is required prior to starting the sidecut, such supports shall be shown on a sketch. Once the sidecut has been completed, the sidecut shall be supported by either temporary or permanent supports prior to working in the intersection.

(b) During development, except where old workings are involved, mine openings shall not be holed through into unsupported areas. When a mine opening holes through into a permanently supported entry, room, or crosscut, the intersection so created shall be considered unsupported and no work shall be done in or inby such intersection until either:

(i) The newly created opening is permanently supported as indicated in the approved roof control plan, or;

(ii) The newly created opening is timbered off with at least two rows of posts installed on not more than 4 foot centers across the opening.

11. An approved, calibrated torque wrench that will indicate the actual torque on the roof bolts by a direct reading shall be provided on each roof bolting machine in operation.

12. Immediately after the first bolt is installed in each place, the torque shall be tested and thereafter at least one roof bolt out of every four shall be tested by a qualified person. If any of the bolts tested do not fall within the required torque range, the remaining previously installed bolts on this cycle shall be tested.

If the majority of the bolts still fall outside the required torque range, necessary adjustments shall be made immediately. If, after these adjustments are made, the required torque ranges are still not obtained, supplementary supports such as different length roof bolts with adequate anchorage, posts, cribs, or crossbars shall be installed.

13. A spot-check on torques shall be made during each 24-hour period on at least one roof bolt out of every ten from the outby corner of the last open crosscut to the face. Such torque checks are necessary only in advancing sections in working places producing coal during any portion of the aformentioned 24-hour period.

    The results of these tests shall be recorded in the onshift examination book. The record shall show the number of bolts tested and number above and below the required range.

    If the results show that the majority of the bolts are not maintaining at least **150 / *120 foot-pounds of torque or have loaded up to where they exceed 250 foot-pounds or torque, supplementary support such as additional roof bolts, longer roof bolts with adequate anchorage, posts, cribs, or crossbars shall be installed.

14. Posts installed under roof that is cracked, broken, or susceptible to sloughing shall have a wooden cap block, plank, or crossbar between the post and the roof. Where crossbars or planks are installed, they shall be blocked to equally distribute the load across their length.

15. Posts shall be installed tight and on solid footing. Not more than two wooden wedges shall be used to install a post.

16. A supply of suitable roof support material, including temporary supports sufficient to support the roof during one complete cycle of mining, shall be provided as close as practicable to each working face. (Each plan shall specify the location for the supply of such materials.)

17. An additional supply of supplementary roof support material consisting of 20 roof bolts, at least 12 inches longer than the bolt length being used, a minimum of 20 posts of proper length with sufficient cap pieces and wedges, and where applicable, at least 6 crossbars shall be provided. at the dumping point or within 500 feet of the faces, whichever is closer. Tools and equipment necessary to install such support shall be available within this distance. (The 20 roof bolts, 12-inches longer, do not apply to resin installations.)

**Plates directly against roof.
*Plates against wood.

18. A suitable roof sounding device shall be provided with all mobile face equipment, except haulage equipment. If face workmen who are not operators or helpers on such equipment do not carry a roof sounding device, such device shall be available within 50 feet of their working area.

19. (a) Where roof falls have occurred and at all overcasts, boom holes, and other construction sites that require removal of mine roof material, (e.g., by blasting, by ripping with a continuous mining machine, by cutting with a cutting machine, or any other means), the roof shall be considered unsupported. If miners are required to enter such areas, either to travel over the fallen material, to clean it up, or to perform other duties, the roof shall be supported adequately. Mine management shall devise and have posted in writing at the scene of such unsupported roof a plan incorporating the following procedures:

    (i) Such work shall be under the direct and, unless the miners are specially trained to do such work, constant supervision of a certified person.

    (ii) Adequate temporary support on not more than 5-foot centers shall be set at the edge of the fall where work is to be started. A minimum of four posts or jacks shall be used.

    (iii) Temporary support mentioned above shall be replaced by permanent supports (roof bolts and/or posts) and advanced as cleanup work progresses.

    (iv) Bolting or timbering shall proceed from permanently supported roof to the temporary supports before other work is performed and roof supports shall be advanced as the cleanup work progresses.

    (v) Where necessary to load material before support can be set, such loading shall be done from areas of permanent under supported roof at all times.

    (vi) Where feasible, permanent supports shall be placed in the entire fall area before loading starts.

    (b) All roof falls and other areas in the active workings where the mine roof material has been removed from its natural location by any means and is not being cleaned up shall be posted off at each entrance to the area by at least two rows of posts (or the equivalent) installed on not more than 5-foot centers across the opening.

20. On haulageways, all crossbars or beams shall be installed with some means of support that will prevent the beam or crossbar from falling in the event the supporting legs are accidently dislodged. (The District Manager may utilize this requirement, or waive this requirement on a mine-by-mine basis.)

21. Permanent roof supports shall not be recovered unless the operator has included a detailed system for such recovery in the approved roof control plan.

22. Devices such as spherical washers, angle washers, or slotted wood wedges, should be used to compensate for the angle when roof bolts are installed at nagles greater than $5^{o}$ from the perpendicular to the roof line.

23. All roof bolt materials shall be stored and handled in such a manner that will minimize rusting and/or damaging.

NOTE: Part 80, Title 30, Code of Federal Regulations, provides that all unintentional roof falls described therein be investigated and the results of the investigation shall be maintained in accordance with Section 80.23 of Part 80. Such falls shall also be shown on a map of the mine. Failure to do so will be a violation of Part 80.

## SAFETY PRECAUTIONS FOR CONVENTIONAL PLANS

1. This is the minimum roof control plan and was formulated for normal roof conditions while using the mining system(s) described. In areas where subnormal roof conditions are encountered, indicated or anticipated, the operator shall provide additonal support where necessary. If changes are to be made in the mining system that necessitates any change in the roof control plan, the plan shall be revised and approved prior to implementing the new mining system.

2. All personnel required to install roof supports shall be trained by a qualified supervisor designated by mine management before being assigned to perform such work. This training shall insure that such persons are familiar with the functions of the support being used, proper installation procedures, and the approved roof control plan.

   Supervisors in charge and miners who install supports shall be informed of and approved roof control plan and any change in a previously approved roof control plan no later than their first working shift following receipt of the approved plan. As soon as possible, but not later than three weeks after receipt of this approved plan, all previsions contained herein shall be fully explained to all miners whose duties require them to be on a "working section". All new miners shall have the hazards of mine roof and ribs and the content of this plan explained to them before they start to work.

3. (a) Upon completion of the loading cycle, a reflectorized warning device, such as a "stop" sign, shall be conspicuously placed to warn persons approaching any area that is not permanently supported. It is to be emphasized that the warning device has been placed to cause the person to stop, examine, and evaluate the roof and rib conditions prior to entering the area--even after temporary supports have been installed.

   (b) Where required, temporary support shall be installed immediately after the loading cycle is completed.

   (i) Except when the District Manager has determined that more than 5 minutes are needed, "immediately" is interpreted to mean that the installation of such temporary supports shall be started not later than 5 minutes after mining of the cut is completed and, after the installation of such supports is started, the installation of supports shall be continued until at least the minimum member are installed as required in the approved plan.

(c) Only those persons engaged in installing temporary supports shall be allowed to proceed beyond the last row of permanent supports until temporary supports are installed. Before any person proceeds inby permanently supported roof, a thorough visual examination of the unsupported roof and ribs shall be made. If the visual examination does not disclose any hazardous condition, persons proceeding inby permanent supports for the purpose of testing the roof by the sound and vibration method and installing suppports shall do so with caution and shall be within 5 feet (less if indicated on Sketch Nos. ) of a temporary or permanent support. If hazardous conditions are detected, corrective action shall be taken to give adequate protection to the workmen in the area involved.

4. Work such as extending line curtains, other ventilating devices or making methane tests inby the permanent supports shall not be done unless a minimum of two temporary supports is installed. This minimum is applicable only if they are within 5 feet of the face or rib and the work is done between such supports and the nearest face or rib. Other methods of providing temporary supports for this work will be accepted if equivalent protection is provided.

5. (a) Where loose material is being taken down, a minimum of two temporary supports on not more than 5-foot centers shall 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.

   (b) To enable miners to perform their duties from a safe position without exposure to falling material, a bar of suitable length and design shall be provided on all mobile face-equipment, except haulage equipment, and such bar shall be used when taking down loose material. The length of bar shall be suitable for the area involved in its use. (i.e., construction areas, roof falls, and other mining areas require a bar of suitable length.)

6. All metal jacks shall be installed with a cap block between the jack and the roof unless an oversize bearing plate of not less than 36 square inches is provided.

7. The roof in the face of an entry or room shall be supported according to the approved plan before any side cuts are started. A sketch shall be attached showing roof supports, such as radius turn posts, to be installed before any sidecut is started.

8. All posts installed under roof that is cracked, broken or susceptible to sloughing shall have a wooden cap block, plank, or crossbar between the post and the roof. Where crossbars or planks are installed, they shall be blocked to equally distribute the load across their length.

9. A supply of suitable roof support material, including temporary supports, sufficient to support the roof during one complete cycle of mining shall be provided as close as practicable to each working face. (Each plan shall specify the location for the supply of such materials.)

10. Posts shall be installed tight and on solid footing. Not more than two wooden wedges shall be used to install a post.

11. An additional supply of supplementary roof support material shall be provided at the dumping point or within 500 feet of the faces, whichever is closer. Such supplementary support shall consist of at least 20 posts of proper length with sufficient cap pieces and wedges and a minimum of two crossbars for each active place or at least six per section. Where spot roof bolting has been incorporated in the roof control plan, at least 50 roof bolts of the approved length or longer shall be provided and such roof bolts may be used in lieu of the crossbars. If such bolts are used, the approved spot bolting plan shall be compiled with. Tools and equipment necessary to install such supports shall be available within the above specified distance.

12. A suitable roof sounding device shall be provided with all mobile face equipment, except haulage equipment. If face workmen who are not operators or helpers on such equipment do not carry a roof sounding device, such device shall be available within 50 feet of their working area.

13. When an opening is no longer needed for storing of supplies or for travel of equipment, the roof at the entrance of all such openings along travelways shall be supported by extending the post line across the opening.

14. (a) Where roof falls have occured and at all overcasts, boom holes, and other construction sites that require removal of mine roof material, (e.g., by blasting, by ripping with a continuous mining machine, by cutting with a cutting amchine, or any other means), the roof shall be considered unsupported. If miners are required to enter such areas, either to travel over the fallen material, to clean it up, or to perform other duties,the roof shall be supported adequately. Mine management shall devise and have posted in writing at the scene of such unsupported roof a plan incorporating the following procedures:

    (i) Such work shall be under the direct and, unless the miners are specially trained to do such work, constant supervision of a certified person.

    (ii) Adequate temporary support on not more than 5-foot centers should be set at the edge of the fall where work is to be started. A minimum of four posts or jacks shall be used.

    (iii) Temporary support mentioned above shall be replaced by permenent supports and advanced as cleanup work progresses.

(iv) Installation of supports shall proceed from permanently supported roof to the temporary supports before other work is performed and roof supports shall be advanced as cleanup work progresses.

(v) Where necessary to load material before support can be set, such loading shall be done from areas of permanent support with the operator and other persons in the area under supported roof at all times.

(vi) Where feasible, permanent supports shall be placed in the entire fall area before loading starts.

(b) All roof falls in active working areas and other areas of unsupported roof that are not being cleaned up shall be posted off at each entrance to the fall and unsupported areas by at least two rows of posts (or the equivalent) installed on not more that 5-foot centers across the opening.

15. During development, except where old workings are involved, mine openings shall not be holed through into unsupported areas. When a mine opening holes through into a permanently supported entry, room, or crosscut, the intersection so created shall be considered unsupported and no work shall be done in or inby such intersection until either:

(a) The newly created opening is permanently supported as indicated in the approved roof control plan, or:

(b) The newly created opening is timbered off with at least two rows of posts installed on no more than 4-foot centers across the opening.

16. Permanent roof supports shall not be recovered unless the operator has included a detailed system for such recovery in the approved roof control plan.

NOTE: Part 50, Title 30, Code of Federal Regulations, provides that all unintentional roof falls described therein shall be investigated and the results of the investigation shall be maintained in accordance with Section 50.11, 30 CFR, Part 50. Such falls shall also be shown on a map of the mine. Failure to do so will be a violation of Part 50.

