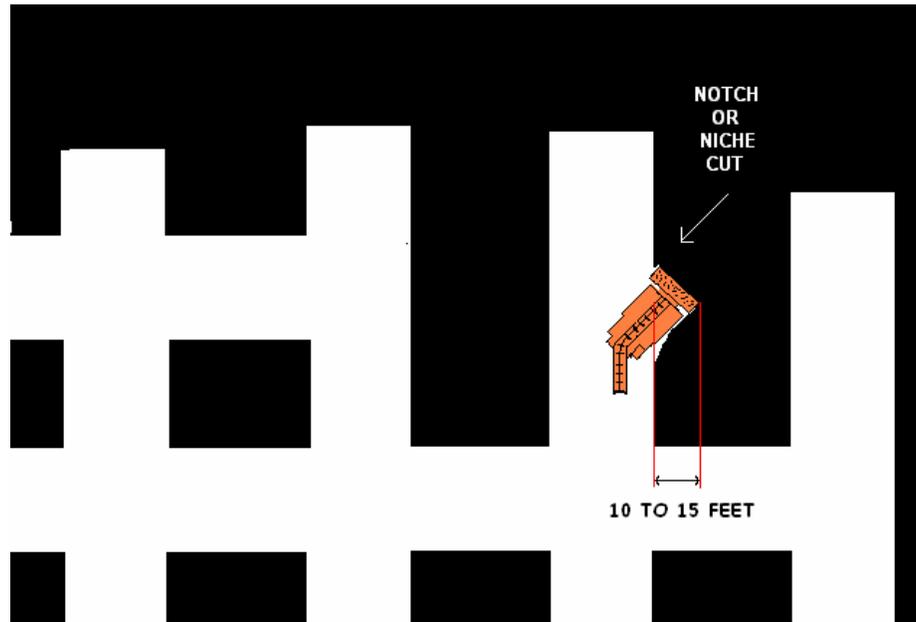


## ***BEST PRACTICES: Turning a Crosscut with a Remote-Controlled CM***

### **#1 - Use of a Notch or Niche Cut**

The use of a “notch” or “niche” cut is one recommended best practice to reduce the likelihood of continuous miner (CM) operator injury due to roof falls while mining crosscuts. A notch cut is a shallow, initial cut made at a



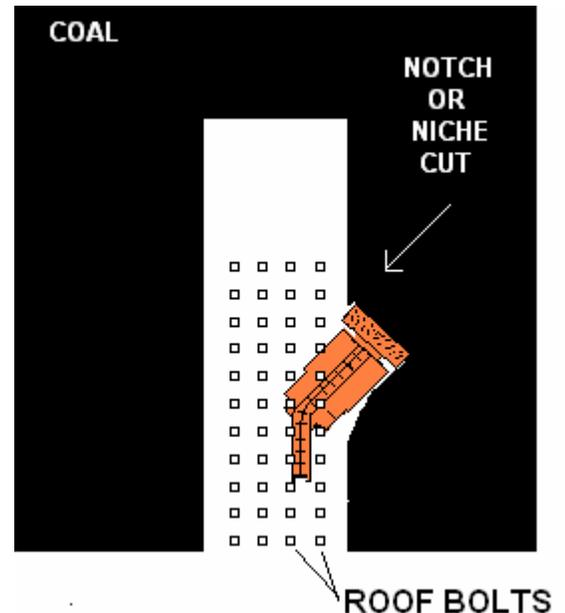
planned intersection location. Although some people refer to any cut that is less than the “normal” approved cut depth as a niche or a notch, for this discussion, a niche or notch will be considered to be a shallow, wedge-shaped side cut in the 10-to-15 ft. depth range.

A June 2003 review of MSHA roof control plans concluded that over 100 mines already utilize a notch cut to reduce CM operator exposure to unsupported roof at the mouth of the crosscut being mined. The approach used for the notch cut is very simple. As the continuous mining machine is being withdrawn from a normal cut up the straight entry, a side-cut is mined on a shallow angle. The side-cut typically is limited to 10-to-15 ft. deep and one miner head wide; no attempt is made to “turn” the crosscut. The miner is backed out of the place and a bolting machine is used to support the just-mined notch cut and then the cut up the straight entry.

