

MSHA Approval and Certification Center

REMOTE CONTROL CONTINUOUS MINING MACHINE CRUSHING ACCIDENT DATA STUDY

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ABSTRACT

A committee was formed to identify norms and trends in remote control continuous miner crushing accidents as part of MSHA's efforts to reduce and eliminate these types of accidents. The committee was tasked with collecting, reviewing, and evaluating remote control accident data to identify significant factors that could possibly contribute to remote control accidents. The report identifies that these types of accidents commonly happen to experienced miners during routine mining activities, with the majority occurring while moving the miner from one face to another (place changing). Another common aspect of the accidents is that many of the victims are newly employed at the mine where the accident occurred. Training all employees to stay outside the turning radius of an energized remote control continuous miner, establishing this as a safe operating procedure, and consistently enforcing this practice among miners will reduce these types of accidents.

INTRODUCTION

Remote control continuous miner (RCCM) fatalities have been increasing; 12 fatalities occurred from 2000 through 2004, while 17 occurred in the 16 year period between 1984 and 1999. Since the initial Remotely Controlled Mining Machinery Study¹ was completed in August 1998 by MSHA's Approval and Certification Center, various efforts have been undertaken to address mining accidents involving remote control continuous mining machines.

- A Program Information Bulletin (PIB03-03)² informing the mining industry of recommended design safeguards for remote controlled continuous miners was published. The PIB recommends remote emergency stop devices, accidental tram activation protection, and reduction of machine slew rate (the rate at which the machine turns or pivots when the tram controls are split or singularly activated).
- The hazards associated with handling the continuous miner's cable have also been studied.³ MSHA hosted a Cable Handling Workshop in 2004. The workshop provided an opportunity for industry personnel to submit ideas to address cable handling and the resultant RCCM pinch point accidents. Attendees voted on the top three suggestions and listed pros and cons of each. Wireless communication and remote shut down units were voted first and second, respectively. However, these suggestions did not directly address the cable handling issue. The "cable reel concept" was ranked third among the concepts, and both cable and cable reel manufacturers stated technologies existed to make such a system work.
- Efforts to analyze the task sequence of a continuous miner operator through Job Task Analysis (JTA) have been completed. MSHA personnel, in cooperation with mine operators, have interviewed and observed continuous miner operators to better understand their actions, responsibilities, and work environment.
- Efforts to develop a system that will detect mine personnel in close proximity to an energized continuous miner and deenergize the machine are ongoing. One proximity warning system was approved and another system was near the MSHA approval application stage at the date of this report.

¹ MSHA Approval and Certification Center, "Remotely Controlled Mining Machinery Study," 08/03/98, Clark, Warnock, Wease, Dransite.

² The PIB published in 2003 was titled, "Recommended Design Safeguards for Permissible Remote Controlled Continuous Mining Machines" and can be viewed at the following link: <http://www.msha.gov/regs/complian/PIB/2003/pib03-03.htm>.

³ MSHA Approval & Certification Center, Applied Engineering Division, "Cable Handling Workshop Report", April 29, 2004.

- MSHA broadcast a Remote Control Continuous Miner Safety Presentation via a web cast on May 3, 2005 to inform industry of the increasing trend of remote control continuous miner accidents. The purpose of the presentation was to inform industry of the problem in the hopes that better awareness and information sharing would foster solutions to reduce the accident trend. The web cast presented factors common in RCCM fatalities and highlighted some best practices when operating remote control continuous miners.

This report focused on fatal and non-fatal accidents where the victim was crushed by a remote control continuous miner. MSHA's Teradata accident database was searched for fatal RCCM accidents. The committee used the electronic database (which began in 1983) to identify fatal accidents. The first identified RCCM fatality occurred in 1984, and the accidents have continued to 2004. The study of non-fatal accident data was limited to the years 1999-2004, the years since the initial Remotely Controlled Mining Machinery Study was published.

Some trends were common among the fatal and non-fatal RCCM accidents. Identification of these trends served as a mechanism for development of complimentary solutions to the ongoing proximity detection, cable handling efforts, and Job Task Analysis. The results of this accident data study are presented in this report.

BACKGROUND

Over 90% of the continuous miners in use in underground coal mines are operated by remote control. RCCMs are also used in underground potash and trona mines. Most of these machines do not have an operator's deck.

The remote operation of continuous miners has enhanced the health and safety of underground miners in many aspects: miners' exposure to dust is reduced, miners are no longer subject to the intense machine vibration associated with operating a continuous miner from an operator's deck, and they are removed from immediate roof fall hazards during production. Aside from the health and safety benefits to the miner, some mine operators are able to experience the benefits of extended cut plans, which increase productivity by increasing the amount of time the continuous miner is actively producing. Although there are benefits to using RCCMs in mines, the use of this technology has introduced a "new" hazard. As of the date of this report, twenty-eight underground coal and one trona miner have suffered fatal injuries when they were crushed by a RCCM.

Accident data is entered into MSHA's Teradata system from the MSHA 7000-1 accident reporting form required by mine operators to report accidents, injuries, and illnesses. Mine operators are not required to report whether a continuous miner is operated by remote control on the 7000-1 form; therefore, this information is not included in the Teradata database. Because of this, the search for non-fatal RCCM accidents was accomplished in two phases: by searching for accidents where the accident equipment description was "continuous mining machine", and by searching for accidents where the equipment description was not given as "continuous mining machine" AND the occupation, activity, or narrative contained the keyword "continuous".

Each non-fatal accident search was conducted from 1983 to 2004. Approximately 22,000 non-fatal accidents were returned in the Teradata search. Because of the volume of returns, the 1998 report, and misspellings, abbreviations, odd spacing, and slang expressions commonly found in accident narratives, the narratives were searched for various keywords. Accidents having "continuous mining machine" listed as the equipment type and classified as caught in/by, fall against, or struck by moving, powered, or stationary objects were selected. Approximately 1,000 accidents remained after this sort; these narratives were reviewed and the accidents were selected if it was determined to be RCCM-related. The result was a set of 67 non-fatal RCCM accidents in coal and metal/nonmetal mines from 1999 to 2004.

Although MSHA had previously identified 24 fatal RCCM accidents, a Teradata database search was conducted to corroborate the number of fatalities. The search was performed for fatal accidents from 1983 to the present where the underground mining

method, occupation, activity, equipment type, and narrative contained the keywords “remote” or “continuous”. The published fatal accident reports for the remaining accidents in which the narratives either indicated the fatality was RCCM related or where there was not enough information to make a determination were reviewed. A total of 29 RCCM fatalities were identified from 1984 through 2005.

This report contains an analysis of both fatal and non-fatal remote control continuous miner crushing accidents, identifies accident trends, and makes recommendations for future MSHA efforts to reduce and eliminate these accidents. Information regarding non-fatal remote control continuous miner accidents is addressed, followed by fatal accidents. The trends identified as contributing factors in RCCM accidents are included in the **Discussion** section of the report. Other factors reviewed, along with training and outreach efforts by State agencies, training tools developed by the committee, and other data used in the preparation of this report, are included in the appendices of this report.

DISCUSSION

Non-Fatal RCCM Accident Data Review

Sixty-seven non-fatal RCCM accidents that occurred between 1999 and 2004 were reviewed for this report.

Distribution of Non-Fatal RCCM Crushing Accidents

The distribution of these 67 non-fatal RCCM accidents per mining district is represented in the following chart⁴.

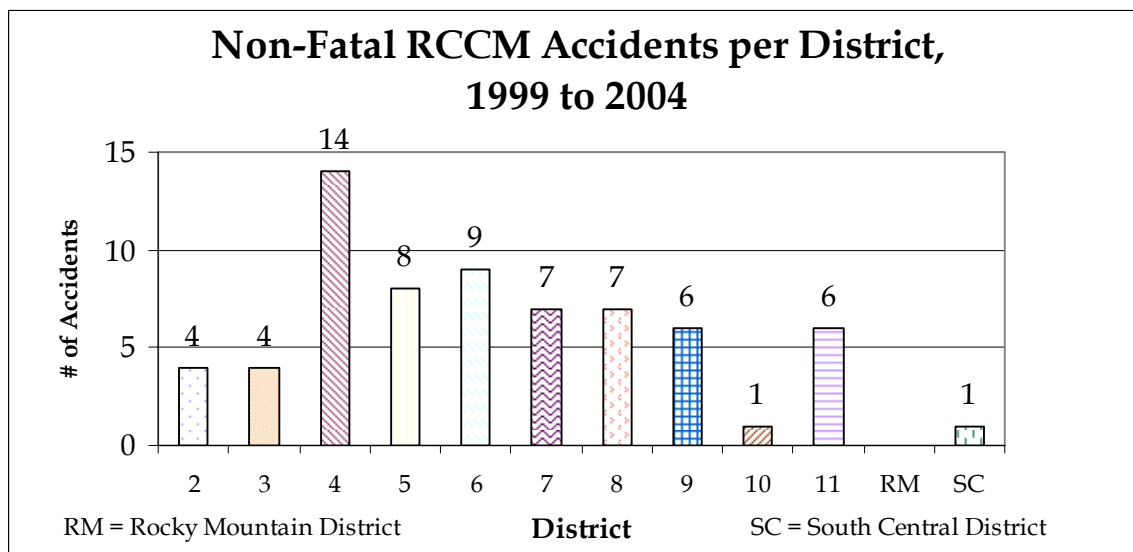


Figure 1: Non-Fatal RCCM Accidents per District, 1999 to 2004

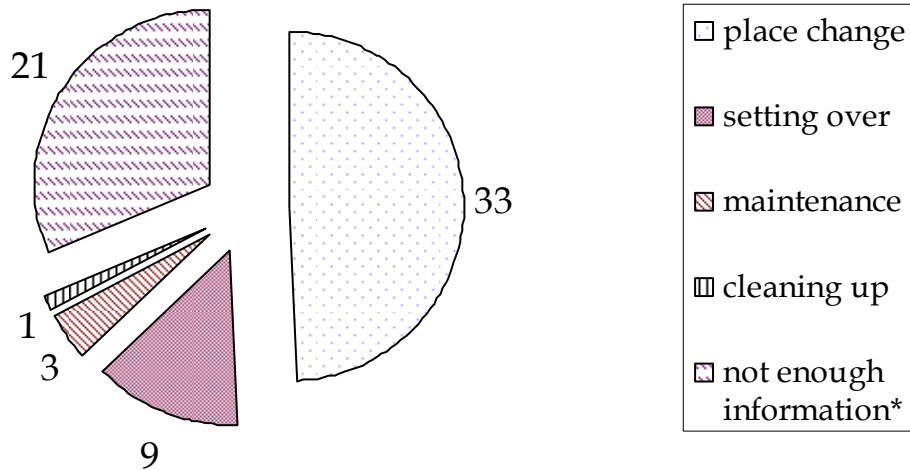
The non-fatal data sample indicates that there were many more opportunities for fatal RCCM accidents to occur.

Activity during Non-Fatal RCCM Accidents

Based on accident narratives submitted by mine operators, the non-fatal accidents analyzed in this report have been characterized as shown in Figure 2. Many of the narratives lacked sufficient detail to discern the activity during the accident and are included in the “not enough information” group.

⁴ Please note that statistics and information about District 1 will not be included in this report because there are no remote controlled continuous miners located in that District.

RCCM Data Sample: Activity during Non-fatal Accidents as Determined from the Narratives on MSHA 7000-1 Forms



*There was not enough information included in the accident narratives to determine the activity in 21 of the non-fatal accidents included in the data sample.

Figure 2: RCCM Data Sample: Activity during Non-Fatal Accidents as Determined from 7000-1 Forms

The accident narratives indicate that the non-fatal accidents are occurring during routine mining activities. Almost half of the accidents occurred during place changing activities (moving the continuous miner from one face to another). Routine mining activities include:

- mining at the face (production)
- setting over (during production to mine the other side of the face)
- cleaning up (maneuvering to clean up loose material at the end of the cut)
- place changing, and
- servicing the continuous miner.

Maintenance activities, including moving the continuous miner to perform maintenance activities, are considered routine for maintenance personnel. Examples of non-routine activities for all miners include:

- trimming bottom
- tramming a continuous miner to a different area of the mine, and
- using the continuous miner to move another piece of equipment (because it is stuck or broken down, for example).

Victim Experience

The following chart shows the number of non-fatal RCCM accidents included in the data sample with respect to the accident victim's total mining experience. Personnel with more than 10 years of mining experience had an overwhelming majority of the 67 non-fatal RCCM accidents.

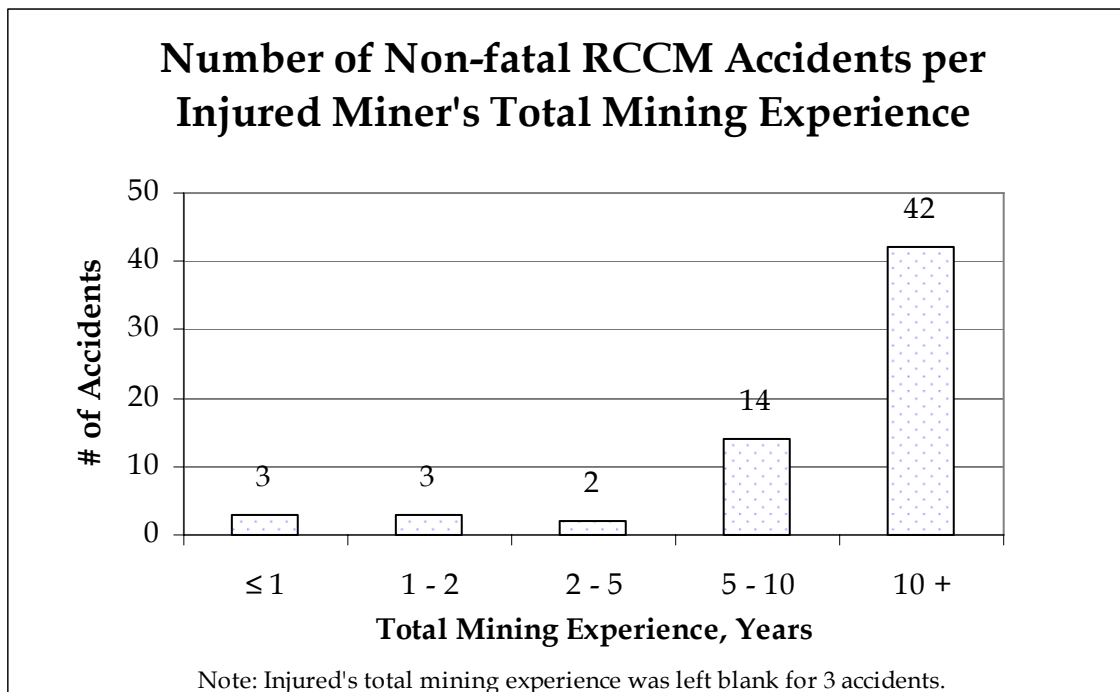


Figure 3: Number of Non-Fatal RCCM Accidents per Injured Miner's Total Mining Experience

The following chart displays the number of non-fatal accidents included in the data sample with respect to the injured miner's experience at the mine where the accident occurred.