## SPOT BOLTING SAFETY PRECAUTIONS TO BE TAKEN

1. Spot roof bolting shall be used only as a supplement to the approved roof control plan.

2. In addition to permanent posts, at least two (four at intersections) temporary supports on not more than 5-foot centers shall be installed before roof bolts are installed at spot locations. (Each plan should indicate the location of such temporary supports.)

3. Roof bolts (spot bolting) shall be installed in accordance with roof conditions, but in no case, shall spacing exceed 4-feet lengthwise and crosswise. Where roof bolts are installed at spot locations, roof bolting shall begin nder safe roof and continue for the length of the adverse roof condition until safe roof is again encountered.

4. An approved calibrated torque wrench that will indicate the actual torque on the roof bolts by a direct reading shall be provided on each roof bolting machine in operation.

5. Immediately after the first bolt is installed in eac h place, the torque shall be tested and thereafter at least one roof bolt out of every four shall be tested by a qualified person. If any of the bolts tested do not fall within the required range, the remaining perviously installed bolts on this cycle should be tested.

   If the majority of the bolts still fall outside the required torque range, necessary adjustments shall be made immediately. If, after these adjustments are made, the required torque ranges are still not obtained, supplementary supports such as different length roof bolts with adequate anchorage, posts, cribs, or crossbars shall be installed.

6. When roof bolts (spot bolting) are installed inby the outby corner of the last open crosscut, a spot-check on torques shall be made during each 24-hour period on at least one out of every ten roof bolts installed in such area. Such torque checks are necessary only on advancing sections in working places producing coal during any portion of the aforementioned 24-hour period.

   The results of these tests shall be recorded in the onshift examination book. The record should show the number of bolts tested and number above and below the required range.

   If the results show that the majority of the bolts are not maintaining at least ** 150 / * 120 foot-pounds of torque or have loaded up to where they exceed 250 foot-pounds of torque, supplementary support such as additional roof bolts, longer roof bolts with adequate anchorage, posts, cribs, or crossbars shall be installed.

7. Devices such as spherical washers, angle washers, or slotted wood wedges, shall be used to compensate for the angle when roof bolts are installed at angles greater that 5° from the perpendicular to the roof line.

8. All roof bolt materials shall be stored and handled in such a manner that will minimize rusting and/or damaging.

9. At locations where roof bolts are installed (spot bolting), the first roof bolt hole shall be drilled to a depth of at least 12 inches above the anchorage horizon of the bolts intended for use to determine the nature of the strata. If the area to be bolted exceeds 100 feet, additional test holes shall be drilled at inervals not to exceed 200 feet.

** Plates used directly against roof.
* Plates used aginst wood.

## SAFETY PRECAUTIONS FOR RESIN GROUTED RODS

1. Persons responsible for installation of resins shall be instructed in safe handling precautions for such materials.

2. The relationship between the hole dimensions, rod size, and the size and number of resin cartridges is critical; therefore, adequate training and supervision shall be provided to assure proper installation.

3. All safety precautions required in the regular roof control plan shall apply--except Nos. _____. (The torque checks specified for conventional roof bolts do not apply.)

4. Resin grouted rods shall be installed as soon as possible (to be determined on a mine-to-mine basis--normally not more than 8 hours) after the working place is exposed. Where required, temporary supports shall be installed immediately after the loading cycle is completed unless roof bolting machines are equipped with acceptable automated supports.

   (a) Except when the District Manager has determined that more than 5 minutes are needed, "immediately" is interpreted to mean that the installation of such temporary supports shall be started not later that 5 minutes after mining of the cut is completed and, after the installation of such supports is started, the installation of supports shall be continued until at least the minimum number are installed as required in the approved plan.

5. Resin grouted rods and conventional roof bolts shall not be intermixed unless they are either used as supplementary support or a systematic plan has been approved by the District Manager for combining the two roof support systems.

6. Drill steel shall be equivalent in length to the rods used or adequately marked to assure the proper hole depth. Each drill hole shall be filled the entire length with resin.

7. (a) All resin grouted rods shall be used with bearing plates approved for use at the mine.

   (b) Bearing plates shall be installed tight against the mine roof.

8. (a) The resin shall not be used if manufacturer's recommended shelf life is exceeded.

   (b) Resin packages shall be protected form excessive heat and cold during storage, and shall not be used in areas where the ambient temperature falls outside the range recommended by the manufacturer.

(c) Broken cartridges of resin or cartridges that show signs of deterioration shall be removed from the underground portion of the mine.

(d) Resin grouted rods shall be installed in accordance with the manufacturer's recommendations.

9. For test purposes the first resin grouted rod installed in each cycle in each working place, after a minimum curing time of 10 minutes, shall be checked with a torque wrench after installing the first line of permanent support and prior to removing any temporary supports. The torque applied should be 150 foot-pounds. Should the rod turn in the hole, a second rod shall be tested in the same manner. If this rod also turns, resin installation shall be discontinued until reasons for failure of the resin is determined. (A click type torque wrench is recommended for this test.)

## SAFETY PRECAUTIONS--SPECIAL ROOF CONTROL PLAN

Because the number of mines having a special roof control plan is minimal and the latitude of variation in requirements peculiar to special roof control plans is so great, it is believed that safety precautions to be included in such plans shall be formulated on a mine-to-mine basis.

AUTOMATED TEMPORARY ROOF SUPPORT (ATRS) SAFETY PRECAUTIONS

A.

| | Roof Bolter Manufacturer | Model Number | Serial Number | Minimum Load Carrying Capacity |
|---|---|---|---|---|
| 1. | LEE NORSE | TD1-43 | 3624 | 8000 |
| 2. | | | | |
| 3. | | | | |
| 4. | | | | |
| 5. | | | | |

B. A registered professional engineer shall certify that each ATRS is capable of supporting the above minimum load carrying capacities. Evidence of the certification shall be furnished by attaching a plate, label, or other appropriate marking to the ATRS system. Written evidence of this certification shall be retained by the operator

C. Two safety jacks must be kept on the bolting machine at all times to be used when adverse roof conditions are encountered and the automated support does not supply adequate protection for the bolter operator.

D. No one shall proceed inby the automated temporary support system unless a minimum of 2 temporary supports are installed. This minimum is applicable only if the supports are not more than 5 feet apart, within 5 feet of permanent support, face, or rib and the work is done between such supports and the nearest face or rib.

E. Holes will not be drilled or bolts will not be installed to the left or right of the outer roof contact points of the automated temporary support system unless the coal rib or a temporary support is within 5 feet of these contacts.

F. The automated temporary support system shall be placed firmly against the roof not more than 5 feet inby the last row of permanent supports, before any person proceeds inby permanent support.

G. There will be no installation of roof bolts inby the temporary roof support.

H. The controls necessary to position and set the automated support shall be located in such a manner that they can be operated from under permanent support.

I. A check valve or equivalent protection shall be incorporated in the automated temporary support system to eliminate the danger of collapse through sudden loss of hydraulic fluid from a broken hose.

J. The temporary roof supports as required in the approved roof control plan do not apply where the roof bolting machine is equipped with the acceptable ATRS system. This does not preclude the use of temporary supports where needed to make necessary tests or for ventilation purposes.

K. The drawing in figure D shows how the ATRS system shall be positioned and re-positioned as bolting progresses, and shows the sequence of installation of roof bolts in a typical face area.

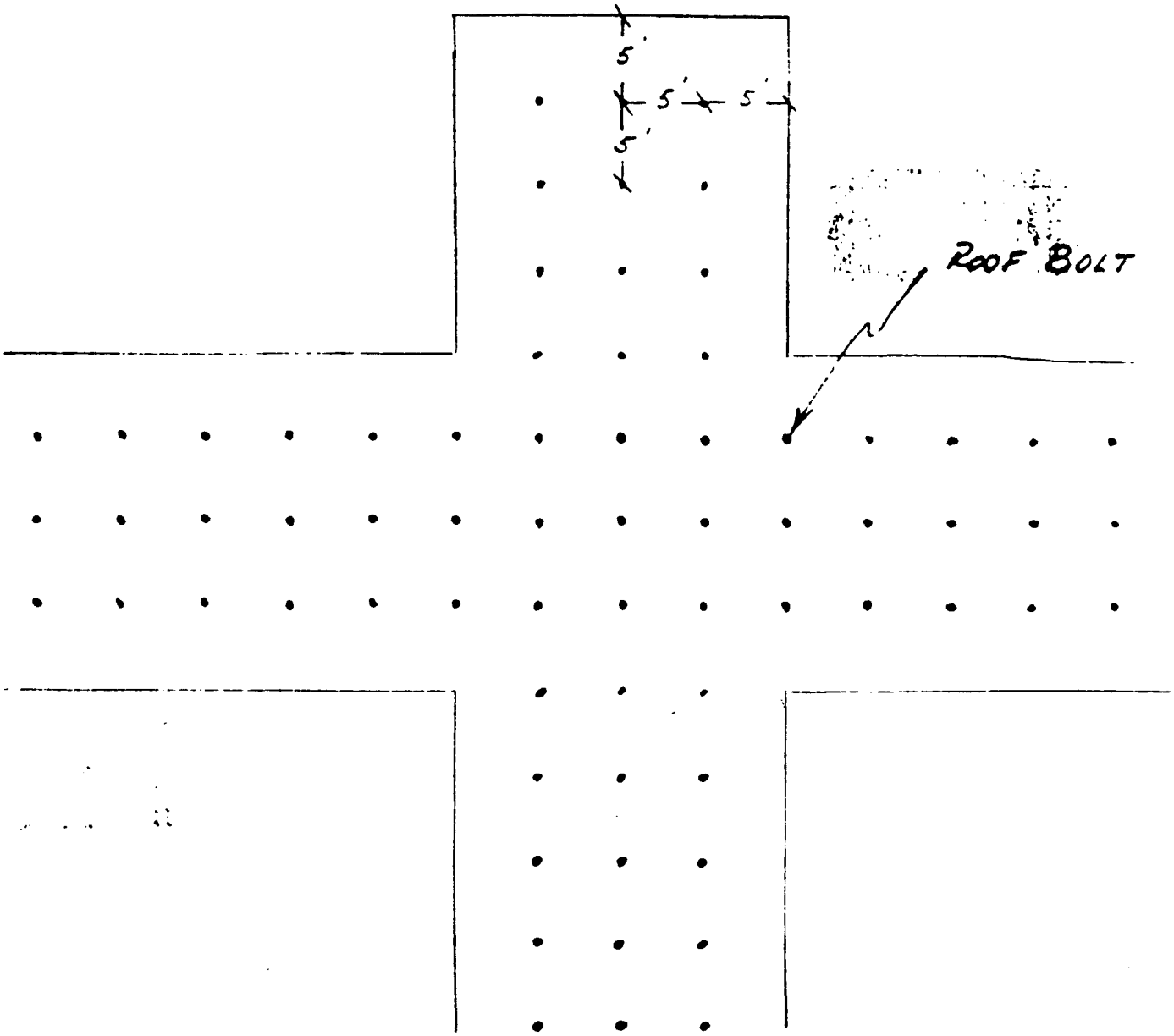
L. The drawing in figure D shows in plan view, the ATRS safety arm support and roof contact devices, with dimensions.