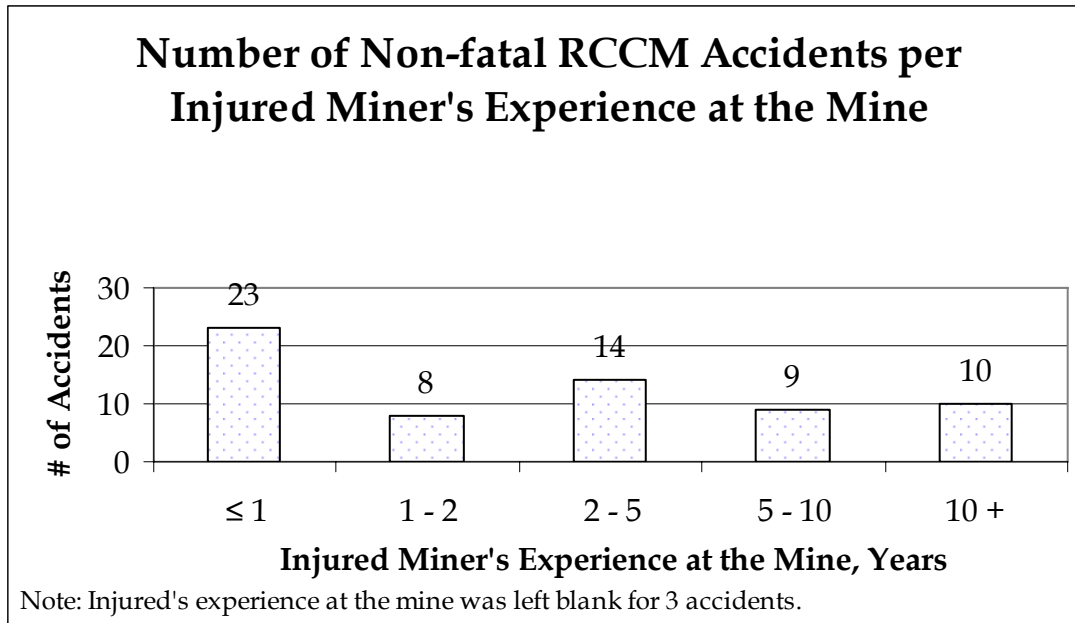


Figure 4: Number of Non-Fatal RCCM Accidents per Injured Miner's Experience at the Mine

Forty-six percent (46%) of the non-fatal crushing accidents sampled involved miners with two or less years of experience at the mine where the accident occurred.

Fifty-six victims had five or more years of total mining experience at the time of the accident. However, 24 of these experienced miners had two or less years of experience at the mine where the non-fatal RCCM accident occurred; 18 had one year or less experience at the mine where the accident occurred.

Lack of Communication in Non-Fatal Continuous Miner Crushing Accidents

While performing the keyword search of accident narratives to identify non-fatal RCCM crushing accidents, 27 accidents were identified as crushing continuous miner accidents (see Appendix G for narratives). There was insufficient data to determine whether these accidents involved remote-controlled or deck-operated continuous miners, so they were not included in the data sample reviewed for this report.

However, as 90% of continuous miners in use in underground coal mines are operated by remote control, the assumption is that many of these may have been non-fatal RCCM accidents.

The accident narratives indicate the cause of most of these accidents was either a lack of communication or miscommunication between coworkers. These communication problems had the potential to result in 27 more fatalities. Improving communication between coworkers operating either remote-controlled or deck-operated continuous miners could reduce and eliminate these types of accidents.

Fatal RCCM Accident Data Review

Twenty-nine fatal remote control continuous miner accidents have occurred from 1984 through 2005. The first step in the data analysis of fatal RCCM accidents was to determine if the accidents followed the population of remote control continuous miners. A logical assumption was that a higher number of RCCM fatal accidents would occur in Districts that operate a higher number of RCCMs, unless factors within the mines located in the District(s) influenced the accidents.

RCCM Population

The distribution of continuous ripper Mechanized Mining Units (MMUs⁵) among the Coal Districts is displayed in Table 1. As is apparent in the table, one MMU can represent more than one continuous miner. An example is a super section with two continuous miners. This section may have only one MMU if the ventilation plan allows only one continuous miner to produce coal at a time. For example, District 7 has 122 continuous miners, but only 102 MMUs.

District	Continuous Ripper Miner		Remote Controlled	
	MMUs	Machines	MMUs	Machines
1	2	2	0	0
2	58	58	57	57
3	60	60	58	58
4	179	258	157	236
5	85	98	83	96
6	118	148	112	140
7	102	122	99	119
8	60	80	60	80
9	40	41	40	41
10	31	58	27	54
11	21	21	21	21
RM	n/a	17	n/a	12
SC	n/a	28	n/a	22
Totals	756	991	714	936

Table 1: Mechanized Mining Unit (MMU) and Continuous Miner Count

The four underground trona mine operators in the Rocky Mountain District use 17 continuous miners, 12 of which are remote controlled. The three potash mine operators and the Department of Energy in the South Central District use 28 continuous miners, 22 of which are remote controlled.

⁵ An MMU is a unit of mining equipment used for the production of coal. Examples are continuous ripper miners, continuous auger miners, shearers, augers, and hand-loading equipment. In underground coal mines, MSHA tracks MMUs according to Title 30 Code of Federal Regulations (30 CFR) Part 70 dust sampling requirements.

Distribution of Fatal RCCM Accidents

The following chart shows the RCCM fatalities by District. Only those Coal and M/NM Districts that have experienced RCCM fatalities are depicted. The mine at which the trona RCCM fatality occurred is in Metal/Nonmetal's Rocky Mountain District.

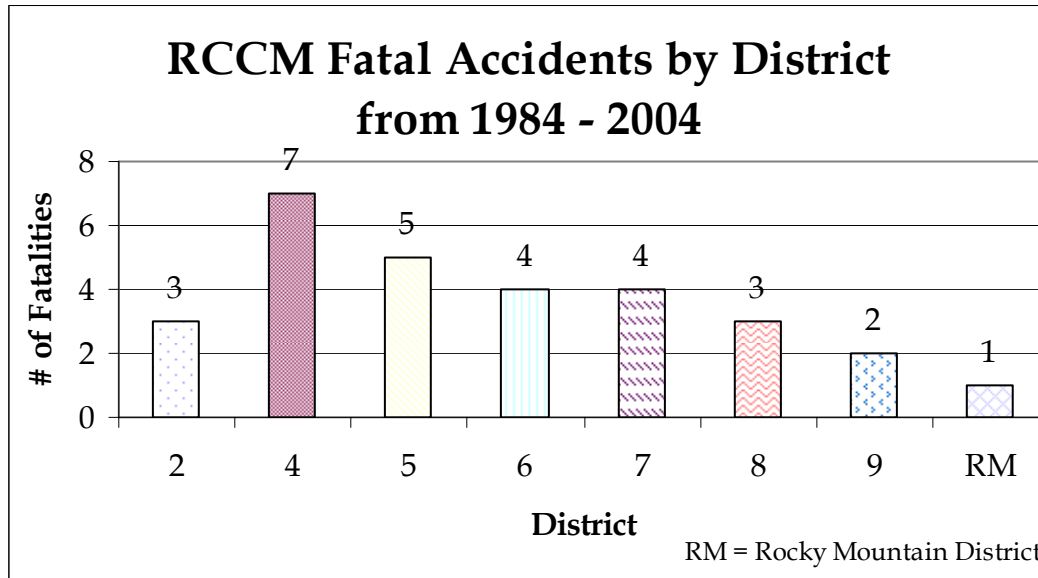


Figure 5: RCCM Fatal Accidents by District

Districts 4, 6, 7, and 5 currently have the largest populations of RCCMs, respectively. These four Districts have also experienced the largest number of RCCM fatal accidents. The data study did not yield information that explains why some Districts have not experienced RCCM fatalities, why some Districts have gone more than eight years without experiencing an RCCM fatality, or why some Districts only began experiencing RCCM fatalities since 2000. See Appendix A for more information about the RCCM population and distribution of fatal accidents among the Districts.

Activity during Fatal RCCM Accidents

The following chart shows the victim's activity when the RCCM fatal accident occurred. The data was gathered from MSHA's published fatal accident reports. This chart shows that 48% of RCCM fatal accidents occurred while the continuous miner was place changing (for both advancing and pillar recovery sections).

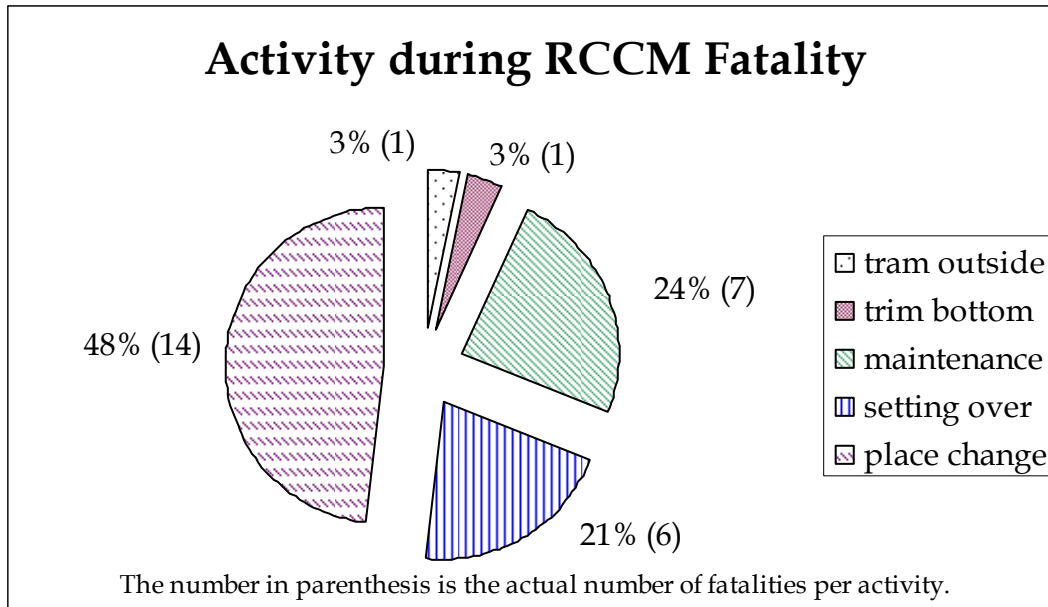


Figure 6: Activity during RCCM Fatality

Fatal RCCM accidents have occurred while place changing in all the Districts except District 2 and the Rocky Mountain District. The following bullets present some observations about the RCCM place changing fatalities.

- These fatalities have occurred throughout the history of the RCCM fatal accidents, from 1984 to 2004.
- Two of the 14 place changing fatalities occurred at mining heights of 48 inches or less; the 12 remaining fatalities occurred at mining heights greater than 48 inches. If the point differentiating low and high working conditions is defined as 48 inches, 86% of the place changing fatalities occurred in high working conditions.
- The RCCM place changing fatalities occurred in all types of coal mine operations (room and pillar, pillar recovery, and longwall mines).

After place changing, maintenance-related accidents are the second most common type of RCCM fatality. In the RCCM fatalities classified as maintenance, personnel were performing general service (changing bits), troubleshooting, and making repairs to the continuous miner at the time of the accident. The following bullets present some observations about maintenance-related RCCM fatalities.

- Maintenance activities account for 24% of RCCM fatalities.
- The first maintenance fatality occurred in 1990, the most recent in 2004.
- In six of the seven RCCM maintenance fatalities, the person operating the RCCM was a maintenance person. It is unclear in several of the MSHA fatal

- accident reports how much, if any, actual “RCCM operator” training and experience these maintenance personnel had prior to the accident.
- Three of the seven maintenance related fatalities occurred in District 2. (All of District 2’s RCCM fatalities are maintenance related.) However, District 2 has not experienced a RCCM fatality since 1997.
 - The RCCM maintenance fatalities occurred in working heights between three and nine feet and in room and pillar, pillar recovery, and longwall mines.

Fatalities while the RCCM was setting over to mine the other side of the face were the third most common activity. The following bullets highlight some observations about the fatalities that occurred while the continuous miner operator was setting over.

- These fatalities account for 21% of all RCCM fatal accidents.
- These fatalities have occurred throughout the history of RCCM fatal accidents, as early as 1988 and as recent as 2004.
- These fatalities have occurred in one M/NM and four different coal districts in room and pillar operations.
- Four of these six fatalities occurred at mining heights of 48 inches or less. In three of these four fatalities, the tram interlocks on the remote had been defeated.
- During retreat mining (or pillar recovery), none of MSHA’s fatal accident reports indicated that the RCCM was repositioning (or setting over) when the fatality occurred.

The two remaining RCCM fatalities occurred when the continuous miner was trimming bottom in a heading and when a continuous miner was being trammed to the surface (non-routine activities).

Victim Experience

Twenty-six victims had five or more years of total mining experience at the time of the RCCM fatality. However, 16 of these fatal accident victims had two or less years of experience at the mine where the accident occurred, and 11 of these had one year or less experience at the mine where the accident occurred.

Longwall Mining Activity

Another factor that distinguishes the coal districts is longwall mining activity. The February 2005 issue of “Coal Age” magazine presents the 2005 Longwall Census. According to the census, there are 52 active longwalls divided among one Metal/Nonmetal (M/NM) and eight Coal Districts. (The two longwall operations in Rocky Mountain District mine trona.) The January 2005 Teradata search performed of active MMUs and mines reporting employment and production data in 2003 indicates that the average incident rate (IR) for a longwall mine is 10.9, which is less than half of the 23.1 average IR for mines with continuous miners only. An IR is a rate of injury

occurrence based on 200,000 hours of employee exposure⁶. Although headgate panel development is similar to or the same as room and pillar mining, there have only been two RCCM fatalities at longwall operations.

Continuous miner sections in about 20% of longwall mines advance the panels by the in-place mining method, as opposed to the place change method of mining performed in most coal mines. The in-place mining method uses integrated (or satellite) miner/bolters, which allow the continuous miner to advance the entire length of the pillar (which can be hundreds of feet) before moving to the next face, or place changing. The entries are the same width as the cutter head on the integrated miner/bolter. The in-place mining method results in no setting over in a place and a drastically reduced number of place changes. As is noted previously, almost half of RCCM fatal accidents have occurred during place changing activities, and 21% occurred while setting over in a cut. In-place mining methods reduce exposure to two of the three most common types of RCCM accidents experienced.

RCCMs in Metal/Nonmetal Mines

Forty-five, or approximately 5%, of the continuous miners identified in this report are operated in underground M/NM mines; 75% (or 34) of these are RCCMs. The majority of these continuous miners are used in room and pillar operations in potash and trona mines.

Room and pillar mining methods in coal mines differ somewhat from those in M/NM mines in that ventilation and ground control are major considerations in coal mines but may be secondary in M/NM mines. Some of the differences these considerations result in are that ground support is achieved in M/NM room and pillar operations primarily by pillars (additional roof support is installed where necessary), they generally do not have restrictions on cut depth, and place changing occurs less frequently than in coal operations. Another difference is that room size in M/NM operations is usually larger than in coal operations.

As was evident in mines that use the in-place mining method (which again reduces the number of place changes), RCCM accidents have occurred less frequently in M/NM room and pillar operations. This is evidenced by the low number of fatal RCCM accidents documented in M/NM mines.

⁶ See Title 30 CFR Part 50.1 for more information on incident rates.

Contributing Factors in RCCM Fatalities

The contributing factors listed in the fatal accident reports published by MSHA indicate the following:

- Eighteen reports concluded that the cause of the accident was that the victim placed himself in a hazardous position or in a location where he was exposed to the sudden movement of the continuous miner.
- Seven reports concluded that management failed to ensure that personnel followed the approved roof control plan with regard to tramming the continuous miner from a safe location, or failed to recognize the hazard and ensure that personnel operated the continuous miner from a safe location.
- Three reports indicated that operator disorientation might have been a causal factor.
- Four reports stated a causal factor was that the tram interlocks were defeated.
- Six of the reports indicated that the machine was energized during maintenance activities.
- Lack of communication was a factor in three fatalities.
- Failure to have a procedure or to follow an established procedure was cited as a causal factor in six fatalities.
- Inadequate training was cited as a factor in at least two fatalities.
- Three of the most recent fatal accident reports state that tram speed was a causal factor.

SUMMARY

Distribution of RCCM Accidents

Districts 3, 10, and 11 have never experienced a RCCM fatality. Districts 2 and 9 have not experienced a RCCM fatality since 1997 and 1995, respectively. Only Districts 4, 5, 6, 7, and 8 have experienced RCCM fatalities since 1999. However, all of the coal districts, except District 1, have experienced non-fatal RCCM accidents.

RCCMs have been in use in trona and potash mines since at least 1988. However, the Rocky Mountain District experienced its first RCCM accident in 2004. No report was found of a RCCM non-fatal accident in the Rocky Mountain District since 1999, and one non-fatal accident was reported in the South Central District in that time.

The distributions show that RCCM crushing accidents occur in every district that uses RCCMs, but some Districts have not experienced fatalities.

Activity during RCCM Accidents

Of the non-fatal RCCM accidents in which the activity at the time of the accident was able to be determined, an overwhelming majority of accidents occurred while place changing. Non-fatal RCCM accidents during setting over and maintenance activities were second and third, respectively. This is similar to the activities during fatal RCCM accidents, with the exception that the number of fatalities during maintenance activities exceeded the number of fatalities while setting over.

Victim Experience

Eighty-four percent (84%) of non-fatal accident victims had at least five years of total mining experience at the time of the RCCM accident. Ninety percent (90%) of fatal accident victims had at least five years of total mining experience at the time of the RCCM accident.

Thirty-two percent (32%) of non-fatal accident victims with at least five years of total mining experience had one year or less experience at the mine. Forty-two percent (42%) of fatal accident victims with at least five years of total mining experience had one year or less experience at the mine.

Comparison of the Coal Districts

The different mining conditions, methods, and RCCM population trends render a direct comparison of RCCM accidents among the Coal Districts difficult. An important item to consider is that the IRs and numbers of RCCMs presented here are current data. The fatal and non-fatal accident data are historical, and as stated previously, MSHA has not tracked the historical number of remote control continuous miners in service.

Table 2 indicates the number of RCCMs in each District as of April 2005, the number of RCCM fatalities, and the overall District IR (per a January 2005 Teradata search).

District	# of RCCMs	# of RCCM Fatalities	District IR
2	57	3	11.2
3	58	0	11.6
4	236	7	17.3
5	96	5	13.0
6	140	4	13.8
7	119	4	14.3
8	80	3	19.0
9	41	2	9.4
10	54	0	18.7
11	21	0	10.0

Table 2: Coal District Comparison

Several things are obvious from the chart.

- RCCMs are operated in every Coal District (except District 1).
- While District 4 has the highest number of RCCM fatalities, it also has the largest number of RCCMs by almost a factor of two.
- Compared to Districts 4, 6, and 7, Districts 2 and 9 have high numbers of RCCM fatalities compared with low numbers of RCCMs. However, Districts 2 and 9 have not experienced a RCCM fatality since 1997 and 1995, respectively.
- Although District 5 operates a relatively low number of RCCMs, it has experienced more RCCM fatalities than Districts 6 and 7, which operate significantly more RCCMs.
- All three of District 8's RCCM fatalities have occurred since 2001. Additionally, District 8 has the highest IR as of January 2005.

Districts 3, 10, and 11 have not experienced any RCCM fatalities. Again, Districts 3 and 11 are Districts with a large amount of longwall activity. RCCM fatalities have only occurred at two longwall mines, and longwall mines average lower IRs than non-longwall mines. A significant number of District 3 longwall mines use the in-place mining method, as opposed to place changing, for their panel development, but the District 11 mines do not.

Contributing Factors

All of the causal and contributing factors listed in the fatal RCCM accident reports are recognized hazards in the mining industry. Most of these factors are experienced in occupations other than the operation of a remote control continuous miner.

CONCLUSION

A review of non-fatal and fatal RCCM accident data indicates the following as factors that can possibly contribute to RCCM accidents:

- (1) Both fatal and non-fatal RCCM accidents are occurring during routine mining activities, with the majority of the accidents occurring while place changing. The majority of accident victims were working within the turning radius of an energized RCCM⁷. With the exception of some maintenance activities, the RCCM should have been deenergized while the miner(s) worked within the turning radius at the time of the accidents.

The trend apparent in all of these accidents is that the victim was positioned within the turning radius of an energized remote control continuous miner. In most cases, the employee was within the turning radius of an energized remote control continuous miner to handle the cable while place changing or moving the miner. Although the machine is designed for personnel to move the cable by hand, the machine does not need to be energized in order to complete this task.

It is apparent that miners allow the RCCM to remain energized during routine tasks and position themselves within the turning radius of an energized continuous miner to increase production by performing their jobs more quickly and efficiently. However, this is at-risk behavior (similar to failure to lock and tag out or wear a seat belt) and puts their safety in jeopardy. This is an employee training and work practice issue dependent upon mine management to present and enforce safe work practices among all of its employees. The safe work practices should focus on the development of standard operating procedures (SOPs) requiring personnel to stay out of the turning radius of an energized remote control continuous miner.

- (2) A significant portion of accidents involve experienced miners (miners with five or more years of total mining experience) with less than one year of experience at the mine.

The apparent trend in these accidents indicates that inadequate experienced miner training and/or new task training may be contributing factors. Several factors could explain this trend: the experienced miners may have little or no RCCM experience, or years of RCCM experience on other makes/models of RCCMs, when they transfer to a new mine; or the experienced miners have difficulty adjusting to different conditions at a new mine. Management must ensure that both the training and SOPs are sufficient to

⁷ One exception to this statement is the 04/12/01 fatality. A RCCM operator was killed when another RCCM struck the cutter head of the victim's parked RCCM, which extended into an intersection, causing the parked RCCM to pivot such that the boom crushed the operator against the rib.

address these areas. Management must also enforce and follow-up on the job performance of these miners until they are proficient with equipment operation, roof control and ventilation plans, and SOPs.

- (3) Most of the causal and contributing factors listed in the fatal accident reports are recognized hazards in the mining industry.

The causal factors listed in the fatal accident reports include possible operator disorientation, defeating the tram interlocks, having the continuous miner energized during maintenance activities, and inadequate training. These factors indicate that more intensive training is required for both RCCM operators and other miners, such as maintenance employees, who do not regularly operate RCCMs. The fatality reports that identify operator disorientation and tram speed as a factor in the RCCM fatality indicate that hands-on training should be emphasized. Because of the number of maintenance-related accidents, specific SOPs for maintenance activities requiring the RCCM to be energized should be established. These SOPs should also specify when a RCCM should not be energized during maintenance.

Communication was indicated to be the cause of 27 non-fatal continuous miner crushing accidents. Communication between coworkers is obviously a problem area that needs to be addressed, whether the continuous miner is operated remotely or not.

RCCM crushing accidents have occurred wherever there is exposure to RCCMs. Some Districts have not experienced any RCCM fatalities, or have not experienced RCCM fatalities in several years. Conversely, some Districts only recently began experiencing RCCM fatalities. The data review did not yield information that explains these trends within the individual Districts.

Each of the causal factors identified in the fatal accident reports is experienced while operating other types of mining equipment and is commonly addressed in roof control plans, training plans, refresher classes, safety meetings, etc. Because the non-fatal and fatal RCCM accidents are occurring during routine activities, the hazards identified as causal factors should be incorporated and emphasized in RCCM training and SOPs.

This data study generated numerous training aids and recommendations for future efforts for MSHA to undertake in conjunction with the mining industry. The results of this study can be directed towards the training needs of personnel who work near RCCMs and towards areas where communication and cooperation between regulatory agencies and the mining industry can combine to reduce accidents and fatalities. The RCCM Safety Tips, the RCCM Safety Presentation, and the recommendations for training resulting from this study, as well as the accumulation and tabulation of raw accident data statistics, should provide MSHA and the mining industry with useful tools in the prevention of RCCM accidents.

Although the causal factors identified in the study contributed to many of the non-fatal and fatal accidents, most if not all of these fatalities could have been prevented if the victim was not positioned within the turning radius of an energized RCCM at an inappropriate time. A combined effort of MSHA, the States, mine operators, and underground miners to focus on staying out of the turning radius of an energized continuous miner is necessary to reduce and eliminate remote control continuous miner accidents.

RECOMMENDATIONS

- 1 The most significant factor identified in remote control continuous miner accidents is positioning within the turning radius of an energized continuous miner. This is an employee training and work practices issue. MSHA should emphasize RCCM training programs that focus on proper place changing procedures and staying out of the turning radius of an energized continuous miner (to include cautions about multitasking). All miners working around the remote control continuous miner, and not just the miner operator and helper, should receive this training. Some specific items the training should address are:
 - RCCM training should include the hazards of working near energized RCCMs, the “Red Zone” program (See Appendix F), and the importance of communication when using remote controlled machinery.
 - RCCM training should be given to all miners.
 - This training should include “hands-on” segments addressing operator disorientation and tramming the RCCM in reverse. Equipment operators should be trained in machine start and shut-down sequences, to include training in how the remote control unit and continuous miner will react when different types of shut downs occur (E-stop, circuit breaker trip, methane monitor shut down, etc). The training should also include instruction in how the machine starts up after different types of shut downs occur, with an emphasis on tram speed and machine slew rates.
 - The training should emphasize precautions that maintenance personnel should take when working around RCCMs. The training program for maintenance employees should focus on safely moving the continuous miner, and during what activities and under what conditions the RCCM should and should not be energized.

- 2 As mentioned in the Introduction section of this report, a technological solution to RCCM accidents is being pursued with the development of proximity warning systems for RCCMs. Another technological response to these types of accidents (and cable handling/place changing accidents and injuries in general) is the cable reel concept recommended by the 2004 Cable Handling Workshop Report. MSHA should continue to research and promote technological solutions to these types of accidents.

- 3 Some of the State Regulatory Agencies indicated that a single source addressing RCCM accidents would assist their efforts in reducing and eliminating RCCM accidents. MSHA should develop a Special Initiative on www.msha.gov for these types of accidents. The web site could serve as a resource and information sharing tool for the entire mining industry.

- The site could provide links to the progress and availability of technological solutions developed to address these types of accidents.
- Information about non-fatal and fatal accidents could be posted to promote industry awareness.
- A forum could be established for the industry to discuss issues regarding RCCM accidents.
- Training materials (such as accident scene sketches, digital pictures, and fatalgrams), comments, news, and accident trends could be posted as well.

APPENDICES

Appendix A: Other RCCM Accident Data

Other RCCM Accident Data

Other RCCM Accident Details

Several other details were reviewed as possible influences of the 67 non-fatal and 29 fatal RCCM accidents studied in this report. Upon investigation, these details were found to have no significant impact on RCCM accidents. However, they are included in this Appendix for completeness.

Much of the following data pertaining to the fatal RCCM accidents were included in the RCCM Safety Presentation that was presented at the MSHA Web Cast on May 3, 2005. When the corresponding information was available from Teradata, the numbers for non-fatal RCCM accidents were compiled for comparison.

The following is a list of topics included in this Appendix:

- Working Height
- Equipment Operator
- Machine Malfunctions, Fast Tram, and Slew Rate
- Accidents by Day of the Week
- Accidents by Shift
- Accidents by Job Classification
- Haulage
- RCCM Population
- Distribution of Fatal RCCM Accidents

Working Height

Working conditions can be broadly classified as high or low. For the purposes of this report, 48 inches and less were considered to be low working conditions. A logical assumption is that the distribution of RCCM fatalities would follow the distribution of mine heights, if the mining height was a factor in this type of accident.

Low working conditions introduce some of the following difficulties to miners:

- Equipment operators have reduced visibility.
- Miners' maneuverability is diminished.
- Communication between miners is more difficult.

In addition, miners in higher working conditions may develop a complacency because their visibility, maneuverability, and communications are not as limited as in low conditions.

The following chart shows the working heights reported⁸ for mines that experienced non-fatal and fatal RCCM accidents.

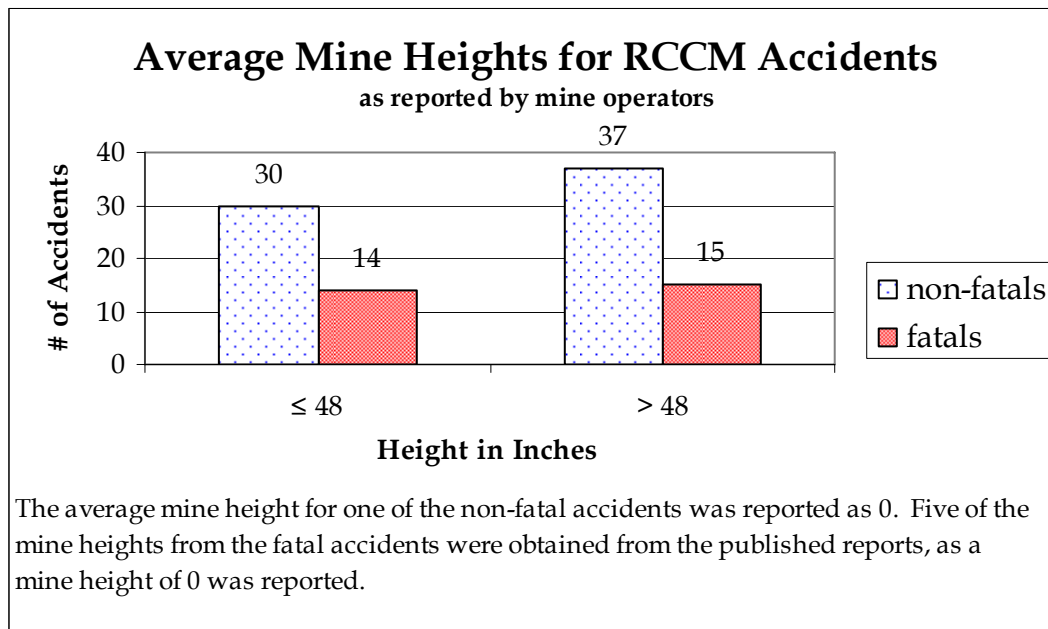


Figure 7: Average Mine Heights for RCCM Accidents

The working height in approximately 45% of the non-fatal RCCM accidents was low; the working height in 48% of fatal RCCM accidents was low. However, during the time between 1999 and 2004 (the period from which the non-fatal data sample was taken) and according to the height at the accident scene listed in the fatal accident report

⁸ Average mine height is reported to MSHA by mine operators on the 2000-122 Mine Status Data form.

published by MSHA, 11 out of the 13 (85%) fatal RCCM accidents occurred in high working conditions.