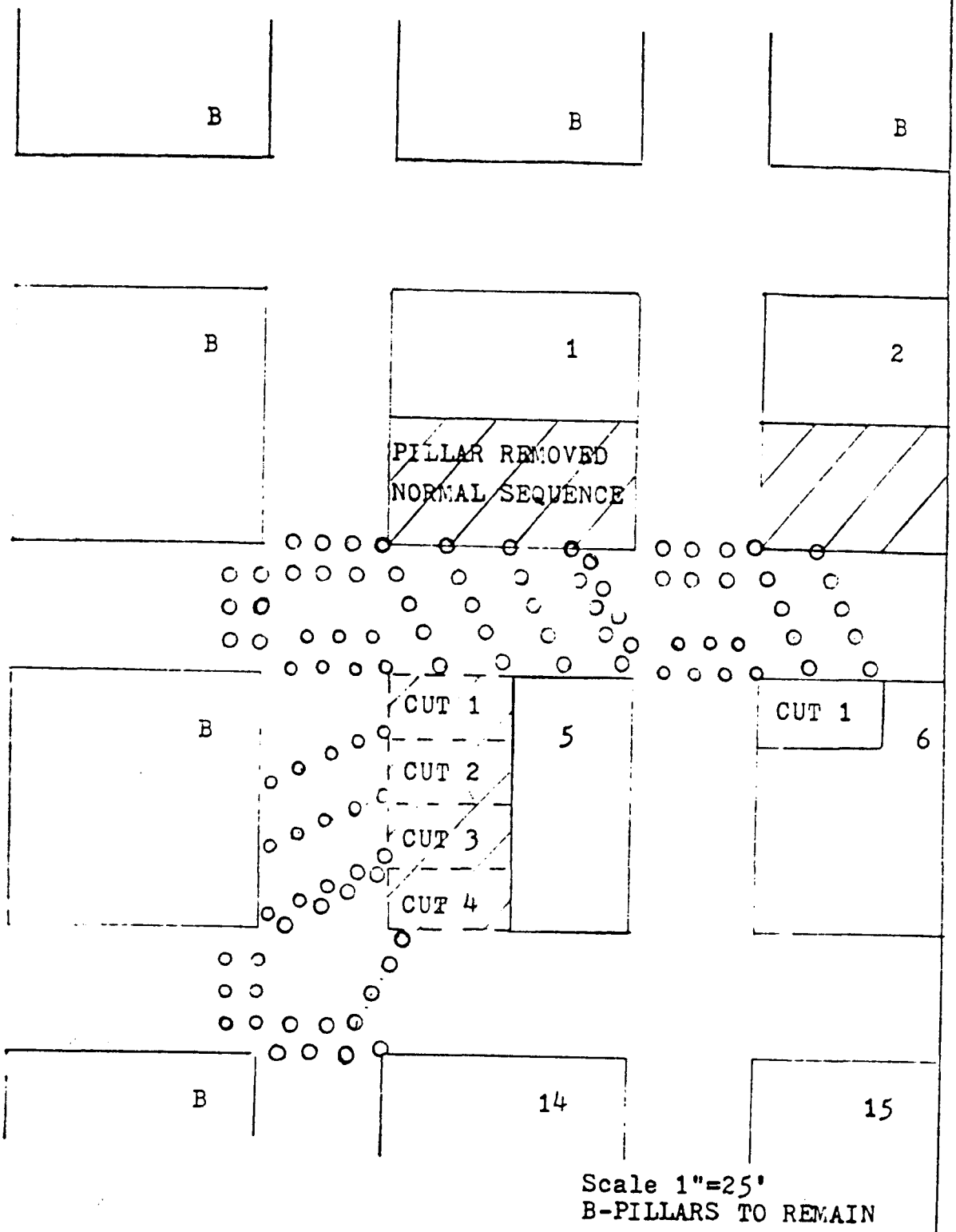
M. It should be noted that certification or approval of an ATRS by equipment manufacturers does not constitute approval of an ATRS system in lieu of temporary supports. Only the District Manager or his representative can approve an ATRS system in lieu of temporary supports.

CHKD BY ..... DATE .....

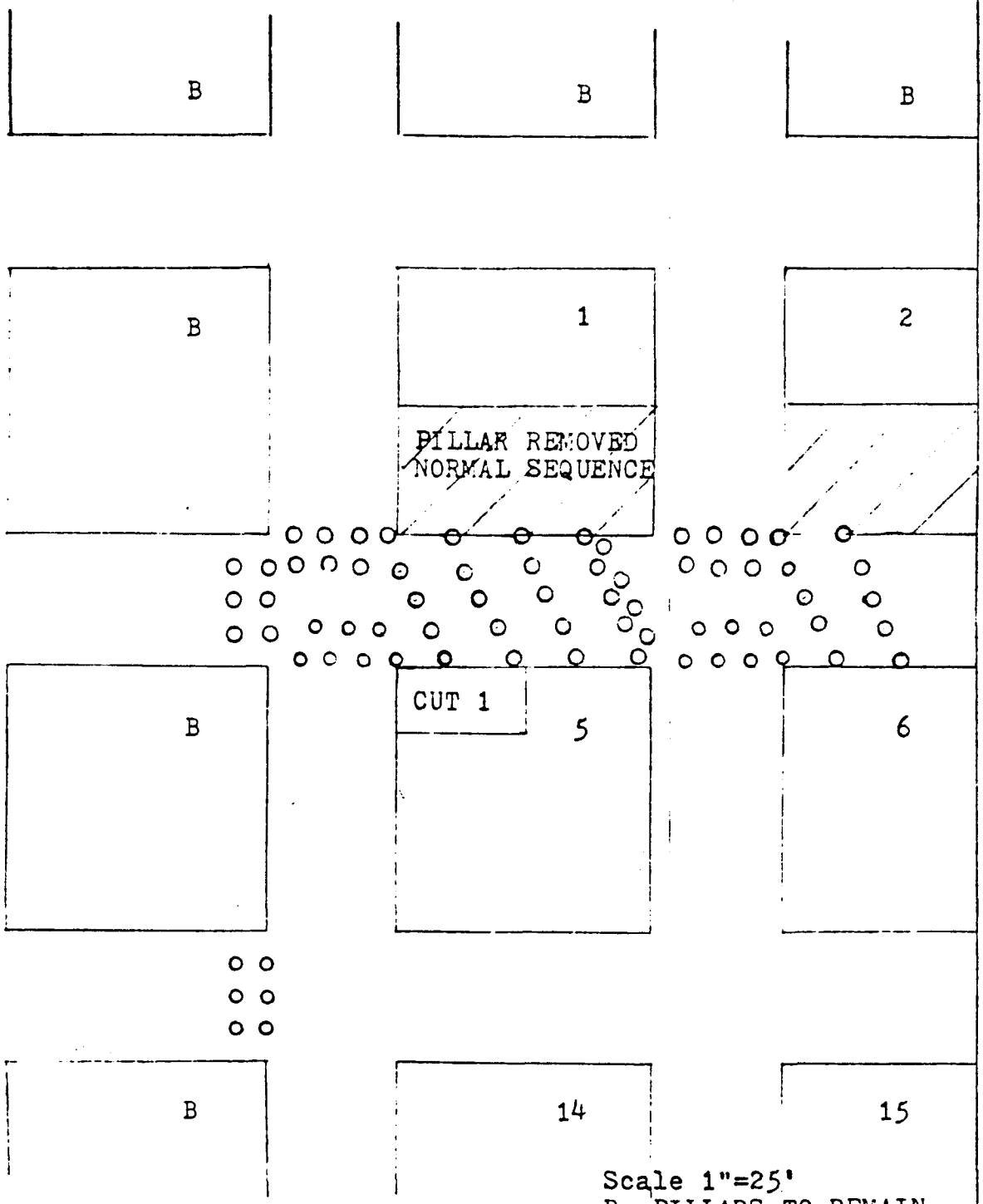
JOB NO. .....

SCALE 1" = 10'



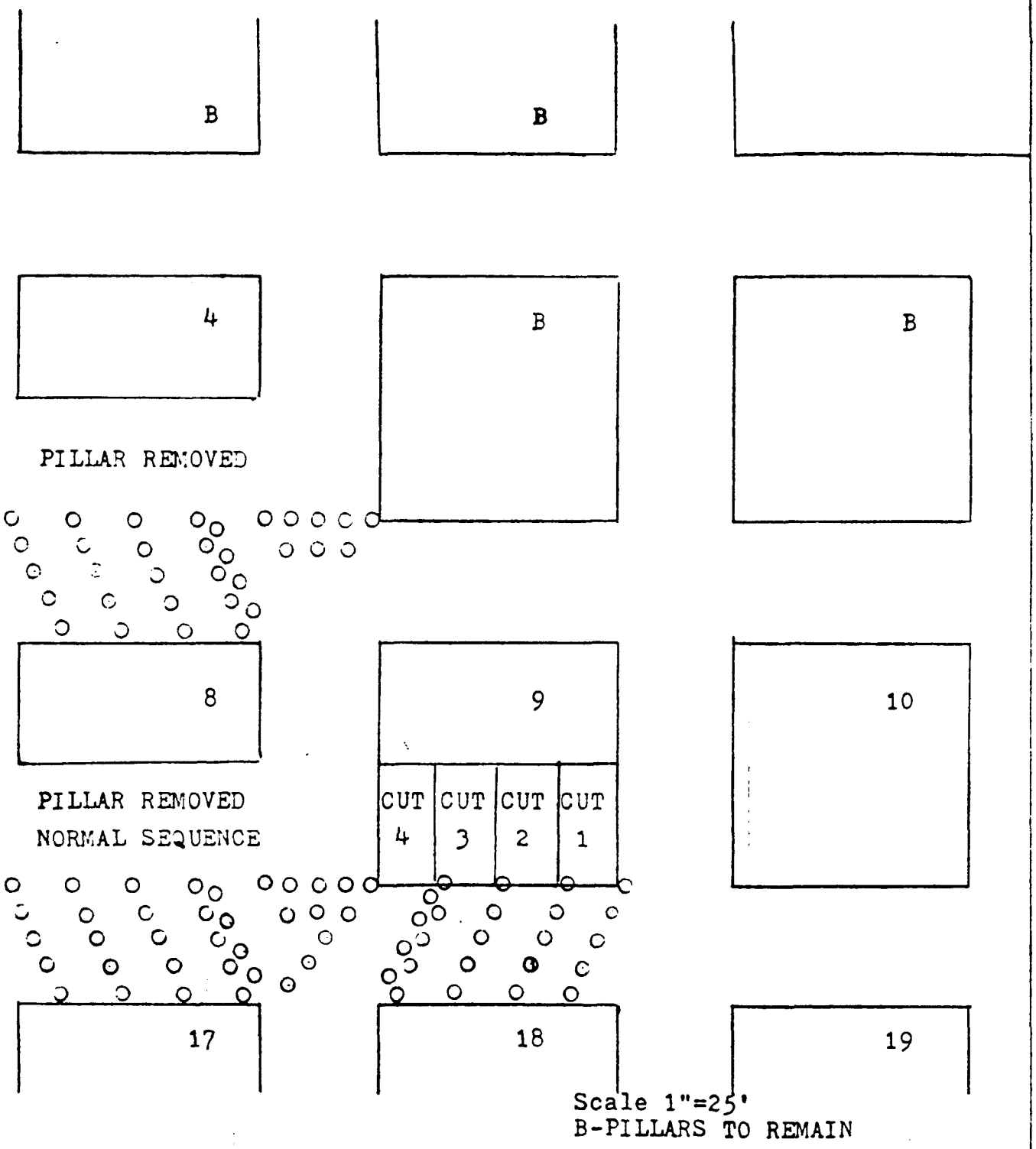



PILLAR "5" HAS BEEN MINED AND THE SAME SEQUENCE WILL BE FOLLOWED ON PILLAR "6" OR THE FRONT HALF MAY BE REMOVED AS SHOWN ON PAGES 2 THRU 5.