Mine heights of coal mines that reported underground production between 1999 and 2004 were obtained from a Teradata search. The purpose of this search was to compare the percentages of low and high working conditions in mines that experienced RCCM accidents with working conditions in all producing underground coal mines over the same period of time. In this six year period, approximately 25% of mine operators reported a mine height of zero inches. Of the 75% mine operators that did report heights, the breakdown between low and high working conditions was almost even. The largest difference occurred in 1999, with 6% more mines reporting low working conditions than high. The ratio gradually changed over the years until in 2004, 38% of mine operators reported high conditions and 35% reported low.

Twelve mine operators who experienced fatal RCCM accidents reported mine heights that differed by 12 inches or more from the heights listed in the fatal accident reports. Because a significant percentage of mine operators reported an infeasible mine height, and because there are discrepancies between the heights reported by operators and those listed in the fatal accident reports published by MSHA, a determination as to whether working height affects RCCM accidents is not apparent. However, the overall breakdown (meaning both ratios were close to 50%) between working conditions in non-fatal and fatal accidents indicates that working height is not a factor in RCCM accidents.

Equipment Operator

Forty-three of the victims (approximately 64%) involved in non-fatal RCCM accidents were operating the continuous miner at the time of the accident. At least 17 victims (25%) were injured while another person operated the RCCM; the RCCM operator could not be determined in seven accidents. There was insufficient data to determine whether the non-fatal RCCM accident victims were working alone at the time of the accident or not.

In 21 of the 29 RCCM fatalities (72%), the victim was operating the RCCM at the time of the accident. Nine of the 21 victims operating the RCCM when the fatal accident occurred were working alone; 12 were not. The victim was not operating the remote in eight of the RCCM fatalities (28%).

The percentages of accident victims operating the RCCM in non-fatal and fatal accidents are similar. This indicates that an equipment operator is more likely to injure himself than a coworker in an RCCM accident. However, this is expected as an operator has the highest possible exposure to these types of accidents. There is insufficient data to determine whether a person working alone affects RCCM accidents.

Machine Malfunctions, Fast Tram, and Slew Rate

In several of the RCCM fatal accident reports, coworkers in the area at the time of the accidents reported that the continuous miner either shut down, tripped a breaker, or experienced fast tramming or other tram problems prior to the accident. During the examination of the equipment involved in the RCCM fatalities, most of the investigations did not reproduce the equipment malfunctions reported by coworkers.

Machine malfunction is frequently due to loss of signal, which can cause unexplained, intermittent shutdowns to occur. An operator may instinctively approach the machine to improve signal strength. Combining this with possible disorientation and the fact that RCCMs may be set up so that the machine starts up in the same tram speed as before power was lost, a machine operator approaching a continuous miner while focusing on restarting the machine may be surprised when the machine restarts, responds to a command, and is in high tram speed.

The 2003 PIB recommending design features for remote controlled continuous miners states that machine rotational slew rate should be no greater than the slowest tram speed. Coupling this safety feature with training RCCM operators not to approach a machine experiencing intermittent shut downs could remove these as contributory factors to RCCM fatalities.

Accidents by Day of the Week

In recent years, the coal industry has switched from a traditional Monday through Friday to a seven day-per-week workweek. The RCCM Safety Presentation presented the fatal accidents by day of the week, but broke the accidents into two periods: up to 1999, and 2000 to 2004. The following are the distributions of fatal RCCM accidents:

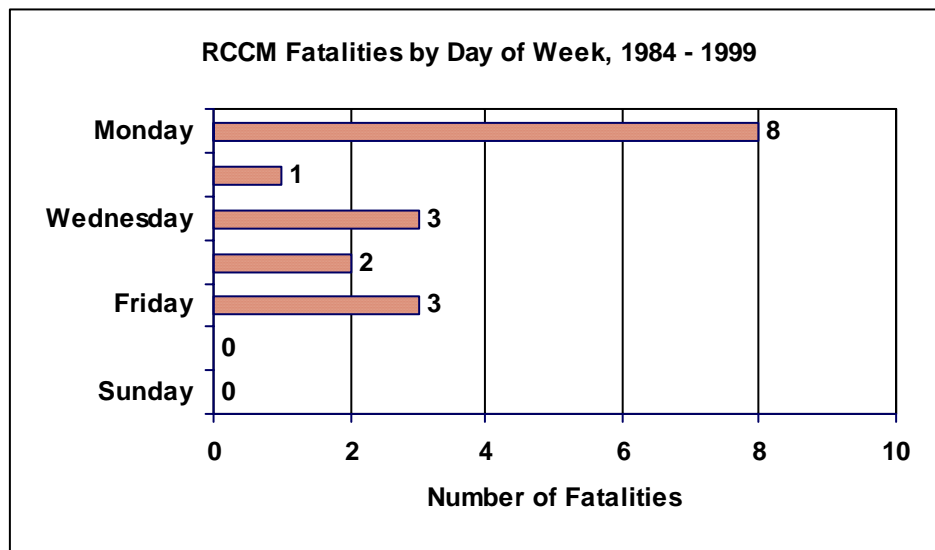


Figure 8: Fatal Accidents by Day of the Week, 1984-1999.

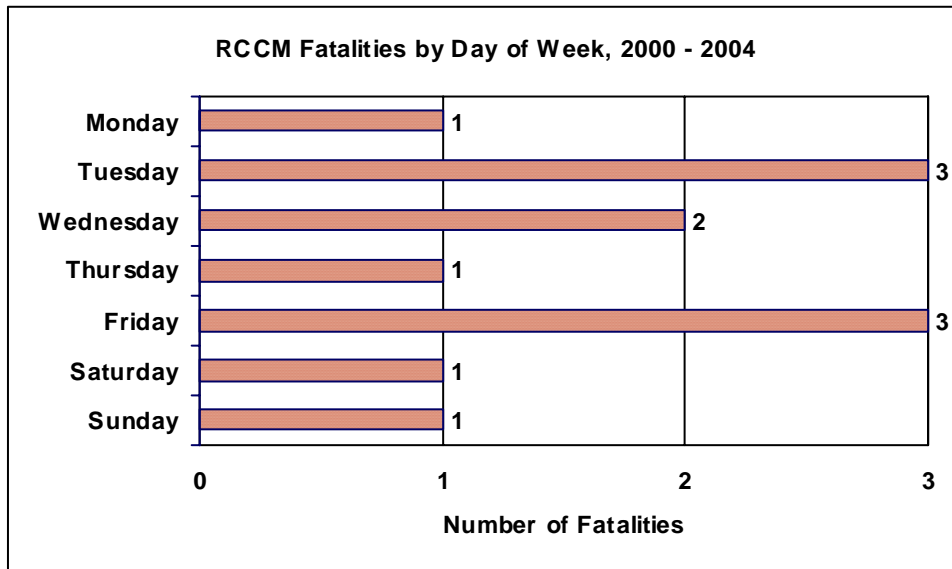


Figure 9: RCCM Fatalities by Day of the Week, 2000 - 2004

Note that a clear majority of the earlier fatalities occurred on Monday, Wednesday and Friday shared the second highest amount of fatalities, and there were no RCCM fatalities on weekends. The latter RCCM fatalities are more evenly spaced throughout the entire week, with the highest numbers occurring on Tuesdays and Fridays.

The following is the distribution of non-fatal RCCM accidents collected in the data sample:

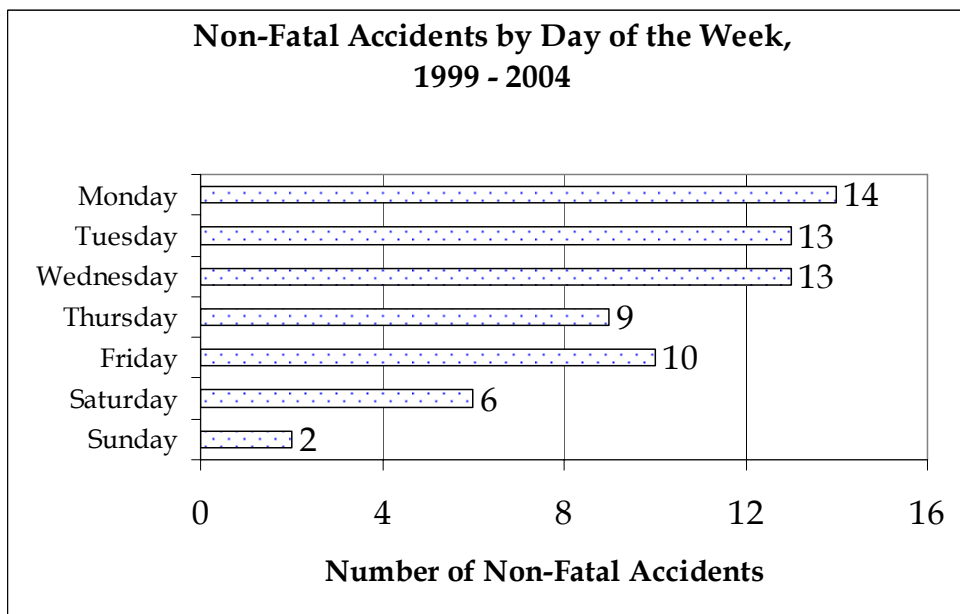


Figure 10: Non-Fatal Accidents by Day of the Week

The days of the week for the fatal accidents displayed in Figure 9 occurred within the same years as the non-fatal accidents shown in Figure 10. Both charts show a more even distribution of RCCM accidents throughout the week than the fatal accidents up to 1999. Therefore, the day of the week does not appear to affect RCCM accidents.

Accidents by Shift

The RCCM Safety Presentation presented the fatal RCCM accidents by shift. It would be logical to assume exposure to RCCM accidents should be greatest on the day shift because many mines perform maintenance on off-shifts, some mines run additional sections on the day shift, and some mines only produce on one shift a day, which is usually the day shift.

The following table presents the distribution of fatal and non-fatal RCCM accidents:

Shift	Number of Fatal Accidents	Number of Non-Fatal Accidents
Day	11 (38%)	34 (51%)
Afternoon	12 (41%)	23 (34%)
Midnight	6 (21%)	10 (15%)

Table 3: RCCM Accidents by Shift

There is a contradiction between the non-fatal and fatal RCCM accident data. Most of the non-fatal accidents occurred on the day shift, and most of the fatalities occurred on the afternoon shift. However, the lack of an overwhelming majority or disparity indicated that the shift was not a substantial contributor to RCCM accidents.

Accidents by Job Classification

Another detail presented in the RCCM Safety Presentation was the job classification of the victim. The following table compares the job classifications of the victims of the fatal and non-fatal RCCM accidents.

Job Classification of Victim	Percentage of Fatal Accident Victims	Percentage of Non-Fatal Accident Victims
RCCM operator	14 (48.3%)	45 (67.2%)
RCCM helper	3 (10.3%)	3 (4.5%)
maintenance employee	8 (27.6%)	7 (10.4%)
foreman	3 (10.3%)	4 (6.0%)
roof bolter	1 (3.4%)	0 (0.0%)
shuttle car/ram car/scoop/LHD o	0 (0.0%)	3 (4.5%)
other	0 (0.0%)	5 (7.5%)

Table 4: Job Classification of RCCM Accident Victim

Maintenance employees include electricians and mechanics; other includes belt men, laborers, and a longwall operator.

As is evident in the table, fatal and non-fatal RCCM accidents most commonly happen to RCCM operators and maintenance personnel. There are some disparities among the other job classifications between fatal and non-fatal accidents. However, the tabulation of job classifications of accident victims underscores the need to provide RCCM training to everyone who works underground, and not just the RCCM operators.

Haulage

The type of haulage system employed by the mine where the fatal RCCM accidents occurred is listed below.

Type of Haulage	Number of Mines
shuttle car	17
una-hauler/ram car	5
mobile bridge conveyer	3
shuttle and ram cars	3
scoop	1

Table 5: Haulage Method at Mines Experiencing RCCM Fatalities

The type of haulage used at the mine was not available in the non-fatal accident sample. Because most of the fatalities occurred during place changing activities and did not involve haulage (or any other type of) equipment, haulage in use at the mine was not considered a contributing factor in RCCM accidents.

RCCM Population

MSHA does not require mine operators to report the number of continuous miners or remote control continuous miners in use in underground mines, so the historical population trends for RCCMs are unavailable. However, two resources were used to determine the current population of continuous miners and remote control continuous miners in underground mines.

First, the continuous miner population data was gathered through a search of the MSHA Standardized Information System (MSIS) for the current number of active mechanized mining units (MMUs) operated in coal mines. An MMU is a unit of mining equipment that is designated as continuous ripper miners, continuous auger miners, shearers, augers, or even hand-loading equipment, used for the production of coal. In underground coal mines, MSHA tracks MMUs according to Title 30 Code of Federal Regulations (30 CFR) Part 70 dust sampling requirements. Secondly, the method of operation for the continuous miners operated in coal mines (remote control or on-board operation) was obtained through a survey of CMS&H District Health personnel. The information regarding the number of continuous miners in

metal/nonmetal mines was obtained from a separate survey of M/NM S&H District personnel.

Distribution of Fatal RCCM Accidents

The following bullets present additional information about the distribution of these fatalities among the Districts.

- Districts 3, 10, and 11 have RCCMs, but no fatal accidents associated with RCCMs. However, a RCCM fatality occurred on 10/15/84 in Alabama, which became part of District 11 in 1999, but was District 7 at the time of the accident.
- District 5 has experienced the second largest number of RCCM fatal accidents, and three of the first nine RCCM fatalities.
- Districts 2 and 9 have had RCCM fatal accidents, but have not experienced one since 1997 and 1995, respectively.
- In the Rocky Mountain District, remote control continuous miners were introduced around 1988. The mine operator using the largest number of RCCMs modified its last machine to remote control in 1991. This district experienced its first RCCM fatality in 2004.
- Coal Districts 4, 5, 6, 7, and 8, and the Rocky Mountain District, have all experienced RCCM fatal accidents since 2000. All of these coal districts have experienced more than one RCCM fatality in recent years except for District 6.

Again, this data study did not reveal explanations as to the different trends in RCCM fatalities among the Districts.

Appendix B: States' Efforts in Addressing RCCM Accidents

States' Activities

An examination of the fatal accidents involving remote control continuous miners shows that 12 of the 29 fatalities have occurred between the years 2000 and 2004, leaving 17 that occurred between 1984 and 1999. This indicates that the trend of remote control continuous miner fatalities is increasing, since 40% of the fatalities have occurred in five years.

Because of this trend, the mining enforcement agencies in states that have experienced a higher number of recent fatalities were contacted to determine whether they have gathered any data or directed any programs towards remote control continuous miner accidents. The results are summarized below.

Kentucky Office of Mine Safety and Licensing (OMSL)

The state of Kentucky has experienced three fatal remote control continuous miner accidents since 2000, and seven over all. The Kentucky OMSL has not directed any efforts specifically at these types of accidents. However, they did send copies of their fatal accident reports for review. A review of these reports indicated that they consistently reported the victim's occupation when injured, regular occupation, total mining experience, and experience at this occupation. The Kentucky reports also included detailed sketches of the accident scenes. Not all of the fatal accident reports published by MSHA and posted on www.msha.gov included these details. However, very few of both the MSHA and the Kentucky reports separated remote control continuous miner operator experience and training from (deck-operated) continuous miner operator experience and training.

Illinois Department of Natural Resources Division of Mine Safety and Training (DMST)

The state of Illinois experienced one fatal remote control continuous miner accident in 2003. The DMST recently produced a video on both a near miss and a fatal remote control continuous miner accident. They also produced a 3-D animation in 1998 that they are in the process of updating.

Indiana Bureau of Mines (BOM)

The state of Indiana has experienced two fatal remote control continuous miner accidents, both since 2001. The Indiana BOM has not directed any efforts specifically at these types of accidents. However, the current Commissioner was appointed in January 2005, and stated his intentions to develop programs to identify trends and address problems experienced in Indiana mines.

Virginia Division of Mines, Minerals, and Energy (DMME)

The state of Virginia has experienced two fatal remote control continuous miner accidents since 2000, and five over all. The DMME, in conjunction with MSHA, has developed a presentation to be offered in new miner, experienced miner, annual refresher, and job task training. The program informs miners of hazards to avoid when

working around remote control continuous miners and outlines options to roof control plans, along with other ideas, that mine operators may use to reduce these types of accidents. Options to roof control plans include using a notch cut when turning a break, limiting the depth of the first cut into a crosscut, and limiting the number of “turned” crosscuts. The DMME also produced a video that simulates a remote control continuous miner accident and presents interviews of actual remote control continuous miner operators who have experienced or witnessed remote control continuous miner accidents.

The DMME suggested that sketches and pictures (and information in general) from these types of fatal accidents be distributed for use as training materials. The DMME also shared their experience that coal miners pay attention to other coal miners and families of miners, and that materials developed using this relationship have a positive influence on training.

West Virginia Office of Miner’s Health, Safety, and Training (OMHST)

The state of West Virginia has experienced three fatal remote control continuous miner accidents since 2000, and seven over all. Although the West Virginia OMHST has not directed any efforts at remote control continuous miner accidents, they are participating in the ongoing remote control continuous proximity protection project undertaken by MSHA, AT Massey, Joy, and Nautilus.

Appendix C: Non-Fatal Remote Control Accident Narratives
As Submitted by Mine Operators on MSHA Form 7000-1

Please note that no attempt was made to modify the language submitted by the mine operators describing the accident (for example, misspellings, improper grammar, etc.)

Mine ID	Accident Date	Equip. Manufacturer	Narrative
4608589	1/30/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING MINER FROM #3 ENTRY TO #1 ENTRY. HE WAS PUTTING A SECOND ROPE ON THE CABLE WHEN HIS LEFT LEG WAS CAUGHT BETWEEN MINER BOOM & BOTTOM. EE ATTEMPTED TO MOVE BOOM OFF OF LEG WHEN T HE BOOM FRACTURED HIS LT. LEG, NEAR THE ANKLE.
1507082	3/12/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	MEMBER WAS BACKING OUT OF #8 HEADING AFTER TURNING A BREAK. HE WAS ATTEMPTING TO CLEAN UP THE WORK PLACE WHEN THE MINER HIT THE RIB ON THE OFFSIDE CAUSING THE MINER TO MOVE SWIFTLY TO THE RIGH T. EE'S RIGHT FOOT WAS MASHED UNDER THE PAN ON THE MINER. THE METATARSAL GUARD WAS DISLODGED TO THE SIDE AND MEMBER SISTAINED A CONTUSION AS WELL AS A LACERATION THAT REQUIRED STITCHES.
4406891	3/31/1999	Jeffrey-Dresser	WHILE TRAMMING CONTINUOUS MINER DOWN LONG JOHN BRIDGES PULL MINER AGAINST RIB TOWARD OPERATOR OF MINER, PINING HIM BETWEEN RIB AND MACHINE.
4200089	4/13/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRIMMING FLOOR AND CLEANING UP THE FACE OF #2 ENTRY. HE WAS OPERATING THE JOY MINER WITH A REMOTE CONTROL AND STANDING ON THE LEFT SIDE OF THE ENTRY. HE HAD STARTED THE MINER TOWARD THE FACE ON AN ANGLE TO LEVEL THE FLOOR. THE SHUTTLE CAR FOLLOWED THE MINER INTO THE FACE ON ABOUT THE SAME ANGLE. THE SHUTTLE CAR WAS STANDARD TYPE WITH THE CAB ON THE RIGHT SIDE OF THE ENTRY.
4601437	6/21/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	MAIN EAST SECTION ACTUALLY BREAKING OF 5 SOUTH BLEEDERS. EMPLOYEE PULLED WRONG LEVER ON MINER. HE THOUGHT HE WAS RAISING PLANKJACK BUT RAISED DRILL CHUCK, CAUSING AUGER TO BEND, PINCHING HIS FINGER.
1515289	6/28/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	WHILE MOVING THE 14-10AA JOY MINER THE EE BENT DOWN TO GET THE MINER CABLE SLACK OUT OF THE WAY AND ACCIDENTALLY HIT THE TRAM LEVERS ON THE REMOTE BOX WHICH CAUSED THE MINER TO PIN HIM AGAINBS T THE RIB AND MINER, CAUSING DAMAGE TO HIS RIGHTSHOULDER AND RIGHT RIBS.

3606967	7/16/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMOLYEE WAS OPERATING CONTINUOUS MINER BY REMOTEIN THE L2 ENTRY OF E22 SECTION. MINER WAS STOPPED BUT NOT SHUT OFF. WHILE CARRYING REMOTE RADIO, INJURED WAS POSITIONED BETWEEN THE MINER AND CO AL RIB ALONG SIDE THE END DRUM, WHEN HE BUMPED THE RADIO TRAM LEVER, CAUSING THE MINER TO PIVOTTOWARD THE RIB, AND PINCHING HIS LEG BETWEEN THE MINER AND THE RIB.
0503505	8/11/1999	Not Reported	EE WAS OPERATING A JOY CONTINUOUS MINER. HE WAS BACKING THE MINER OUT OF THE FACE TO CHANGE SIDES. THERE WERE TWO VENTILATION TUBES ON THE RIB. HE WAS BETWEEN THE TAIL OF THE MINER AND THE VEN TILATION TUBES. THE MINER SWUNG OVER AND CAUGHT HIM BETWEEN THE VENTTUBES AND TAIL OF THE MINER. BRUISE LEFT HIP.
1508079	8/18/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE BENT OVER TO MOVE MINER CABLE AND THE MINER BOOM MOVED AND STRUCK EMPLOYEE IN CHEST.
1507082	8/31/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE WAS TRTAMMING THE #1 CONTINUOUS MINER UP TO THE #2 PILLAR BLOCK WHEN THE SHUTTLE CAR OPERATOR HEARD HIM SCREAMING IN PAIN. INJURED STATED THAT HE WAS TRAMMING THE MINER OVER A HILL AND WHEN THE MINER CRESTED ON TOP OF THE HILL ITHAD A TEETER TOTTER EFFECT AND THE RIPPER HEAD CAME DOWN ON HIS FOOT.
1517153	9/13/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS OPERATING THE MINER WITH HIS HAND PLACED AT THE BACK OF THE DECK. WHILE TRAMMING OVER A HUMP THE LITTLE FINGER OF HIS RT HAND WAS CAUGHT BETWEEN THE FRAME AND DECK.
3303349	9/21/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJURED WAS IN A KNEELING POSITION WHILE TRAMMING THE MINER BACKWARDS, HE TURNED HIS HEAD TO LOOK AT APPROACHING SHUTTLE CAR AND INADVERTENTLY PINCHED HIMSELF BETWEEN MINER & RIGHT RIB.
1516856	10/8/1999	Not listed	EE WAS RUNNING THE MINER WITH THE REMOTE BAY. WHEN HE FELL PUSHING THE LEVER AND THE MINER TURN AND HIT HIM.
1517944	10/6/1999	Eimco	EE HAD PULL MINER INTO XC BETWEEN NO. 5 & 6 ENTRY & REMOVED CABLE. AS HE WAS BACKING MINER INTO #5 ENTRY HE CAUGHT HIMSELF BETWEEN MINER & RIB
4608680	10/11/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRYING TO MOVE MINER CABLE WITH FOOT WHEN PAN OF MINER CAUGHT LEFT FOOT.

0102901	12/6/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE AND CO-WORKER WAS MOVING THE MINING MACHINE FROM NO. 3 FACE AND BACKING IT OUTBY THE LAST OPEN X-CUT IN THE NO. 2 ENTRY. EMPLOYEE WAS WALKING TOWARD THE BOOM OF THE MINER TO REMOVE LOOP OF CABLE. HIS FEET BECAME TANGLED. EE ACCIDENTLY SPLIT THE CATS TRACK CAUSING THE BOOM TO HIT EE.
1517816	12/21/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING MINER ON A SLIGHT INCLINE AND MINER SLID OVER AND HIT HIS LEG CAUSING A CONTUSION.
1518065	1/13/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING MINER OUT OF HEADING THE MINE SLIPPED SIDE WAYS CAUGHT EE BETWEEN RIB AND MACHINE. EE WAS TAKEN TO HOSPITAL LATER RELEASED TO RETURN TO WORK.
1518196	2/15/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	20' IN #4 HEADING, EE GOT CAUGHT BETWEEN THE STANDOFF ON THE CONTINUOUS MINING MACHINE AND THE RIB.
1100726	12/15/1999	NO VALUE FOUND	EE WAS OPERATING REMOTE WHEN A WATER HOSE WAS PULLED AND STRUCK HIS RIGHT KNEE. EE CONTINUED TO WORK AND SOUGHT MEDICAL ATTENTION ON 1-27-00 WHEN HE WAS DIAGNOSED WITH A TORN MEDICAL MENISCUS OF HIS RIGHT KNEE.
4608591	2/21/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	RELIEVE OUT MAN MOVING MINER BACK TO CLEAN UP CUT OF COAL. MOVED TO RIGHT STRIKING MINER OPERATOR.
3600970	3/18/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE WAS OPERATING A REMOTE CONTROL CONT MINER MOVING FROM PLACE TO PLACE. HE STPPED TRAMMING TO MOVE MINER CABLE WHICH WAS ALONGSIDE MACHINE, BUT DID NOT SHUT THE C/M OFF. AS HE WAS WALKI NG BACK AFTER MOVING CABLE HE TRIPPED, STARTED TO FALL AND ACCIDENTLY HIT A TRAM LEVER FOR THE C/M. THIS CAUSED THE C/M TO PIVET AND PIN THE EMPLOYEE AGAINST THE COAL RIB.
1102846	4/16/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJURED WAS SETTING MINER UP IN #3 ENTYR ON #3 UNIT. WHEN HE WAS PULLING UP CABLE, THE CABLE HIT RAN XX AND THE MIENR TURNED AND THE TAIL HIT HIS LEFT KNEE.
1102846	4/18/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJURED WAS SETTING MINER OVER WHEN THE CABLE HIT TRAM LEVER AND HIT INJRUED RIGHT LEG CAUSING A LACERATION INJURED RECEIVED 4 STITCHES.
4406895	5/6/2000	NO VALUE FOUND	EMPLOYEE STATED HE WAS MOVING MINER AND WATER LINE TO MINERSTRUCK HIM ON SIDE OF KNEE.

3401787	8/4/2000	Jeffrey-Dresser	MINER OPERATOR WAS SETTING MINER UP IN 3 FACE TOTURN RIGHT HAND X-CUT AND APPARENTLY GOT BETWEENMINER & RIB & WAS PINCHED. EMPLOYEE WAS INJURED IN WAIST AREA.
4608159	8/3/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	ACCORDING TO WITNESSES, THE MINER HAD STOPPED ON A GRADE ON SOFT BOTTOM. EE WAS PUTTING A ROPE OF CABLE SLACK ON THE BOOM WHEN THE MINER SLID SIDEWAYS PINCHING THE EE AGAINST THE RIB WITH THE BOOM.
1518259	8/2/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	BECAME PINNED TO RIB OF MINE BNY THE TAIL BOOM SWING ON THE MINER.
1102236	8/31/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS ON THE FRESH AIR SIDE OF A LINE CURTAIN WHILE BACKING UP ON CONT. MINER #8 JOY. THE TAIL OF THE MACHINE WAS TO THE RIGHT SIDE. HE BACKED THE MINER UP & PINNED HIMSELF BETWEEN THE TAIL & THE RIB.
3301159	2/23/2000	Caterpillar	EE WAS OPERATING A CONTINUOUS MINER AT THE FACE AREA. A LOOP OF TRAILING CABLE FLIPPED OVER AND STRUCK HIM ON THE SIDE OF THE KNEE, BENDING IT TO THE OUTSIDE.
4608457	12/13/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJURED WAS IN THE PROCESS OF RESPOSITIONING THE MINER AND CAUGHT HIMSELF BETWEEN. THE COAL RIB AND THE TURNTABLE OF THE CONTINUOUS MINER BOOM.
0503505	1/22/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	THE CONTINUOUS MINER OPERATOR AND THE EMPLOYEE WERE BACKING THE CM OUTOF THE #1 ENTRY. THE EMPLOYEE WAS PICKING UP THE ELECTRICAL CABLE AND PLACING IT ON THE BOOM OF THE CM. THE CMO STOPPED TH E CM, AT WHICH TIME THE CM SLID FORWARD AND TO THE RIGHT HITTING THE EMPLOYEE IN THE RIGHT FRONT SIDE OF THE LOWER ABDOMEN AND PUSHED HIM INTO THE RIB. EMPLOYEE SENT FOR MEDICAL TREATMENT.
4608787	4/5/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE HAD COMPLETED MINING IN THE FACE OF NO. 1 ENTRY AND WAS TRAMMING THE CONTINUOUS MINER OUTBY. THE TAIL OF THE MINER WAS SWUNG TOWARD THE RIB. EE WAS IN A BENT OVER POSITION BESIDE THE RIB WH EN HE WAS PINNED AGAINST THE RIB BY THE BOOM OF THE CONTINUOUS MINER.
1517587	4/11/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING A MINER BACK TOWARDS FACE AFTER SETTING OVER IN #6 ENTRY UP THE RIB. THE MINER SLEWED AROUND HITTING EE IN LEFT HIP & TRAPPING HIM BETWEEN MINER AND RIB. HE MOVED THE MINER OFF HIMSELF FREEING HIM.