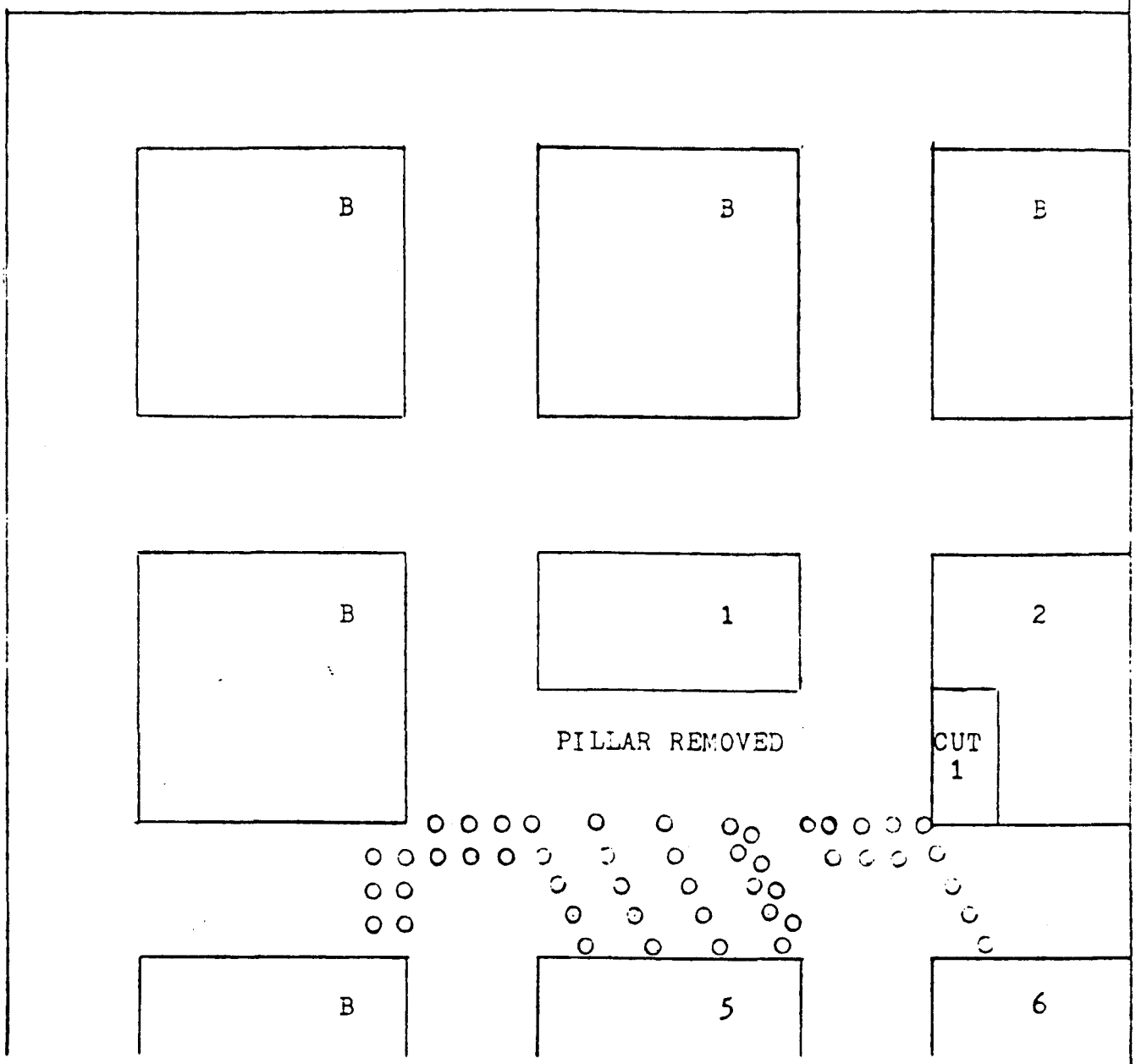

Scale 1"=25'
B- PILLARS TO REMAIN

THE SIDE OF THE PILLAR MAY BE MINED AS SHOWN ON PAGES 7 AND 8 AS LONG AS THE COMPLETE ROW IS REMOVED FROM THE SAME DIRECTION. THE EXAMPLE SHOWN ILLUSTRATES THE TIMBERING AND MINING SEQUENCE TO BE USED.



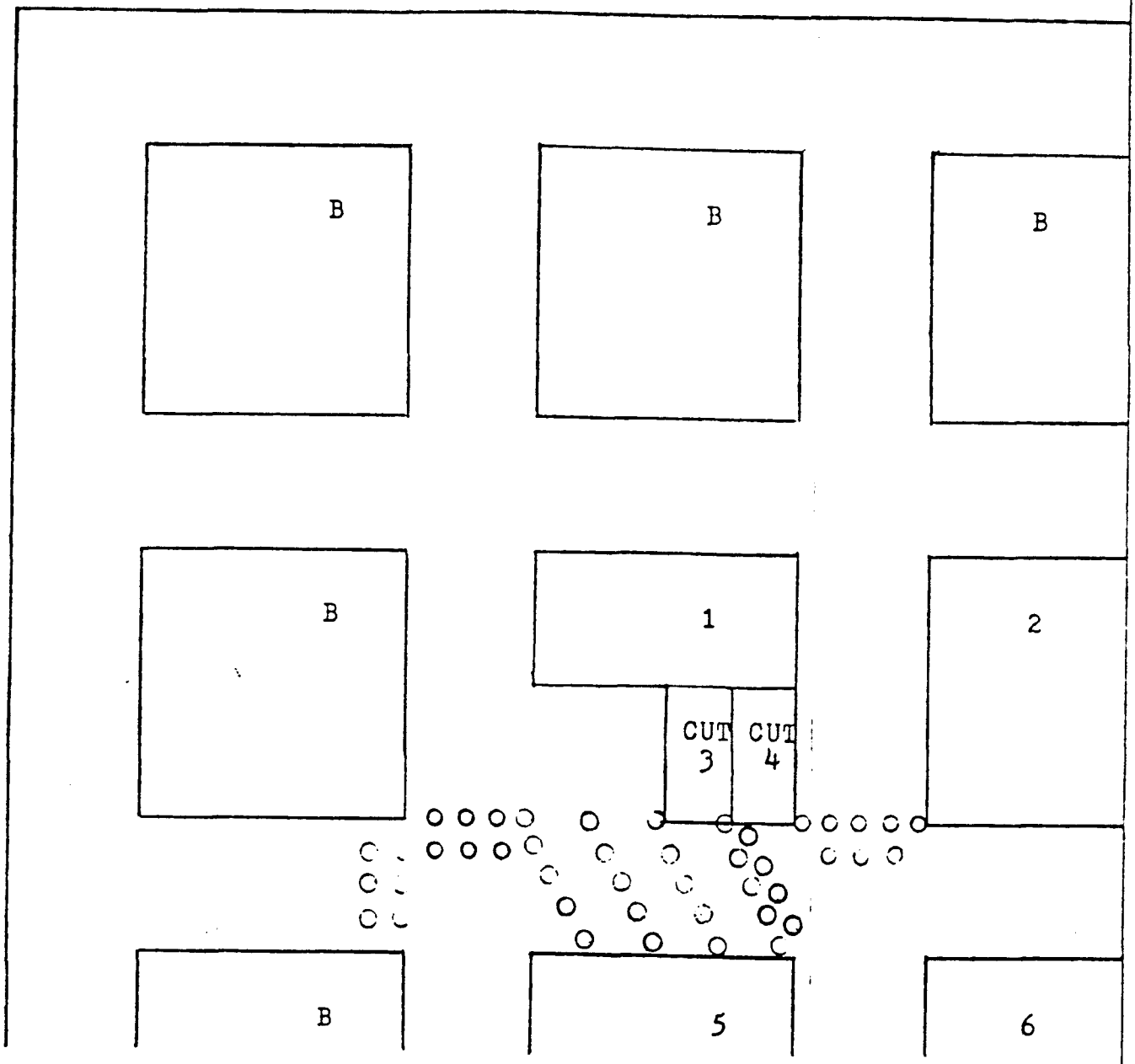

Scale 1"=25'
B-PILLARS TO REMAIN

THIS PILLAR REMOVAL SEQUENCE WILL BE AVAILABLE FOR AREAS OF ADVERSE ROOF CONDITIONS THAT MAY BE ENCOUNTERED, AS SHOWN ABOVE THE NORMAL SEQUENCE COULD NOT BE USED ON PILLAR "9". THE NEXT PILLAR WILL BE REMOVED UNDER THE NORMAL PROCEDURE AS SHOWN ON PAGES 1-5.