1517902	5/30/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	HOOKING PULL ROPE ON TO MINER AND THE BOOM SWUNG AND STRUCK HIM.
3608850	6/28/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	WHILE MOVING THE MINER, EE POSITIONED HIMSELF IN THE MIDDLE OF THE MACHINE, WHILE TRAMMING FORWARD, THE CABLE TENDING ARM CAUGHT HIM FROM BEHIND, WHEN THE ARM CAME IN CONTACT WITH EE, EE HIT THE WRONG TROM LEAVER, WHICH PINCHED HIS LEG BETWEEN THE RIB AND CABLE TENDING ARM.
1518022	7/10/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	RUB RAIL ON MINER CAGUHT FINGER WHEN MINER SLIDING SIDWAY AND RUB RAIL STRUCK TOLO STRUCTION. EE RECEIVED A FRACTURE AND LACERATION TO THE LITTLE FINGER ON THE RIGHT HAND.
4406744	10/5/2001	Eimco	EE WAS SWINGING BOOM OF THE CONTINUOUS MINER. HEGOT HIS HAND CAUGHT BETWEEN THE BOOM & THE FRAMEOF THE MINER MASHING HIS SMALL & RING FINGERS ONHIS LEFT HAND.
4608437	10/8/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJURED WAS FLATING MINER OPERATOR OUT FOR LUNC. WAS SETTING MINER OVER IN A CUT & SWUNG MINER STANDOFF AGAINST HIMSELF & RIB. PINNING HIMSELF MOMENTARILY. HE MOVED THE MINER OFF HIMSELF BEFOR E HELP ARRIVED. HAS A HAIRLINE FRACTURE OF THE PELVIS ON LEFT SIDE. WENT TO HOSPITAL. DIDN'T SEEM TO BE VERY SERIOUS AT THE TIME.
4608437	10/20/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	ELECTRICIAN WAS FLOATING MINER - HAD MOVED MINERTO #3 ROOM ON SOUTH MAINS. HE GOT BETWEEN MINER AND RIB TO GET A PIECE OF CURTAIN OUT OF THE WAYAND SWUNG MINER OVER AND FOULED HIS LEGS BETWEEN MINER AND RIB. HE BRUISED LOWER LEGS BELOW KNEESBUT WALKED TO MANTRIP TO RIDE OUTSIDE. HAD LEGS X-RAYED BUT TEST NEGATIVE - JUST CONTUSIONS.
3301159	11/8/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS MOVING THE CONTINUOUS MINING MACHINE FROM THE FACE OF #1 ENTRY. AS THE MACHINE WAS BEING BACKED INTO THE CROSSCUT FROM 1 TO #2 ENTRIES. THE BOOM ON THE MACHINE, PINNED THE EE AGAINST TH E RIBLINE, FRACTURING HIS PELVIC AREA. THE REMOTE POWER CORD WAS CUT BY THE BOOM AND THE MACHINE SHUT DOWN. THE EE WAS STANDING TO CLOSE TO THE MACHINE WHILE OPERATING IT REMOTE CONTROLLED.

3301070	6/26/2002	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE POSITIONED HIMSELF BETWEEN THE BOOM OF THE MINER AND THE COAL RIB. HE WAS CAUGHT BETWEEN THE RIB AND BOOM OF THE MINER. CAUSE OF THIS INJURY WAS THE VICTIMS FAILURE TO POSITION HIMSELF A SAFE DISTANCE BEHIND THE MACHINE. RULES/REGS WAS A FACTOR, SAFETY EQUIPMENT NOT A FACTOR, MINER PROFICIENCY A FACTOR, MINING EQUIPMENT/SYSTEMS COULD BE A FACTOR (REMOTE CONTROLLED MINER).
3607838	7/1/2002	Lee-Norse Co.	EE WAS TRAMMING THE MINER FROM ENTRY #2 TO ENTRY#3 IN THE EAST SECTION. HE WAS VISUALLY CHECKING THE CLEARANCE AT THE BACK LEFT OF THE MINER WHILE TRAMMING & DID NOT NOTICE THE NARROW AREA BETWEEN THE RIGHT RIB & THE MINER. HIS RIGHT LEG WAS PINNED BETWEEN THE MINER FRAME & THE RIGHT RIB.
0101322	7/26/2002	Eimco	EE WAS PROGRAMMING REMOTE ON MINER, HE WAS WORKING ALL FUNCTION IN MANUAL TO PROGRAM MINER. THE MINER HAD A TRAM PROBLEM, THIS WAS THE REASON FOR CHANGING THE REMOTE. WHEN HE ENGAGED THE MANUAL TRAM HE STEPPED UP ON MINE CABLE- THIS CAUSED THE TRAM LEVER TO HANG & KEEP TRAMMING.
1517287	9/7/2002	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS MOVING MINER CABLE WITH HIS FOOT WHEN THE CM CATS CAUGHT THE CABLE TRAPPING HIS RT.LEG BETWEEN THE CABLE AND THE RUB RAIL ON THE CONTINUOUS MINER. EE WAS KEPT IN THE HOSPITAL OVER NIGHT FOR OBSERVATION, SUBSEQUENTLY NOT WORKING HIS NEXT REGULAR WORK SHIFT.
0100759	11/22/2002	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE STATED HE WAS MOVING CONTINUOUS MINER AND HAD STOPPED TO HANG CABLE ON MINER. HE STATED A DEFLECTION PLATE HAD BEEN ADDED THE SCRUBBER DISCHARGE AND WHILE STANDING AT THE REAR OF THE MINER. HE BEGAN TO MOVE IT AND THE MINER SLOACHED CATCHING HIS LEFT FOOT BETWEEN IT AND THE FOOTWALL.
1202010	12/6/2002	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE HAD JUST FINISHED CUTTING #7 ENTRY AND WAS TRAMMING THE MINER ACROSS THE LAST OPEN XCUT TO #4 ENTRY. HE WAS STANDING BEHIND THE BACK BUMPER OF THE MINER AS HE MOVED IT. AS HE STARTED TO MOVE TOWARD THE MIDDLE OF THE MINER IT'S BACK END MOVED OVER & PINNED HIM BETWEEN THE RIB & THE TRAY ON THE MINER. THIS INCIDENT TORE SOME LIGAMENTS IN HIS CHEST AREA & BRUISED HIS BACK.

1518058	1/10/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING MINER WHEN MINER COASTED INTO HIM CATCHING HIS KNEE BETWEEN MINER AND GOB MATERIAL.
1518241	1/28/2003	Not Reported	EMPLOYEE WAS CAUGHT BETWEEN A ROCK AND THE MINER HURTING HIS LEFT LEG AND FINGER. (HE WAS SEEN IN E.R. ON 1/28 AND FOLLOWED UP BY DOCTOR VISIT ON 1/29 WHO RELEASED HIM FOR WORK).
4406906	2/17/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS REPAIRING MINER, HE WENT BESIDE THE MINER TO MOVE CABLE TO PREPARE TO TRAM THE MINER, WHEN HE BENT OVER THE TRAM LEVER BECAME INTANGLED WITH HIS BELT AND/OR CLOTHING OR BODY, CAUSING TH E MINER TO TRAM SIDEWAYS CATCHING HIM BETWEEN HTHE CUTTER DRUM AND RIB.
4608074	3/12/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS ASSISTING THE CREW IN THE CHANGING OF THE GEARCASE ON THE JOY 14CM10 CONTINUOUS MINER WITH REMOTE IN THE #5 ENTRY, SPAD #1722, OF EAST MAINS WHEN HIS RIGHT FOOT WAS PINCHED BETWEEN THE RIPPERVEYOR SPROCKET AND GEARCASE OF THE MINER, RESULTING IN TWO BROKEN BONES IN HIS RIGHT FOOT.
4608589	5/12/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE WAS TRAMMING MINER WHEN THE BOOM OF THE MINER CAUGHT HIS RIGHT HAND AGAINST RIB. EE BELIEVES THAT HE MAY HAVE CAUGHT TRAM LEVER WITH HIS LIGHT CORD. ALL EMPLOYEE'S HAVE BEEN REPEATEDL Y CAUTIONED ABOUT STAYING CLEAR OF THE MINER WHEN IT IS ENERGIZED.
1516974	5/15/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	WHILE TRAMMING CONT. MINER THE DECK ON CONT. MINER CAUGHT THE CALF MUSCLE OF LEG AND BRUISED IT.
4404856	5/24/2003	Eimco	5 LEFT DEV.- #1 ENTRY: WHEN EE BENT OVER TO KNOCK RIPPER BREAKER, HIS HAND OR ARM HIT THE TRAM LEVER WHICH CAUSED THE MINER TO STEER TO THE RT.CATCHING HIM BETWEEN THE MACHINE & THE RT. RIB.
1517587	8/6/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS IN THE PROCESS OF HANGING A PIECE OF WING CURTAIN IN #5 ENTRY, CO-WORKER WAS TRAMMING MINER TO THE FACE WHEN THE MINER HEAD HIT THE LEFT RIB. CO-WORKER WAS AT THE TAIL END OF THE MINER IN THE INTERSECTION, HE COULD NOT SEE EE AT THE HEAD. COWORKER SLUED THE HEAD AWAY FROM THE RIB CAUSING HEAD OF MINER TO ROLL ONTO EE'S LEFT FOOT. IF HE'D BEEN AT THE PIVOT POINT OF THE MINER,

4608593	8/12/2003	Eimco	WAS SETTING UP MINER TO LOAD, DROPPED PAN & HEAD ON BOTTOM TO PUSH UP LOOSE COAL. I WAS LOOKING STRAIGHT AHEAD & DID NOT REALIZE MY FOOT WAS IN THE PAN OF HEAD A BIT CAUGHT MY BOOT & ROLLED ON MY FOOT BREAKING TWO TOES AND HAVING TO GET STITCHES.
3303349	9/9/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS TRAMMING MINER BOOM FIRST INTO A 60 DEGREE CROSSCUT. HE STOPPED THE MINER AND BEGAN TO WALK PAST THE CUTTER DRUM AND SUDDENLY BECAME PINNED BETWEEN THE COAL RIB & THE CUTTER DRUM. HE STATED HE DOES NOT KNOW HOW THIS HAPPENED. MAINTENANCE DEPT CHECKED TRAMMING DEVICES ON MINER BUT FOUND NOTHING ABNORMAL. ACTUAL CAUSE IS STILL UNDER INVESTIGATION.
1517224	8/26/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	HE BACKED THE CONTINUOUS MINER OUT TO SET OVER TO THE OTHER SIDE. WHEN HE SPLIT HIS CATS THE MINER SLEW OVER AND CAUGHT HIS SIDE AND LEFT AGAINST THE RIB. AND THE HEAD OF MINER WAS SITTING ON HIS FOOT "LEFT". NO BITS WERE IMPALING HIS BODY OR FOOT. HE REFUSED MEDICAL ATT.
1516666	9/29/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	THE MINER OPERATOR WAS TRAMMING THE MINER TO A FRESH CUT. HE LOOKED OVER HIS LEFT SHOULDER TO SEE WHERE THE MINER HELPER WAS. THE MINER RAN OVER A SMALL ROLL IN THE BOTTOM, CAUSING THE MACHINE TO TEETER-TOTTER. THE OPERATOR'S HEAD WAS BETWEEN THE MACHINE DECK AND THE MINE ROOF. THIS RESULTED IN BURSTING THE OPERATOR'S HARD HAT.
1518565	9/25/2003	Eimco	EMPLOYEE WAS BETWEEN CONT MINER AND RIB AND CONT HAULAGE PUSHED MINER AROUND PINNING EE BETWEEN MINER AND RIB.
1517979	11/11/2003	Not Reported	BACKING THE MINER UP AND CAUGHT HIS HEAD BETWEEN THE MINER AND THE TOP.
4406947	12/9/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE ACCIDENTALLY BUMPED INTO REMOTE CONTROL CAUSING TAILBOOM TO SWING AROUND AND HIT HIM IN THE BUTT. BRUISED AND SORE BUTT.
1518088	3/29/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS BRINGING A CONTINUOUS MINER ACROSS THE SECTION. HE WAS BETWEEN #4 & #5 ENTRIES AND STOPPED TO REMOVE A PULL ROPE FROM MINER BOOM. WHEN HE BENT OVER TO REMOVE ROPE, HIS SUSPENDERS CAUGHT A TRAM LEVER AND CAUSED THE MINER TO MOVE AWAY FROM HIM. HE WAS CAUGHT BY EXTRA ROPES AND CABLE ATTACHED TO BOOM, RESULTING IN HIM BEING TOSSED AGAINST BOOM, STRIKING HIS BACK ON BOOM.
1518706	8/19/2004	Joy Machinery Co. (Joy, Joy	MOVING THE MINER OVER, & GOT HIT BY MINER BOOM

		Manufacturing Co.)	
4608266	10/28/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE was injured as he was caught between the coal rib and the miner boom. There was a miscommunication between EE and the miner operator.
4406973	12/13/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	Employee was tramming miner from #2 heading to belt ed from path of miner. Employee bent over to move cable, his to pin him against right rib in #2 heading.
4609015	12/17/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE was tramming the miner across the section. He had stopped to hook a pull rope on boom of miner, when he accidentally pinned himself between boom of miner & rib.

**Appendix D: Training Aids Developed for the Remote Control
Continuous Miner Accident Reduction Program**

RCCM Safety Presentation

Based on the MSHA RCCM Web Cast presented on May 3, 2005, a RCCM Safety Presentation was prepared in PowerPoint as a training aid for the mining industry. The RCCM Safety Presentation incorporated much of the data analyzed in this report and presented in the web cast. Similar to the Web Cast presentation, the RCCM Safety Presentation presents data regarding the number of fatal RCCM accidents per year, fatalities per shift and day of the week, and fatalities by mining experience and job classification. Additionally, the RCCM Safety Presentation includes the make and model of the remote control unit and RCCM involved in the accident, the RED ZONE chart prepared by the State of Virginia and CMS&H District 5 (see Appendix F), and recognition of the often-overlooked RED ZONE above and below the RCCM. The RCCM Safety Presentation was developed for MSHA's 2005 Summer PROPS Outreach efforts.

The presentation can be viewed at www.msha.gov at this link:
<http://www.msha.gov/webcasts/Coal2005/Coalwebcast05032005.htm>.

Miner's Tips for MSHA's Accident Prevention Program

One of the objectives of the committee was to develop handout materials and audio/visual aids depicting information obtained from the data review. These handout materials were also developed for the 2005 Outreach. Information obtained from the data review enabled the committee to develop ideas, which led to the development of six Miner's Tips and a safety sticker for MSHA's Accident Prevention.

Cable Handling, Remote Control Continuous Miners

This Miner's Tip addresses the fact that many fatal and non-fatal accidents have occurred while the miner operator is handling the machine's trailing cable. The tip suggests that when attempting to handle the trailing cable while one is within the turning radius of the continuous miner that the operator de-energizes the machine and the remote control unit according to established safe work practices.

When Radio Signal is Lost, Don't Approach Remote Control Continuous Miners

This Tip addresses the fact that some remote control machinery accidents have occurred where it is believed the operator moved toward the machine, after it was reported that the operator was having difficulty operating the machine with the radio remote control. The tip warns that if the continuous miner is not following the commands of the radio remote control unit, the operator should not get within the machine's turning radius to get closer to the machine's antenna. It may be a common tendency when using radio remote control units to believe that the radio signal is not making it to the machine's receiver antenna if the machine is not following the remote control's commands. The suggestion is, after verifying that the remote control unit is properly powered up to try the command one more time. If the machine does not respond, the operator should assume the equipment has malfunctioned, and initiate machine servicing according to established safe work practices.

Keep Your Mind on Your Work

This Tip addresses the fact that the operators of remote controlled continuous miners have many things to do and think about while operating a continuous miner. Some Job Task Analysis reports show the miner operator's specific tasks while operating the machine during a shift. In addition to safety concerns, miner operators have many other duties, including trailing cable and water line handling, methane checks, watching out for coworkers, following the centerline, etc. The tip stresses that it is imperative that the miner operator must remember never to reposition the mining machine or tram it for a place change if the operator or anyone else is positioned within the machine's turning radius. The tip reinforces that the operator's awareness of his location within the "red zone" is of utmost importance to his safety.

The Middle of the Remote Control Continuous Miner is Not Always a Safe Place

This Tip states that the middle of the remote control continuous miner (pivot point) is not a safe place from which to operate the machine during a place change. The common misconception is that while positioning or traming the machine during a place change, the safest place to operate the machine is alongside the machine at the pivot point. However, the pivot point moves as the machine moves, and it is extremely difficult for one to stay in a safe position relative to the machine movement. The best practice is not to operate the continuous miner while anyone is in the Red Zone.