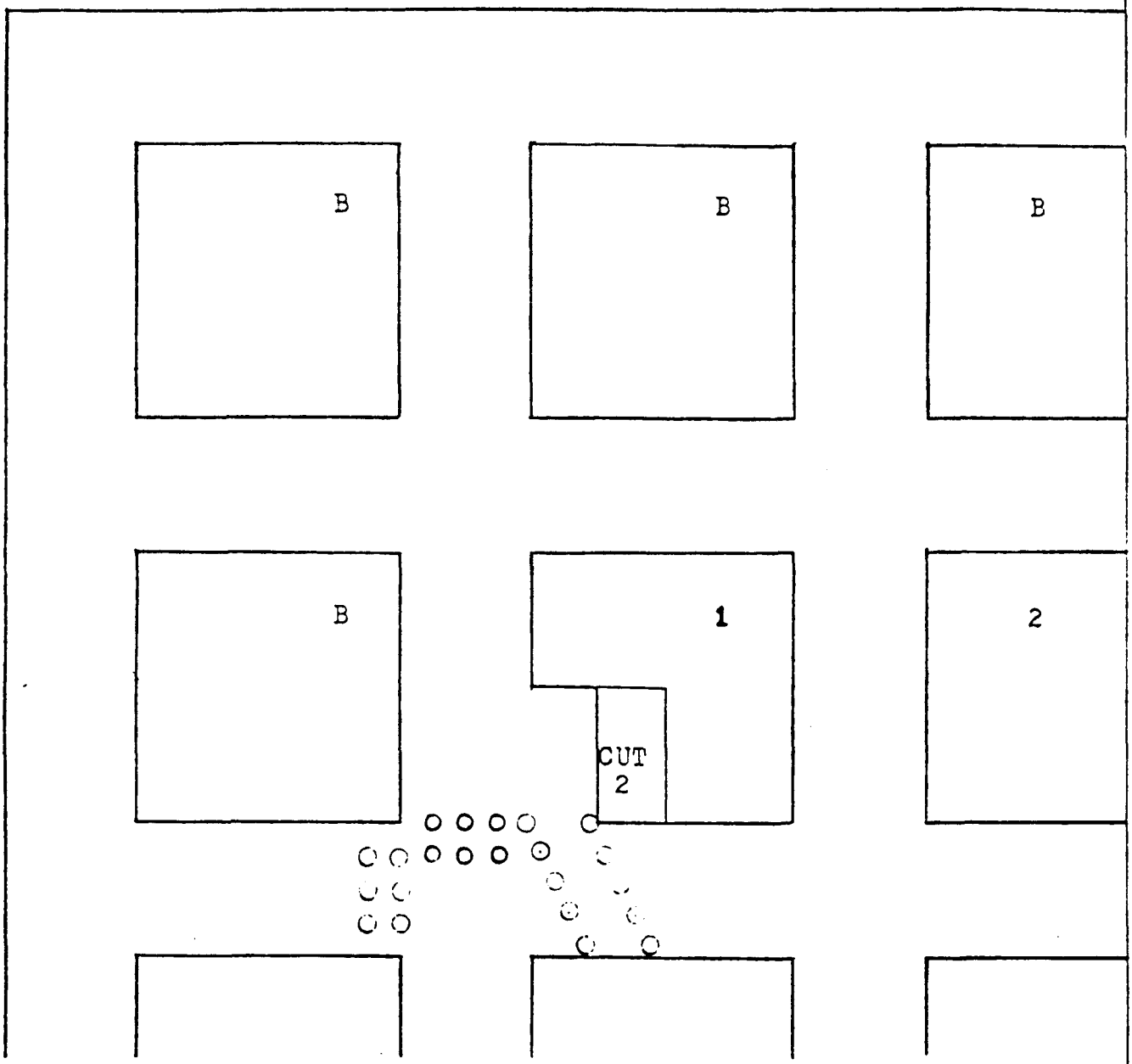



Scale 1"=25'
B-PILLARS TO REMAIN

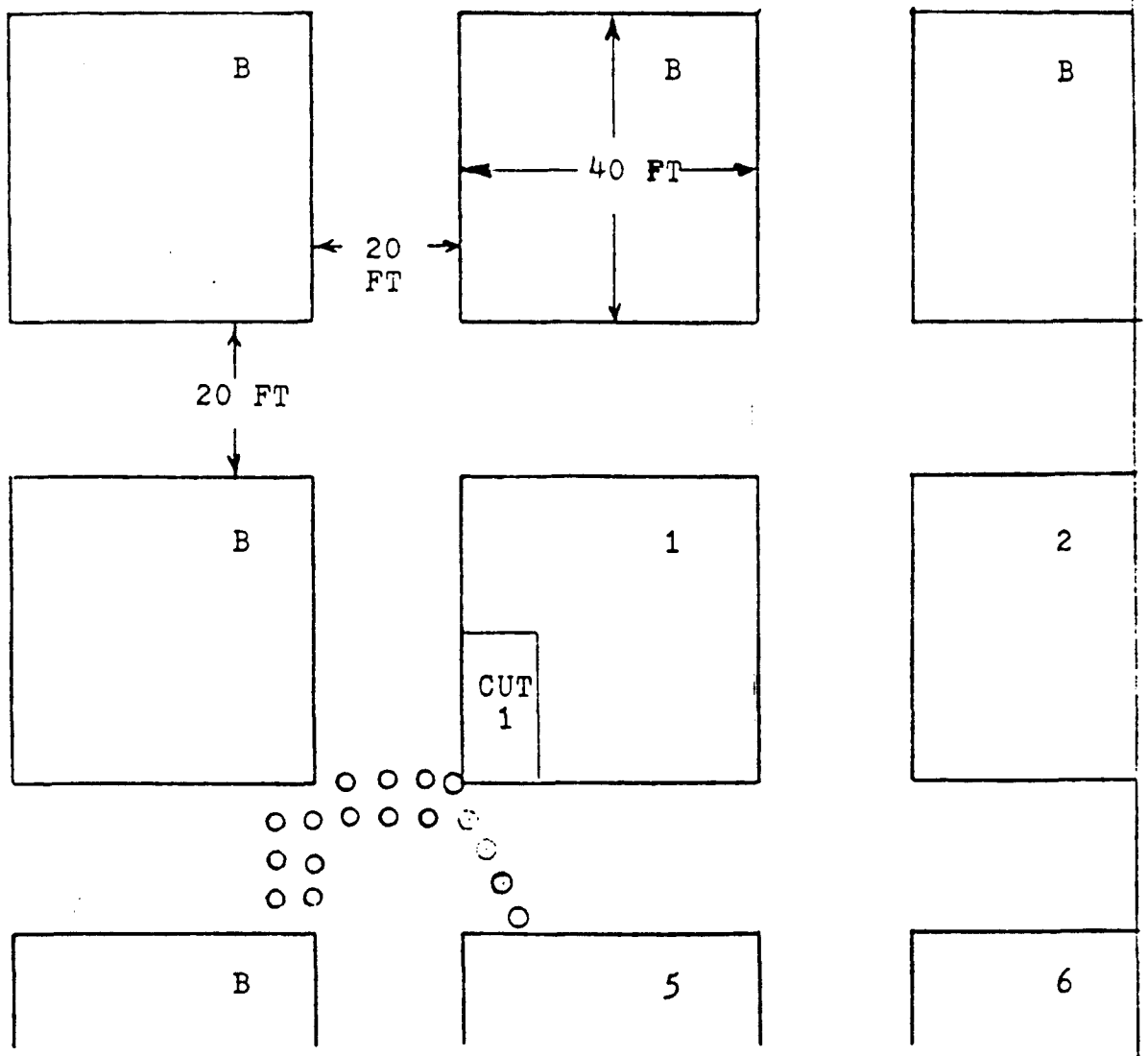
THE PILLAR REMOVAL SEQUENCE HAS BEEN COMPLETED FOR PILLAR "1". PILLAR "2" WILL BE REMOVED IN A SIMILAR MANNER, AS ONE POSSIBLE EXAMPLE WITH THE FRONT HALF AGAIN BEING REMOVED.
IF ADVERSE CONDITIONS ARE ENCOUNTERED, THE REMOVAL SEQUENCE MAY BE CHANGED AS SHOWN ON THE FOLLOWING PAGES.




Scale 1"=25'
B-PILLARS TO REMAIN




Scale 1"=25'
B- PILLARS TO REMAIN




Scale 1"=25'
B-PILLARS TO REMAIN
O-TIMBERS

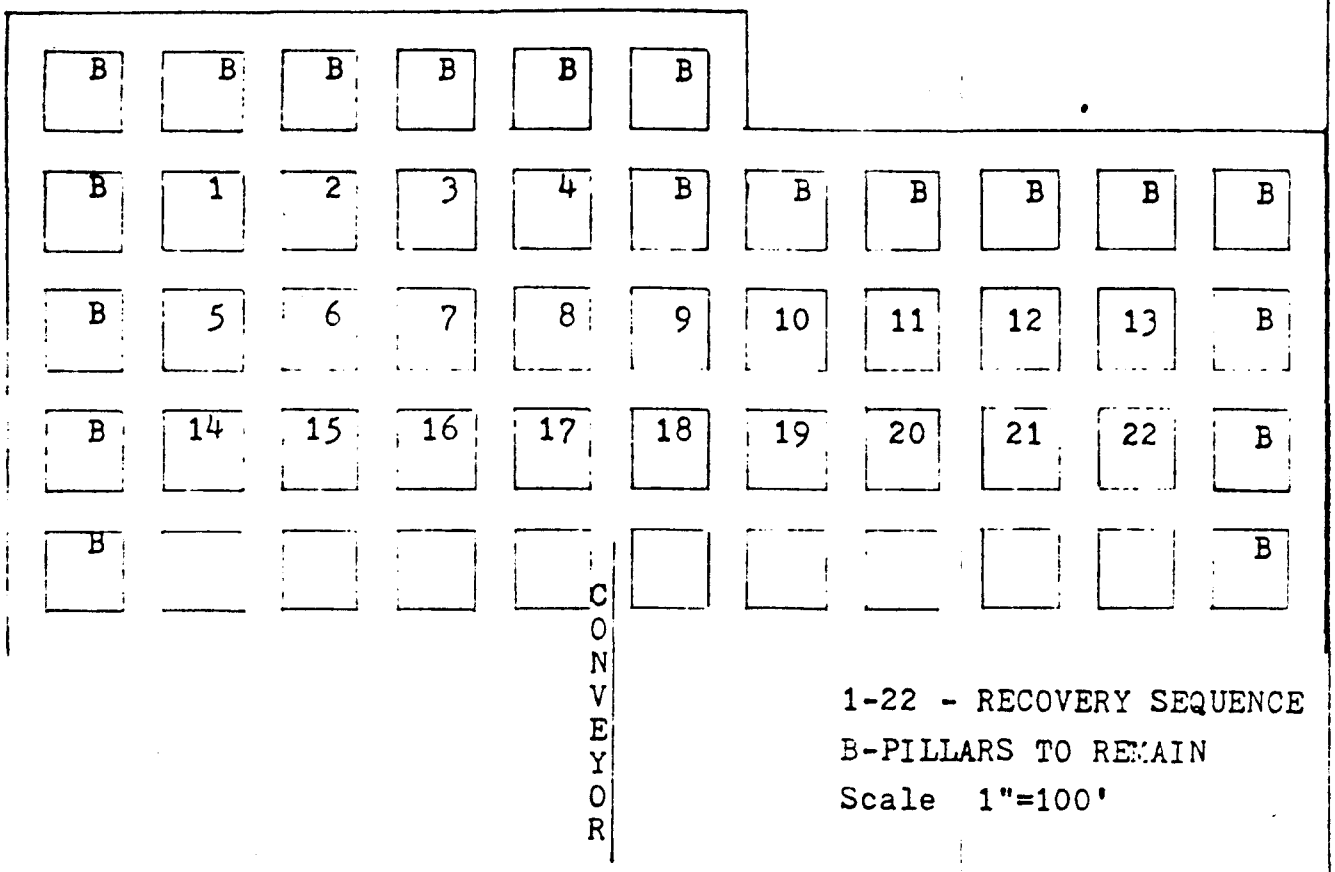
ALL ENTRIES HAVE BEEN BOLTED ON A FIVE FOOT BOLTING PATTERN AS INCLUDED IN THE CURRENTLY APPROVED ROOF SUPPORT PLAN.

TIMBERS REQUIRED FOR PILLAR EXTRACTION WILL BE PLACED ON FIVE FOOT CENTERS.

NO PART OF THE MINING MACHINE OPERATOR'S BODY OR LIMB WILL PROCEED INBY PERMANENT SUPPORT.

THE CUTS MADE INTO THE PILLAR WILL BE AS CLOSE TO PERPENDICULAR AS PRACTICAL WHICH MAY MOVE THE TURN TIMBERS FROM THAT SHOWN ABOVE.

PANEL NO. 1
SOUTH OFF WEST MAINS




1-22 - RECOVERY SEQUENCE
B-PILLARS TO REMAIN
Scale 1"=100'

THIS PILLAR RECOVERY PLAN IS A SUPPLEMENT TO THE ROOF CONTROL PLAN CURRENTLY ON FILE WHICH DOES NOT INCLUDE ANY PROVISIONS FOR PILLAR RECOVERY. THE PILLARS DEVELOPED TO THE SOUTH OFF FROM THE MAIN EAST-WEST ENTRIES WERE DRIVEN ON 60 FOOT CENTERS WITH 20 FOOT ENTRY WIDTHS. A SCALE DRAWING OF THIS AREA IS SHOWN ABOVE.

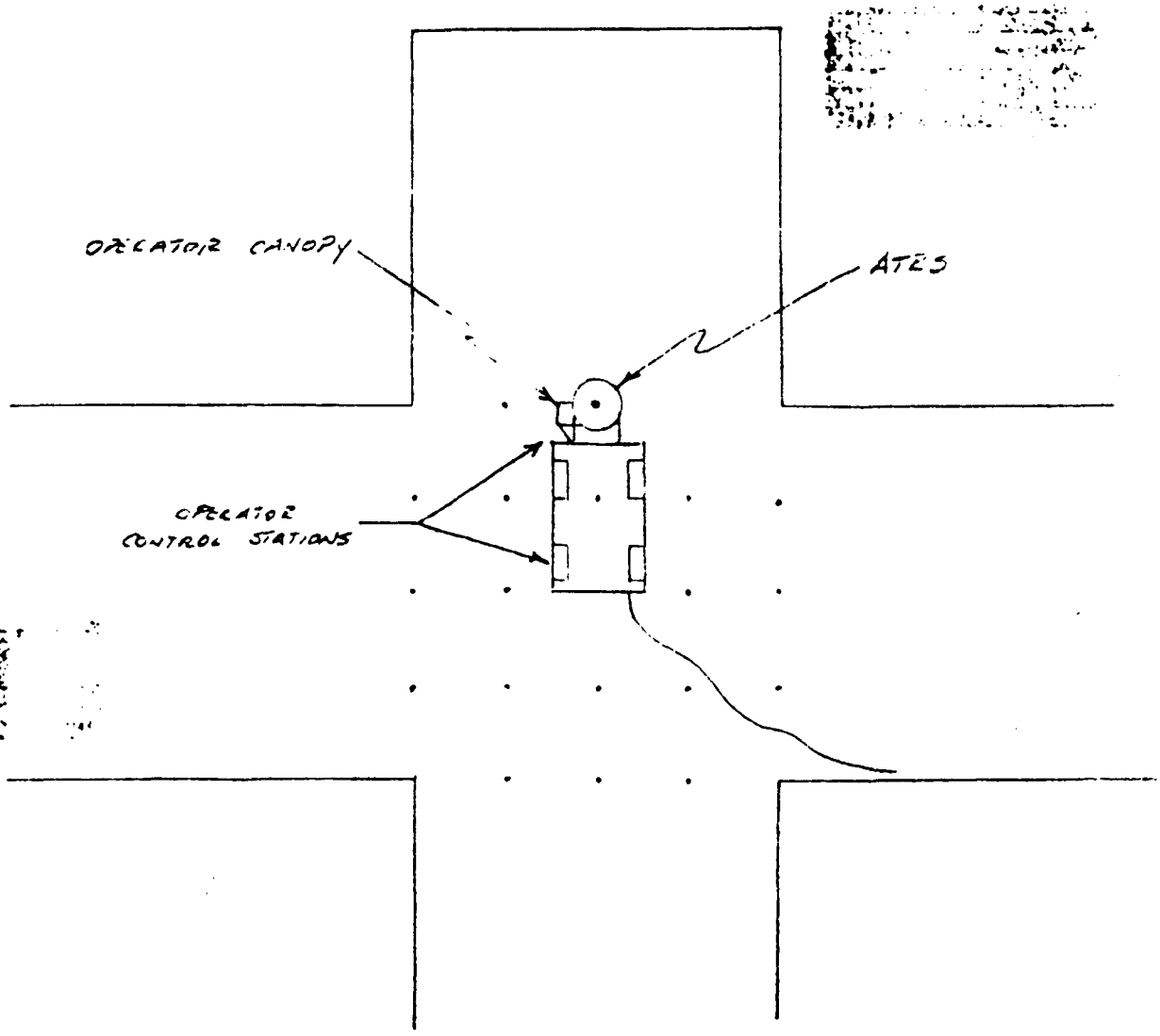
THE PERIMETER PILLARS WILL BE LEFT INTACT TO PROVIDE ADEQUATE SUPPORT FOR THE BLEEDER ENTRY (PILLARS ARE LABELLED AS "B"). THE REMAINING PILLARS WILL BE REMOVED IN THE ORDER SHOWN ABOVE AND IN ACCORDANCE WITH THIS RECOVERY PLAN.