Turning a Remote Control Continuous Miner

This Tip addresses the orientation of the operator relative to the machine while operating a remote control continuous miner. Since the operator of a remote control miner is mobile, it can be easy to issue an incorrect machine command for an intended movement. An operator can easily become disoriented while trying to initiate machine movement while his relative position with respect to the machine changes as he moves about the machine. A forward lever movement of the right tram lever always initiates cutter head movement to the left, regardless of where the operator is located with respect to the machine. This Miner's Tip reinforces the caution that the switch and button operation of the remote control do not change if one is at the rear, facing forward, or at the front, backing out.

Traming While Positioned within the Turning Radius of the Remote Control Continuous Miner Can be Fatal

This Tip reinforces the fact that the single most important factor in the prevention of remote controlled continuous mining machine crushing accidents is the location of personnel outside of the machine's turning radius. A review of fatal accident reports shows that the majority of non-maintenance related crushing accidents involving remote controlled continuous mining machines happened while the victim was positioned within the turning radius of the machine while it was being tramed for a place change. The Miner's Tip recommends that miners do not place themselves in the Red Zone unless the machine and the remote control unit are deenergized according to established safe work practices.

The Tips can be viewed at this link on www.msha.gov:
http://www.msha.gov/Accident_Prevention/categories/sectionface.htm.

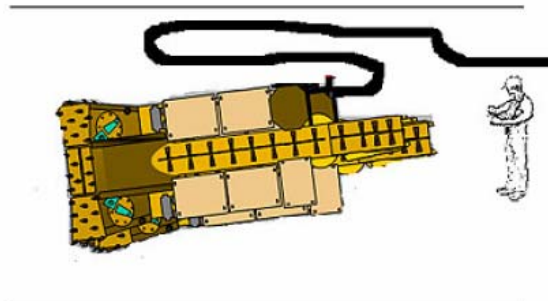


MSHA's Accident Prevention Program
Miner's Tip

Safety and
Health are
Values!

**Cable Handling,
Remote Control Continuous Miners**

Category : Section Face Equipment
Mine Type: Underground Coal and Non-Metal



When handling the cable within the turning radius of the remote control continuous miner, de-energize the machine and remote control unit according to established safe work practices.

Many fatal and near miss accidents have occurred because the cap lamp cord, a tool, or a body part accidentally pushed a tram lever.

Ensure that you and your co-workers always work safely.

DO NOT RISK entering the remote control continuous miner's turning radius to handle the cable unless the machine and remote control unit are de-energized according to established safe work practices.

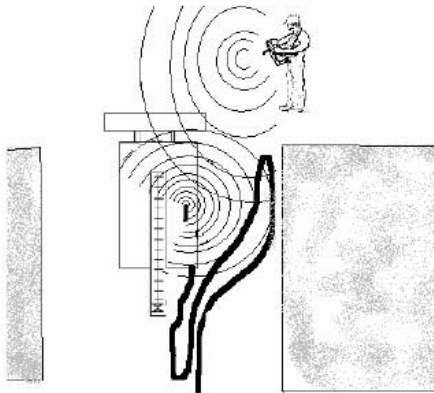
If you have a tip you would like to pass on, you can e-mail it to
zzMSHA-MinersTips@dol.gov.
If your tip is selected, you will receive credit in this space.

Issued: 03/23/2005
Tag # AP2005-M91005



When Radio Signal is Lost, Don't Approach Remote Control Continuous Miners

Category : Section Face Equipment
Mine Type: Underground Coal and Non-Metal



If the remote control continuous miner is not following the commands of the radio remote control, **DO NOT** get within the machine's turning radius to get closer to the machine's antenna.

It is a common tendency to believe the radio control signal is not making it to the machine's antenna when the machine is not following the radio remote control commands.

First, check that the Remote Control Unit is powered up by the cap lamp battery, and then try the control command again.

If the machine does not respond, assume the machine or remote control unit has malfunctioned and proceed according to established company policies for maintenance and trouble shooting of the radio remote control equipment.

If you have a tip you would like to pass on, you can e-mail it to
zzMSHA-MinersTips@dol.gov.
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Tag # AP2005-M91008



MSHA's Accident Prevention Program Miner's Tip

Safety and
Health are
Values!

Keep Your Mind On Your Work

Category : Section Face Equipment
Mine Type: Underground Coal and Non-Metal



Operators of remote controlled continuous mining machines have many things to do and think about.

Safety is one of many concerns for a continuous mining machine operator.

Never reposition the mining machine or tram it for a place change if you are positioned in the machine's turning radius.

De-energize the machine and remote control unit according to established safe work practices before entering the "[red zone](#)".

If you have a tip you would like to pass on, you can e-mail it to
zzMSHA-MinersTips@dol.gov.
If your tip is selected, you will receive credit in this space.

Issued: 03/23/2005
Tag # AP2005-M91004

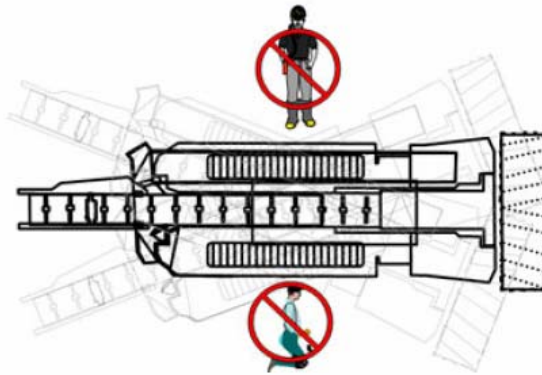


MSHA's Accident Prevention Program
Miner's Tip

Safety and
Health are
Values!

**The Middle of the Remote Control
Continuous Miner Is Not a Safe Place**

Category : **Section Face Equipment**
Mine Type: **Underground Coal and Non-Metal**



The middle of the remote control continuous miner (pivot point) is not a safe place from which to reposition or tram the machine during a place change.

The pivot point moves as the machine moves and may cause you to be in a position to be crushed if the miner suddenly turns.

Never operate the continuous miner when anyone is in the Red Zone

Although some roof control plans prohibit tramping the continuous miner from within the turning radius of the machine, it is important for You to always remember to **Stay Out of the Red Zone!**

If you have a tip you would like to pass on, you can e-mail it to zzMSHA-MinersTips@dol.gov.

If your tip is selected, you will receive credit in this space.

Issued: 03/23/2005
Tag # AP2005-M91007

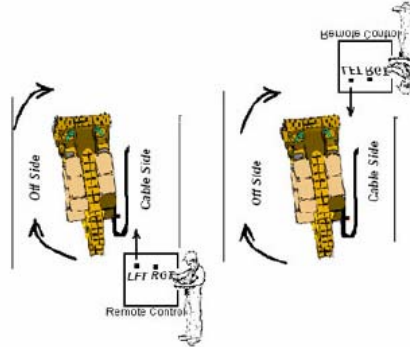


MSHA's Accident Prevention Program Miner's Tip

Safety and
Health are
Values!

Turning a Remote Control Continuous Miner

Category : Section Face Equipment
Mine Type: Underground Coal and Non-Metal



When operating the miner from behind (at the conveyor boom end of the miner facing the cutter head):
The LEFT TRAM FORWARD control will turn the cutter head toward the cable side of the machine
and the boom toward the off side of the machine.

- When operating the miner from the front (at the cutter head end of the miner facing the boom): The
LEFT TRAM FORWARD control will ALSO turn the cutter head toward the cable side of the machine
and the boom toward the off side of the machine.

- ALWAYS expect the remote control to move the crawlers (CATS) in the same direction regardless of
the direction you are facing.

- DO NOT become disoriented because your position changes. The operation of the remote control does
not change if you are at the rear, facing forward or in the front, backing out.

If you have a tip you would like to pass on, you can e-mail it to
zzMSHA-MinersTips@dol.gov.
If your tip is selected, you will receive credit in this space.

Issued: 03/23/2005
Tag # AP2005-M91006

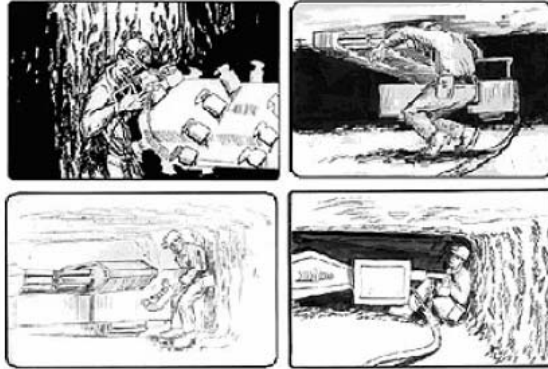


MSHA's Accident Prevention Program
Miner's Tip

Safety and
Health are
Values!

**Tramming While Positioned Within the Turning
Radius of the Remote Control Continuous Miner Can Be Fatal**

Category : Section Face Equipment
Mine Type: Underground Coal and Non-Metal



Fatal accident statistics show that the majority of all non-maintenance related crushing accidents involving remote controlled continuous mining machines happened when the victim was located within the turning radius of the machine while it was being trammed.

Statistics show that your location (**OUTSIDE** of the **MACHINE'S TURNING RADIUS**) is the single most important factor that prevents remote controlled continuous mining machine crushing injuries.

Never position yourself in the turning radius of the remote control continuous mining machine while it is being repositioned or trammed for a place change. Never enter the "**red zone**" unless the machine and remote control unit are de-energized according to established safe work practices.

**If you have a tip you would like to pass on, you can e-mail it to
zzMSHA-MinersTips@dol.gov.
If your tip is selected, you will receive credit in this space.**

Issued: 03/23/2005
Tag # AP2005- M91009

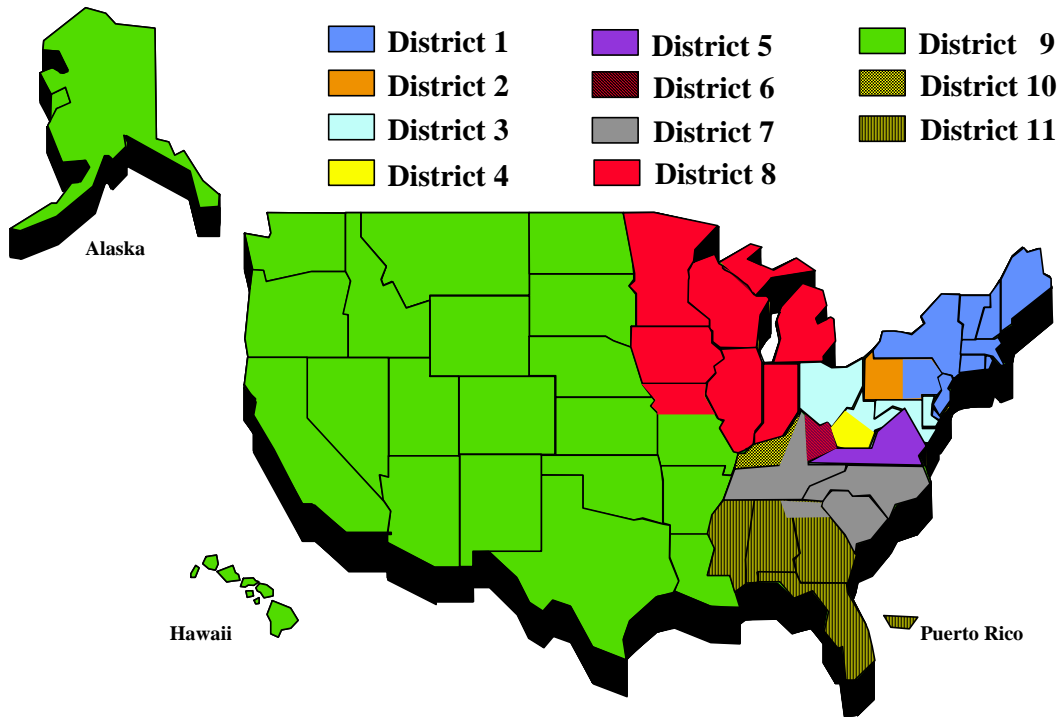
Safety Sticker

The following sticker was developed for distribution during the June 2005 Outreach program as a safety reminder to miners.