ABOVE IS THE NORMAL PILLARING SEQUENCE. UNUSUAL CONDITIONS SUCH AS WATER, ADVERSE ROOF OR PILLAR SIZE MAY DICTATE A CHANGE IN THE SEQUENCE TO PROTECT MINERS. A PILLAR ROW MAY BE STARTED FROM THE RETURN SIDE PROVIDED A COMPLETE ROW IS PULLED IN THE SAME DIRECTION.

NO ONE WILL BE ALLOWED PAST THE LAST MEANS OF ROOF SUPPORT INTO AN AREA OF UNSUPPORTED ROOF.

CHKD. BY ..... DATE ..... BOLT INSTALLATION ..... JOB NO .....

SCALE 1" = 10'

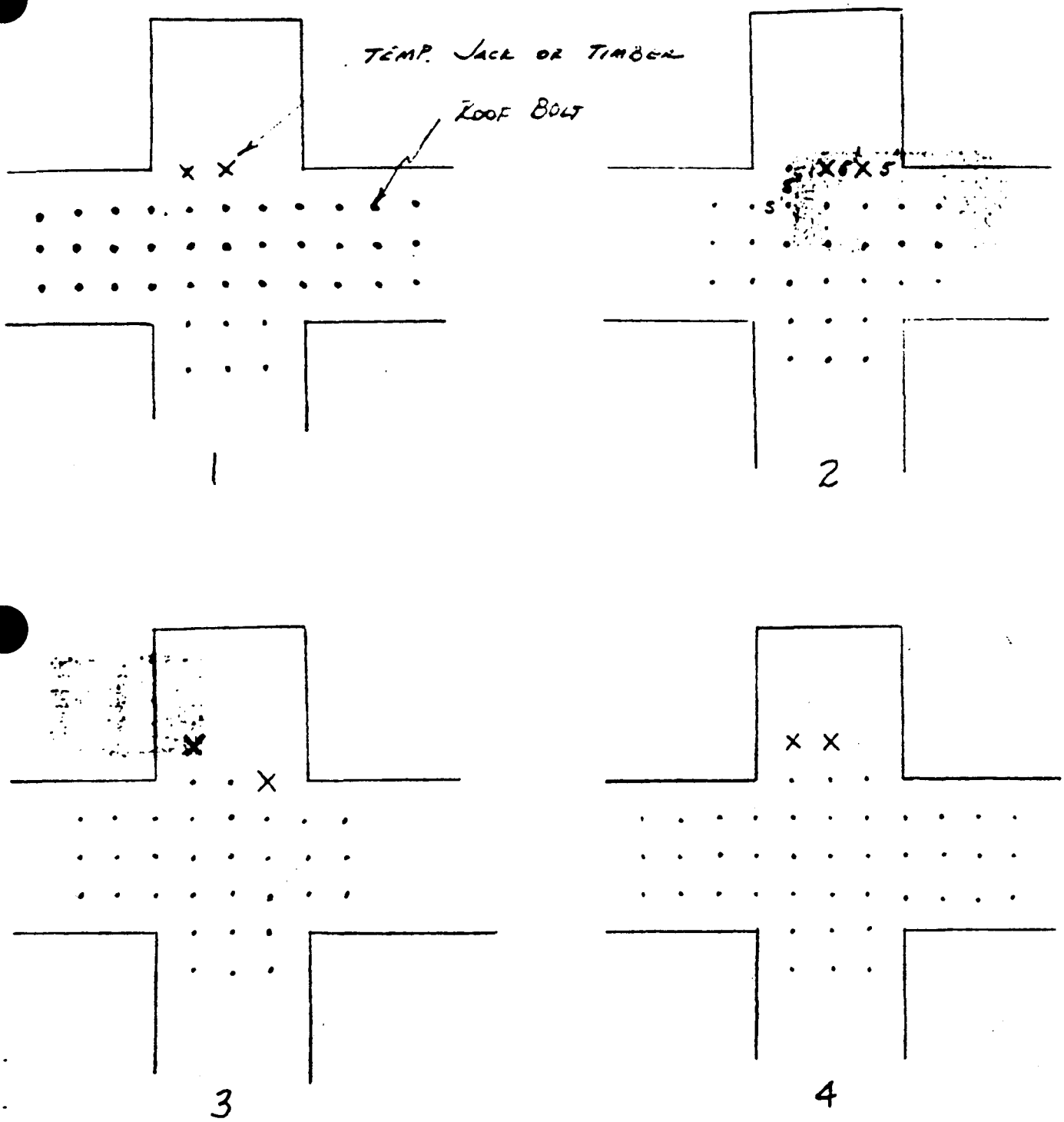



NOTE: ATRS MOVES TO NEXT BOLT IN SEQUENCE

SEQUENCE PROCEEDS LEFT TO RIGHT OR RIGHT TO LEFT [illegible] ROW AT A TIME

CHKD. BY .....DATE .....

IS NOT IN USE




NOTE:

SEQUENCE MAY PROCEED IN MIRROR IMAGE

U. S. Department of Labor

Mine Safety and Health Administration
P O Box 25367
Denver, Colorado 80225
Coal Mine Safety & Health
District 9

May 30, 1985

Mr. Andrew C. King
Mine Engineer
Genwal Coal Company
P.O. Box 1201
Huntington, UT 84528

Re: Crandall Canyon No. 1 Mine
ID No. 42-01715
Roof Control Plan

Dear Mr. King:

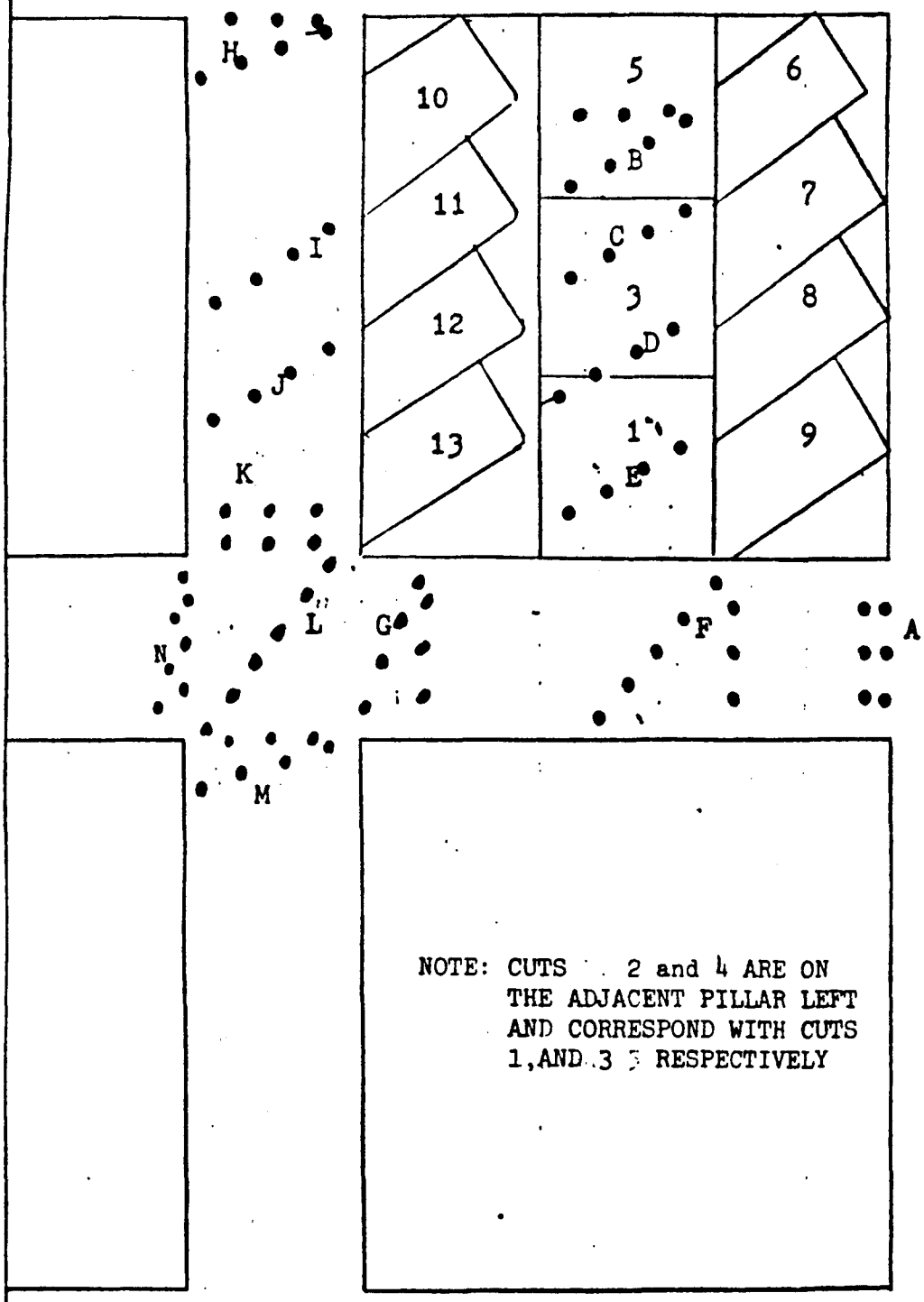
The pillar mining supplement submitted May 30, 1985, has been reviewed by MSHA personnel and is approved. The supplement shall be appended to the plan approved May 24, 1985.

Sincerely,

William A. Wyatt
for John W. Barton
District Manager

80' C-C PILLAR

Scale 1" = 20'

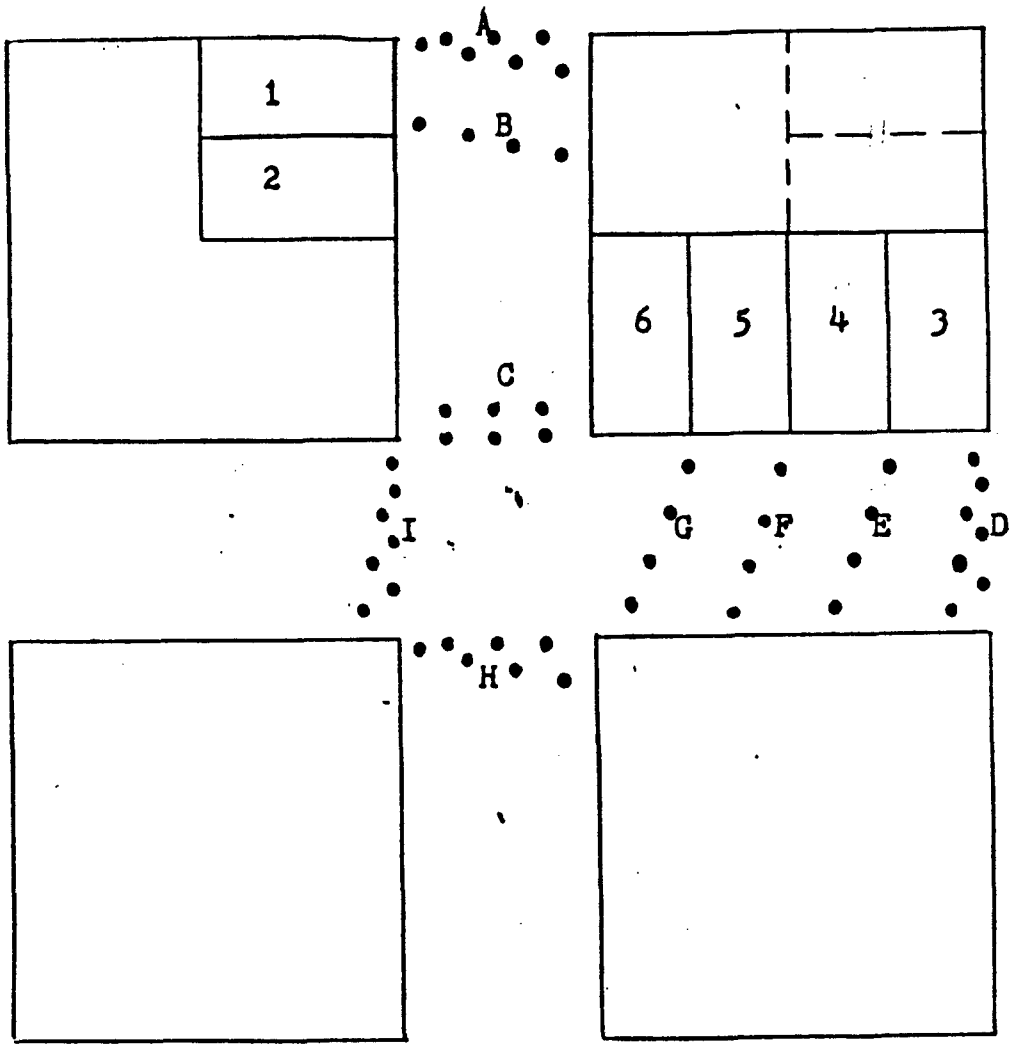



NOTE: CUTS 2 and 4 ARE ON THE ADJACENT PILLAR LEFT AND CORRESPOND WITH CUTS 1, AND 3 5 RESPECTIVELY

SEQUENCE: START CUT 1, BKR A
BOLT 1, CUT 2
BOLT 2, CUT 3
BOLT 3, CUT 4
BOLT 4, CUT 5
BREAKER B, F
CUT 6
ROW C
CUT 7
ROW D
CUT 8
ROW E
CUT 9
BREAKER G,H
CUT 10
ROW I
CUT 11
ROW J
CUT 12
BREAKER K, ROW L
CUT 13
BREAKER M,N

| GENWAL COAL CO. | PILLAR RECOVERY PLAN | 60' c-c 5/30/85 |
|---|---|---|

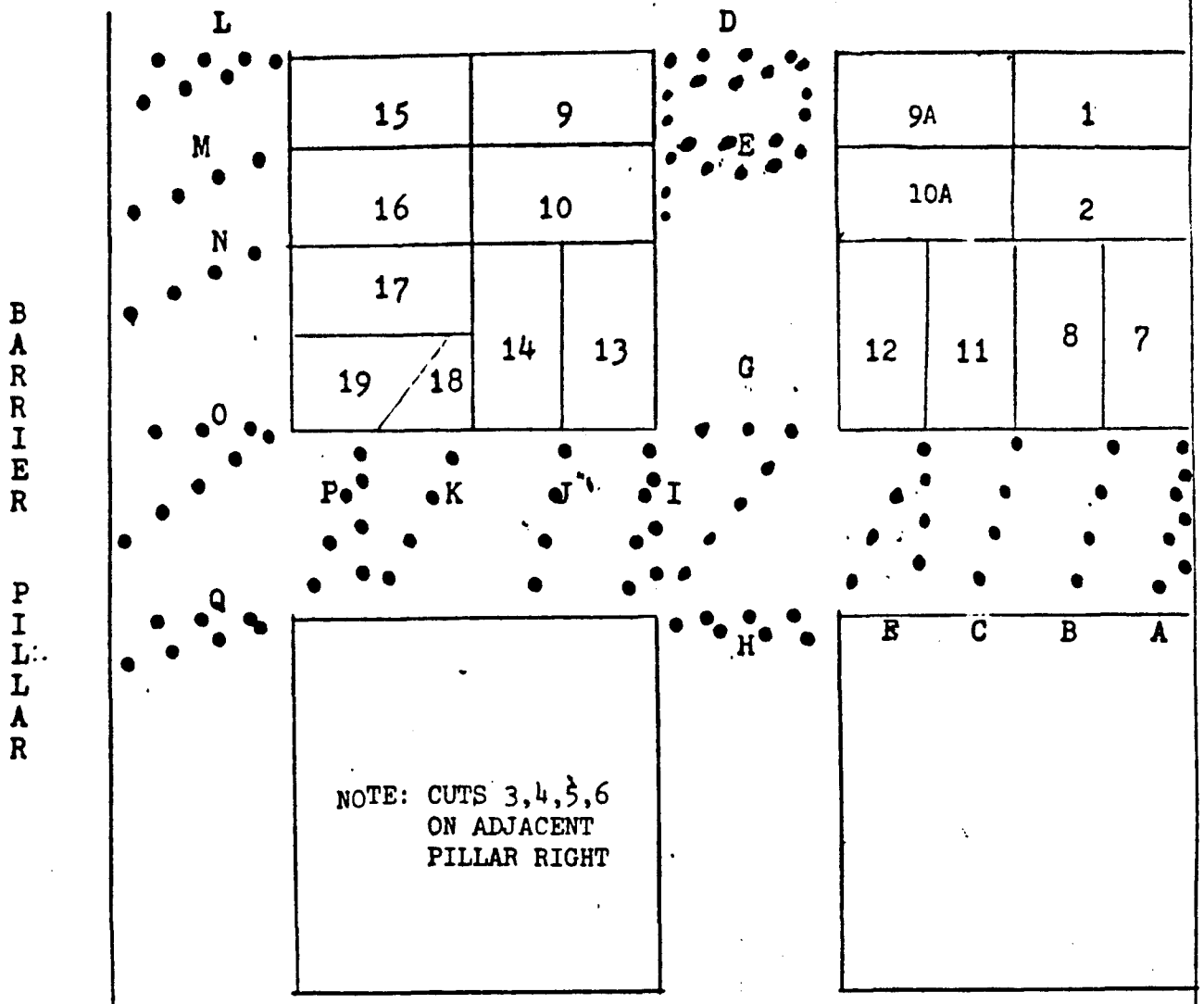
Scale 1"=20'




SEQUENCE: START BREAKER A
CUT 1
ROW B / CUT 2
BREAKER C,D
CUT 3
ROW E
CUT 4
ROW F
CUT 5
ROW G
CUT 6
BREAKER H,I

LEFT SIDE BARRIER PILLAR

Scale 1" = 20'



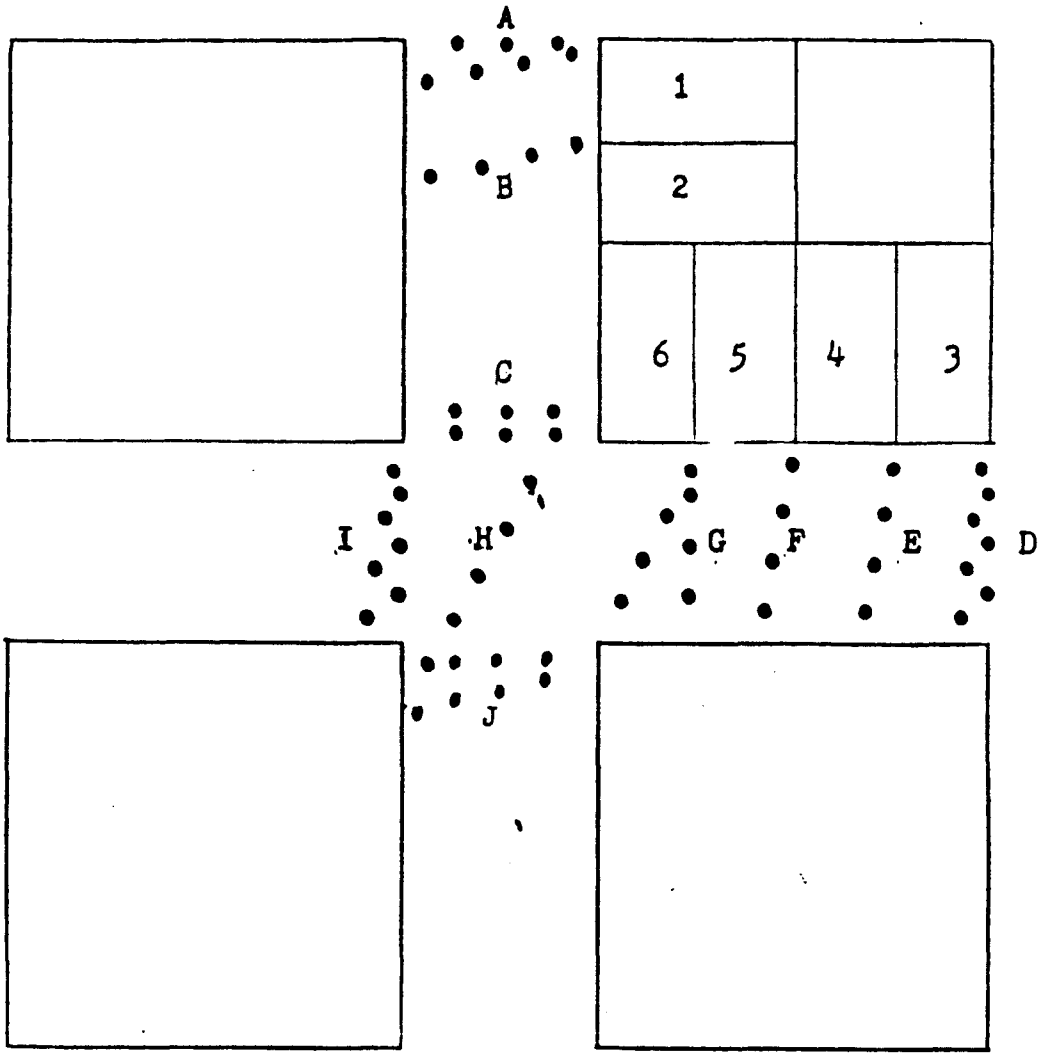

SEQUENCE: START CUTS 1,2,3,4,5,6 AS SHOWN ELSEWHERE

BREAKER A
CUT 7
ROW B
CUT 8
ROW C
BREAKER D
CUT 9
ENTRY TIMBER
CUT 9A
ENTRY TIMBER
BREAKER E
CUT 10
ENTRY TIMBER
CUT 10A
BREAKER G
CUT 11
BREAKER F
CUT 12
BREAKER H,I
CUT 13

CON'T

ROW J
CUT 14
ROW k
BREAKER L
CUT 15
ROW M
CUT 16
ROW N
CUT 17
BREAKER O
CUT 18 (IF NECESSARY)
BREAKER P
CUT 19
BREAKER Q

Scale 1" = 20'