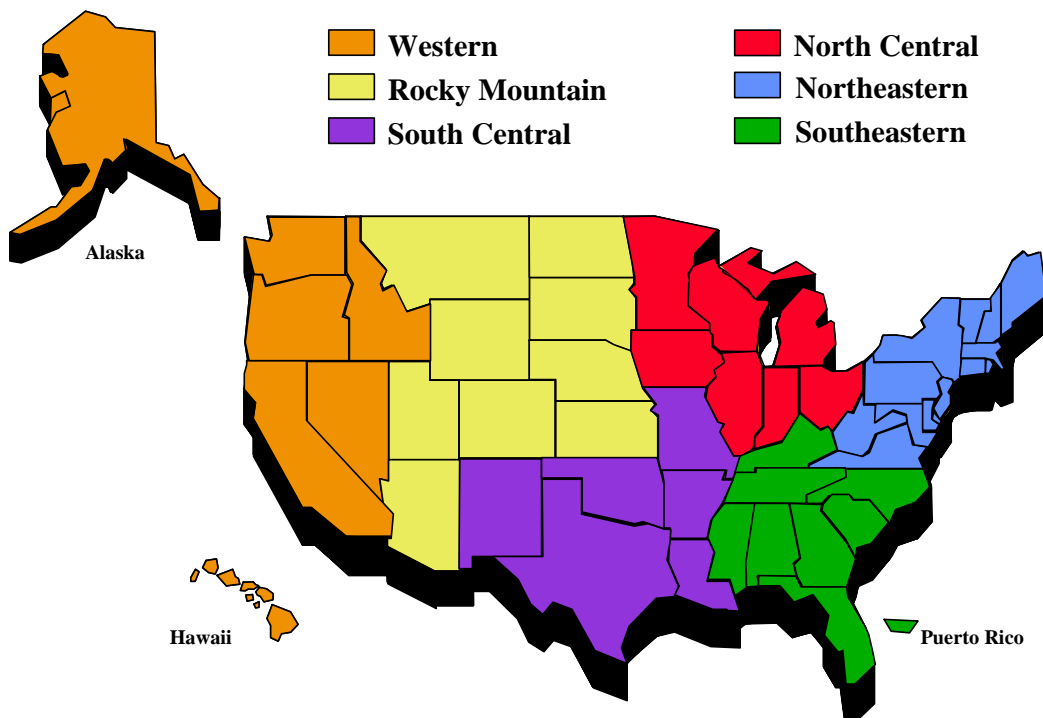


Appendix E: Maps of MSHA's Districts

MINE SAFETY AND HEALTH ADMINISTRATION Coal Mine Safety and Health Districts



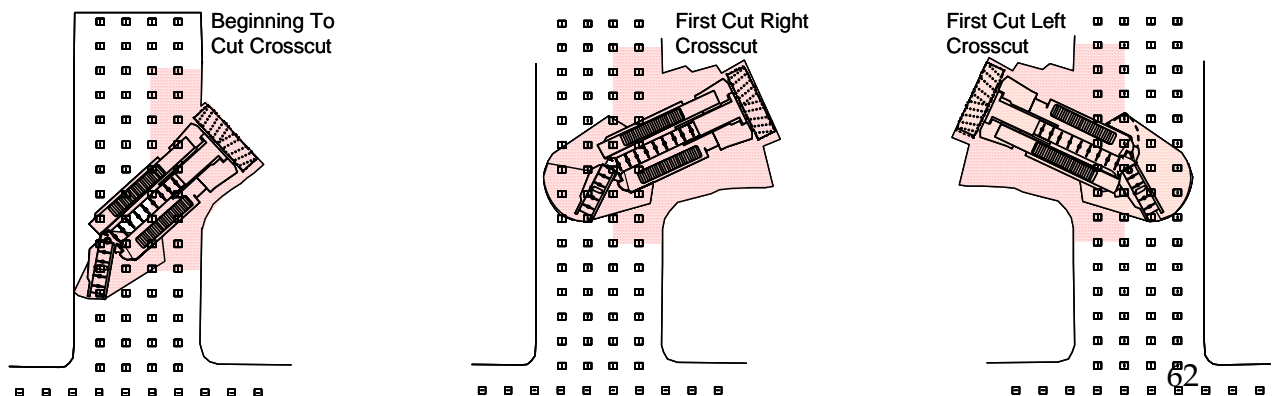
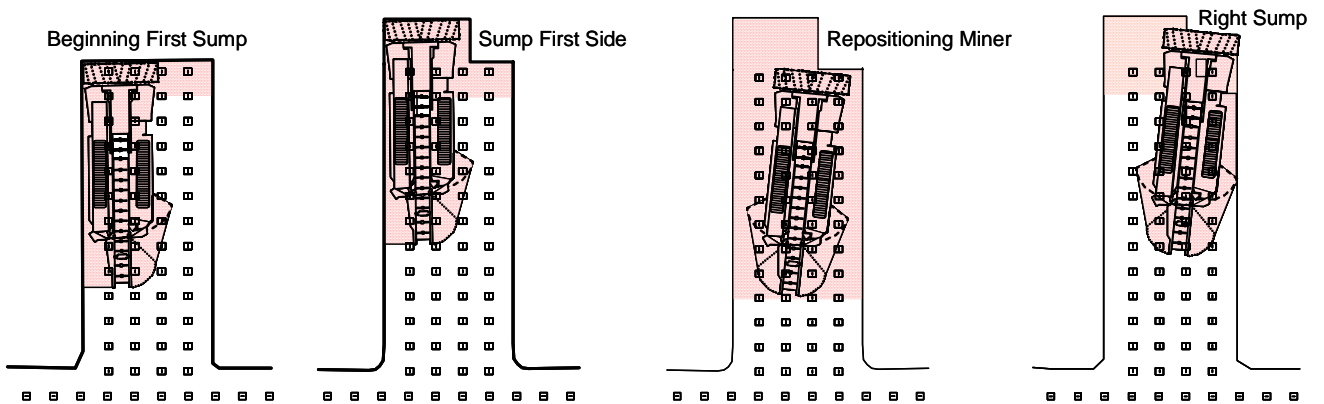
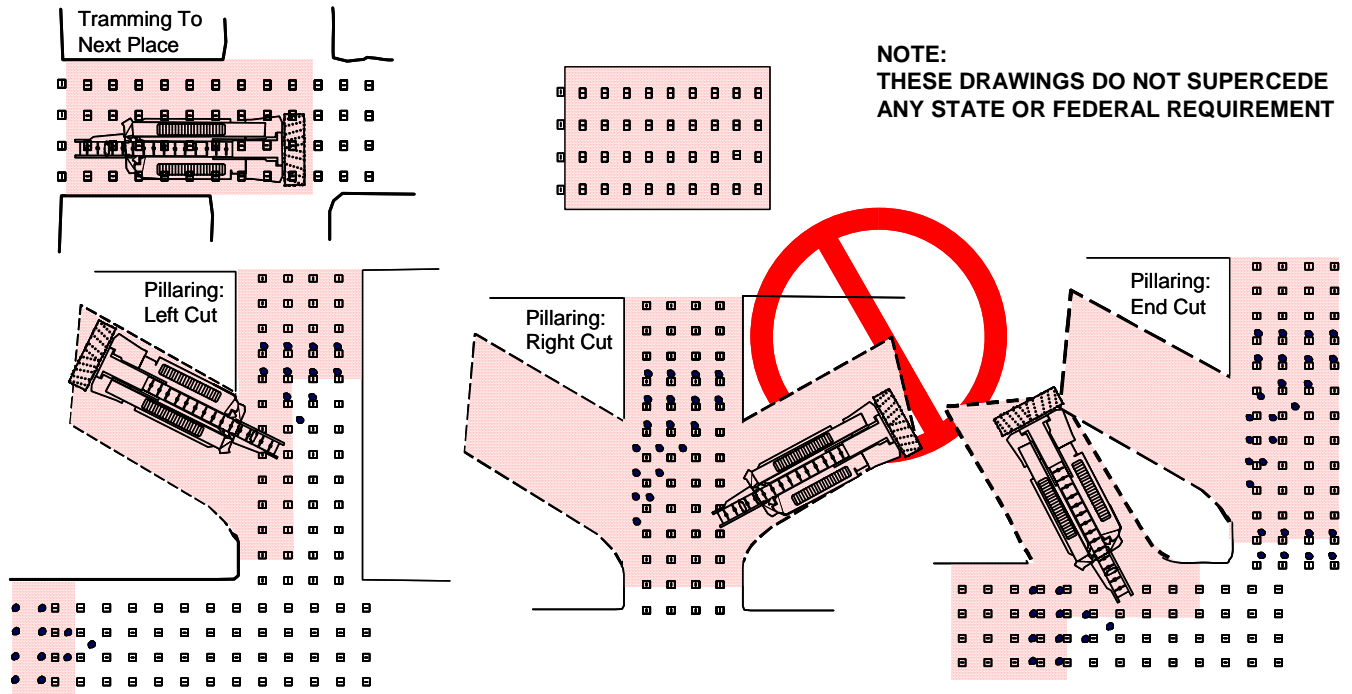
Metal and Nonmetal Mine Safety and Health Districts



Appendix F: Red Zone Chart

RED ZONES ARE NO ZONES

FOR MINING WITH REMOTE CONTROL CONTINUOUS MINERS



Appendix G: Other Non-Fatal Continuous Miner Crushing Accident Narratives

As Submitted by Mine Operators on MSHA Form 7000-1

Please note that no attempt was made to modify the language submitted by the mine operators describing the accident (for example, misspellings, improper grammar, etc.)

Mine ID	Accident Date	Equip. Manufacturer	Narrative
4601286	1/19/1999	Not Reported	AFTER PUTTING CABLE ON BOLTER, MINER TRAMMED BACK CATCHING INJ BETWEEN RIB AND PAN OF MINER CAUSING HAIRLINE FRACTURE TO PELVIS AND 1 VERTEBRE
3605466	3/6/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE WAS STANDING IN AN OFF-SET BESIDE A FULL FACE MINER. ENTRY WAS OFF-SITE AND NARROW DUE TO ROCK INTRUSION. WHEN OPERATOR BACKED UP MACHINE TO CUT ROOF, EMPLOYEE WAS CAUGHT BETWEEN RIB
4201890	5/14/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	INJ WAS HELPING ON A CONT MINER MOVE. HE HAD PLACED THE CABLE IN A HOOK ON THE SIDE OF THE MINER& TURNED HIS BODY TOWARD THE HEAD OF THE MINER WHEN THE MINER OPERATOR BEGAN TRAMMING THE MINER INJ'S FOOT WAS PARTIALLY UNDER THE GATHERING SHO
1202103	6/1/1999	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE HAD JUST APPROACHED THE HEAD OF THE CONT MINER TO REMOVE A CABLE LOOP FROM OFF THE CUTTING HEAD. THE MACHINE UNEXPECTEDLY MOVED TO THE RIGHT CATCHING EE'S LEFT FOOT & LEG BETWEEN THE MIN ER BITS & THE RIB
4406905	11/18/1999	Eimco	MINER HELPER PUT HAND ON GATHERING HEAD. WHILE MOVING MINER CABLE, MINER OPERATOR RAISED PAN, NOT KNOWING HELPER HAD HIS HAND ON THE PAN.
4202113	12/15/1999	Not Reported	RESTRICTED DUTY, EE WAS PICKING UP CABLE LOOP TO PUT OVER BITS ON MINER. CO-WORKER WAS BACKING UP MINER AND WHEN EE TRIED TO MOVE, HIS BELT GOT CAUGHT ON BITS AND HE WAS PINCHED BETWEEN THE RIB AND HEAD OF MINER. EE WAS MEDICALLY RELEASED TO FULL DUTY BUT WAS UNABLE TO DO SO.
4608634	1/10/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	THE INJURED PERSON WAS IN THE MINER CONVEYER BOOM CHECKING SCRUBBER. HE TOLD THE PERSON ON THE GROUND TO START THE SCRUBBER THAT HE WAS WORKING ON. THE OTHER MAN STARTED CONVEYER CHAIN BY MISTAKE. THE INJURED MAN'S RIGHT FOOT WAS PULLED UNDER A ROCK THAT WAS IN THE CONVEYER CHAIN.

0100759	3/1/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WALKED AROUND CONTINUOUS MINER DURING SET-UP IN FACE AREA. THE CONTINUOUS MINER OPERATOR DID NOT SEE HIM AND HE RE-POSITIONED MINER ON CENTERLINE AND THE BOOM OF THE MINER PINNED EE'S LEGS AGAINST COAL RIB. FIRST LOST WORK DAY OCCURRED ON 3/2/00.
2900170	4/13/2000	Eimco	EE WAS MOVING MINER, SETTING UP FOR NEXT CUT, INJEE SAW THAT THE MINER WAS ABOUT TO RUN INTO THE FACE FAN, HE REACHED FOR THE TRAM CONTROLS TO MOVE FAN BEFORE HE COULD MOVE FAN THE BOOM OF THE MINER STRUCK & MASHED HIS LEFT HAND INJURING THERING & LITTLE FINERS. STARTED LOSING TIME 4/21/00
1202103	9/14/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	ON 9/14 EE HAD POSITIONED HIMSELF BETWEEN RIB & MINER TAIL TO DROP OFF A LOOP OF CABLE. AS HE PREPARED TO DROP THE CABLE, THE MINER OPERATOR TRAMMED THE MINER FORWARD & AS THE MINER ADVANCED I T PIVOTED CAUSING THE TAIL OF THE MINER TO PINCH HIS RIGHT UPPER LEG BETWEEN THE MINER TAIL & THE RIB. EE WAS EXAMINED AND TREATED BY DR ON 9/15DIAGNOSED WITH LARGE ECCHYMOTIC BRUISE, INFECTE
0503672	10/28/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE STATES HE WAS HELPING TO MOVE CM-5 TO THE NEXT CUT. AS HE WAS PULLING ON THE SLACK STRAP, THE CM OPERATOR SWUNG THE CONVEYOR TOWARD THE EE. THE CONVEYOR STRUCK THE EE'S LEFT LEG RESULTING I N A LACERATION REQUIRING SUTURES.
4608787	11/7/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EMPLOYEE WAS TRYING TO REMOVE THE R-BOLT FROM UNDER THE RIPPER HEAD OF THE MINER. TO REMOVE IT, HE BRACED HIS HAND ON THE PAN WHICH INEXPLICABLYRAISED UP CATCHING HIS HAND BETWEEN THE PAN AND THE SIDE GUARD ON THE HEAD MOTOR.
0101401	11/29/2000	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	CM OPERATOR WAS TWISTING BOOM OVER TOWARD CURTAIN LINE AND PINNED EE BETWEEN CURTAIN AND CM.
4607125	1/8/2001	Eimco	TRAMMING MINER WITH MANUAL LEVERS PINNED HIMSELF AGAINST RIB.

0101401	5/29/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS LEANING ON BOOM, UNKNOWN TO OPERATOR. OPERATOR TURNED MINER WHICH CAUSED BOOM TO SWING & PINCH EE BETWEEN BOOM AND COAL RIB.
4406979	6/6/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS ON TOP OF THE MINER TO REMOVE A ROCK FOULED IN THE CONVEYOR CHAIN WHEN THE MINER OPERATOR MOVED THE MINER CATCHING THE EE BETWEEN THE ROOF AND MACHINE BRUISING HIS KNEE AND BACK.
3605466	9/6/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	WAS WALKING BY THE BACK END OF A FULL FACE MINER THAT WAS TURNED OFF TO GET TO HIS WORK POSITION. THE OPERATOR SAW HIM CLEAR THE BACK END OF THE MINER AND STARTED THE MACHINE BACK UP. AS HE MOVED THE MACHINE HE CAUGHT THE INJURED'S LEFT LEG BETWEEN THE MACHINE AND THE RIB.
4405559	9/13/2001	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	EE WAS HELPING MOVE MINER WHEN IT SEE-SAWED ON UNEVEN BOTTOM. HE CAUGHT HIS RIGHT ARM BETWEEN ROOF AND MINER. HE STARTED MISSING WORK ON FEB. 2 FOR SURGERY.
4608726	3/8/2002	Not Reported	LOADING CABLE ON MINER, TOLD MINER TO MOVE HELPER STOOD THERE, MINER KICKED SIDWAYS STRIKING HELPER ON RIGHT KNEE.
4608726	5/8/2002	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	PUT PULL ROPE ON MINER. ROPE STARTED TO SLIP. PUT HIMSELF BETWEEN MINER BOOM AND RIB. TOLD MINER TO PULL, MINER BOOM PINNED HIM AGAINST RIB.
3608785	9/10/2002	Fairchild	WHILE BACKING MINOR OUT OF X CUT PINCHED FOOT BETWEEN MINER SEAT AND RIB.
0101247	1/24/2003	Eimco	CAUGHT BETWEEN RIB AND CONTINUOUS MINING MACHINE.
1202249	3/13/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	AN ACCIDENT OCCURRED ON #1 UNIT IN #2 ENTRY JUST OUTBY THE LAST OPEN CROSSCUT. AS THE CONTINUOUS MINER BEGAN TO BE TRAMMED FROM #2 ENTRY TO #7 ENTRY THE VICTIM STEPPED BETWEEN THE TAIL & THE RIB. THE TAIL OF THE MINER STRUCK THE VICTIM IN THE ABDOMINAL AREA. EE RECIEVED CONTUSION TO THE ABDOMINAL AREA.

1518626	6/3/2003	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	MINER BACKING OUT OF FACE - MINER HELPER HIT BY BOOM OF MINER ON RIGHT LEG AND HIP AREA. EMT CHECKED, TAKEN TO PIKEVILLE METHODIST HOSPITAL BY AMBULANCE. ABLE TO MOVE ALL PARTS OF BODY - SORE- WANTED AN AMBULANCE - SEEN BY ER DOCTOR, SENT HOME.
1518241	3/16/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	The repairman was positioned about 20'in front of the machine & instructed the miner operator to stop because the curtain was caught on the ripper ring. Machine operator heard repairman say OK & assumed he was clear of the machine. He started tramming backwards & repairman was caught between rib & left ripper ring.
3605466	6/1/2004	Joy Machinery Co. (Joy, Joy Manufacturing Co.)	A BOLTER WAS WALKING TO THE LEFT SIDE BOLTER STATION WHEN THE MINER OPERATOR STARTED THE MINER AND PINNED THE BOLTER OPERATOR BETWEEN THE RIB AND THE MACHINE.
4607009	10/4/2004	Caterpillar	member had just dropped pull rope off of continuous miner boom cmo was unaware of his position and started tramming miner toward face, boom of miner struck member on pelvis and pinned him in the rib.