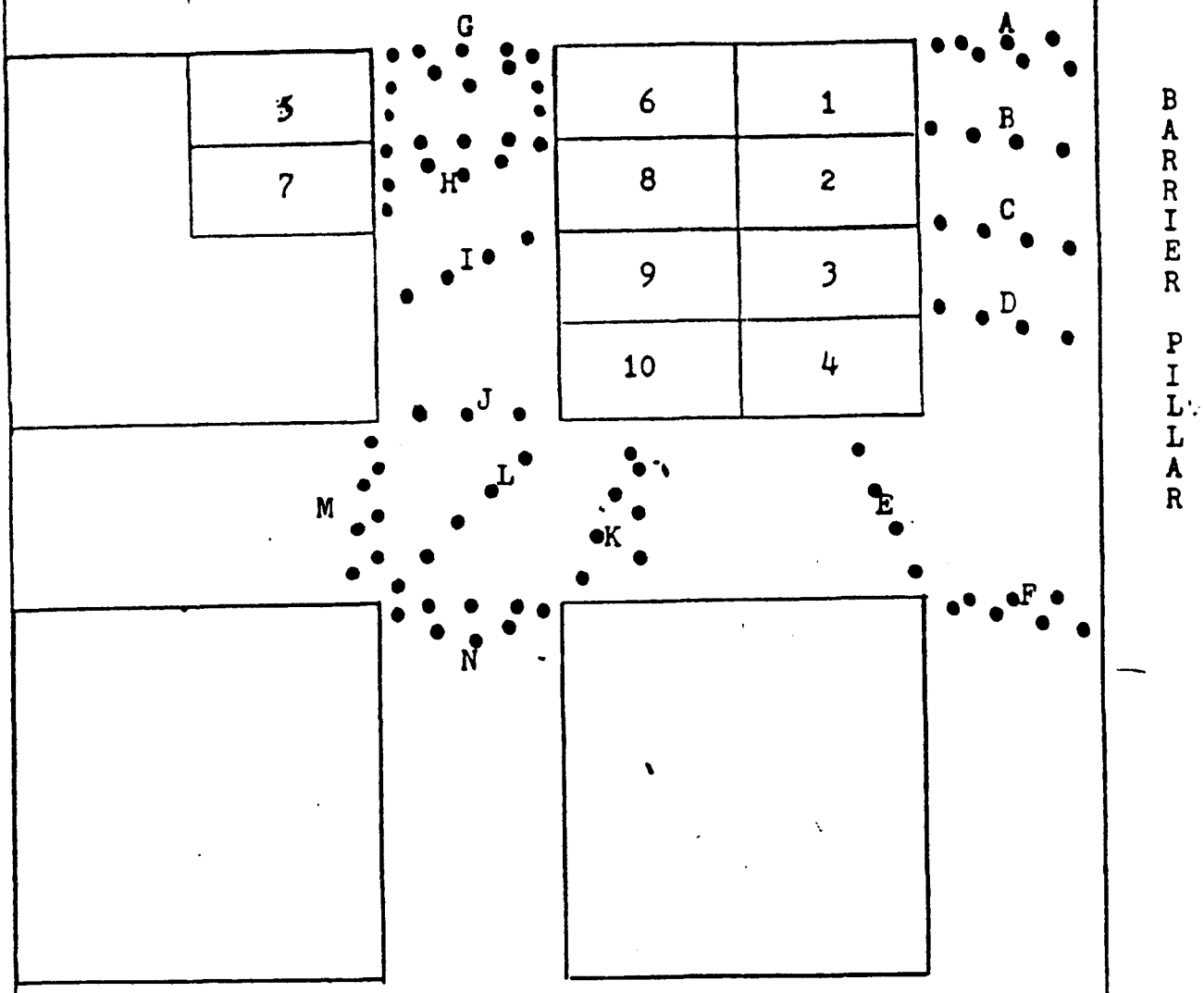



SEQUENCE: START BREAKER A
CUT 1
ROW B
CUT 2
BREAKER C,D
CUT 3
ROW E
CUT 4
ROW F
CUT 5
BREAKER G
ROW H
CUT 6
BREAKER I,J

NOTE: CUT 6 MAY BE TIMBERED AS CUT 6 IS TIMBERED ON DRWG. 101

Scale 1" = 20'

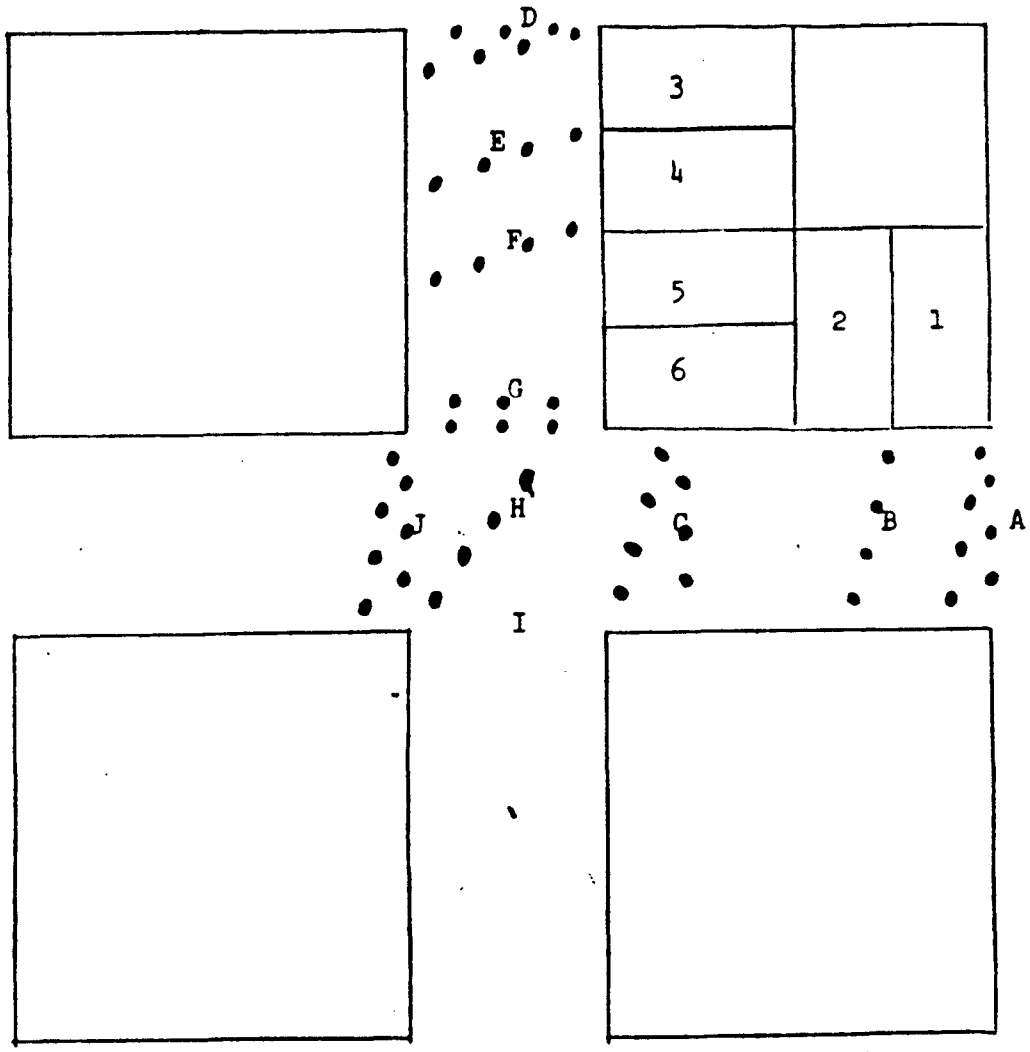
RIGHT SIDE BARRIER PILLAR




SEQUENCE: START BREAKER A
CUT 1
ROW B
CUT 2
ROW C
CUT 3
ROW D,E
CUT 4
BREAKER F,G
CUT 5
ENTRY TIMBER
CUT 6
ENTRY TIMBER
BREAKER H
CUT 7
ENTRY TIMBER
CUT 8
ROW I
CUT 9
ROW J,L
CUT 10
BREAKER M,N

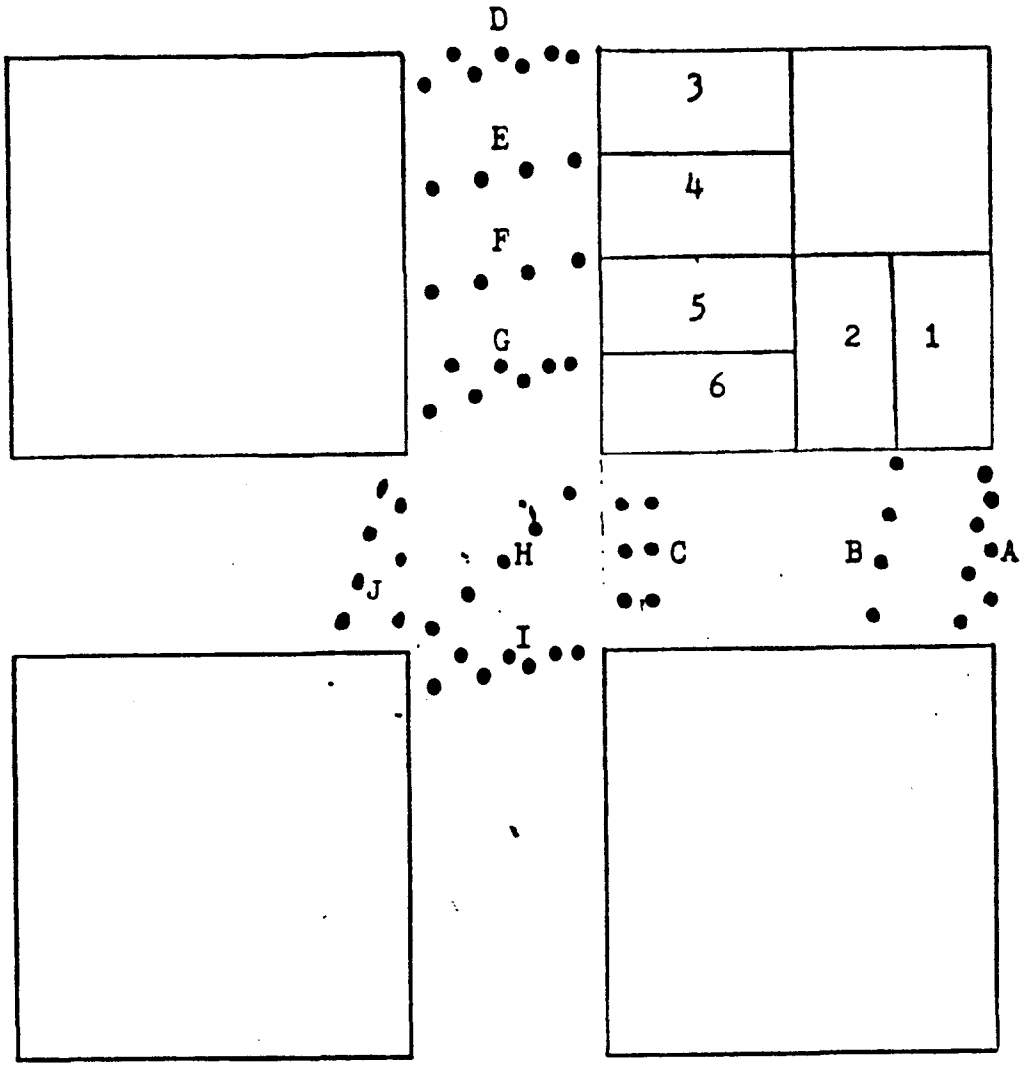
NOTE: CUT 10 MAY BE TIMBERED THE SAME AS CUT 6 ON DRWG. 101

Scale 1" = 20"




SEQUENCE: START BREAKER A
CUT 1
ROW B
CUT 2
BREAKER C, D
CUT 3
ROW E
CUT 4
ROW F
CUT 5
BREAKER G
ROW H
CUT 6
BREAKER I,J

Scale 1" = 20'




SEQUENCE: START BREAKER A
CUT 1
ROW B
CUT 2
BREAKER C,D
CUT 3
ROW E
CUT 4
ROW F
CUT 5
BREAKER G.
ROW H
CUT 6
BREAKER J, I

GENWAL COAL COMPANY
CRANDALL CANYON MINE
ROOF CONTROL PLAN SUPPLEMENT
MAY 30, 1985

STIPULATIONS ON RECOVERING 60' c-c ( 40' x 40' BLOCKS ) PILLARS

- ALL TIMBER WILL BE INSTALLED ON 5' CENTERS
- PILLARS MAY BE PULLED FROM EITHER LEFT OR RIGHT SIDE
- IN AREAS DEPICTING FOUR CUTS IN A ROW ON ONE PILLAR, THREE CUTS ON MORE OF AN ANGLE MAY BE USED ( TIMBERED APPROPRIATELY ) IF PILLAR SIZE AND ENTRY WIDTH PROHIBIT SQUARE CUTS OF ADEQUATE THICHNESS.
- TIMBERS MAY VARY SLIGHTLY FROM SHOWN ON DRAWINGS IN ORDER TO SQUARE MINER INTO PILLAR OR ANGLE MORE IF REQUIRED.
- TURN AND BREAKER ROWS WILL BE LENGTHENED OR SHORTENED AS THE ENTRY WIDTH DICTATES TO MAINTAIN THE TIMBERS WITHIN 5' OF THE RIBS AND NO MORE THAN 5' c-c.
- THE 2 END PILLARS AT BOTH ENDS OF THE ROW THAT ARE AGAINST SOLID COAL MAY BE FULLY EXTRACTED. (AS SHOWN)

- BOLTING WILL BE DONE IN ACCORDANCE WITH APPROVED ROOF CONTROL PLAN

RECEIVED
MAY 30 1985
DISTRICT 9
MSHA
DENVER, CO