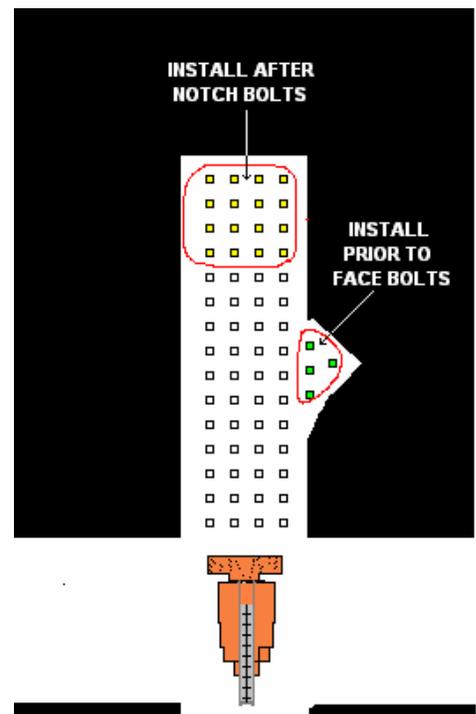
The supported notch area provides a buffer between the CM operator and unsupported roof created as the remainder of the crosscut is mined. Additionally, the supported notch allows for improved visibility and mobility.

A few important points to remember when implementing such a plan are as follows:

- Prior to mining the notch cut, the inby side of the proposed intersection of the proposed notch cut center line must be permanently supported according to the roof control plan. The supported area should extend inby the opening to be created by the notch. (Many plans call for three rows of bolts to be installed inby the notch before the notch is cut).



- The notch cut should be treated as an unsupported opening at an intersection. As such, the area should be permanently supported or at least one row of temporary supports should be installed on not more than 5-foot centers across the opening before any other work or travel in the intersection.
- A safe bolting sequence should be developed specifically for the notched area. This sequence should be included in the roof control plan along with precautions to address damaged bolts. If roof bolts in the entry are disturbed during the mining of the notch, these bolts should be replaced as appropriate while supporting the notch area.



- CM operators should maintain a position no nearer than two rows of bolts outby unsupported roof. Many roof control plans specify two “full rows” of bolts. Bolts installed in the wedge-shaped notch will not extend from rib-to-rib once the full width of the crosscut has been established. In this sense they are not “full rows” and roof control plan wording may need to be revised to clarify how these partial rows should be considered in defining a relative operator position.

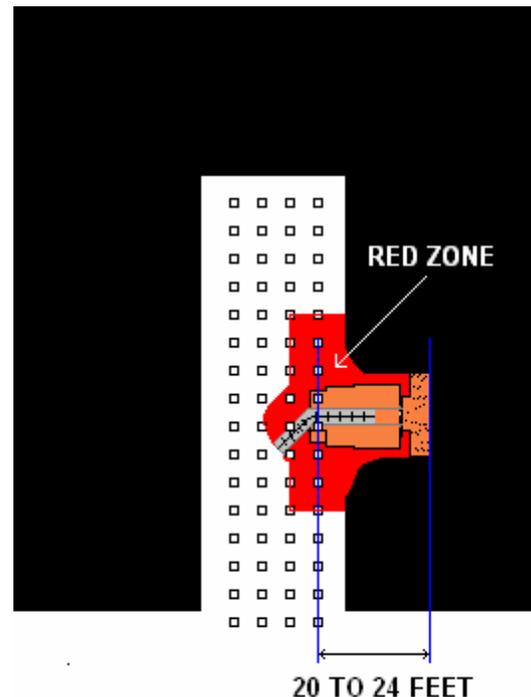
## ***BEST PRACTICES: Turning a Crosscut with a Remote-Controlled CM***

### **#2 - Limiting the depth of the first cut into a crosscut**

Of the six best practices identified in PIB No. P03-28, limiting the depth of the first cut into a 90 degree crosscut is the most widely practiced. When operating from the turn side of the continuous miner (e.g. the right side of the machine during a right hand turn), several factors can encourage operators to work nearer to unsupported roof (e.g. visibility issues and equipment crowding). These factors often become more critical as the machine advances into the crosscut. Hence, limiting cut depth into a crosscut helps to insure that the miner operator remain under supported roof.

A few important points to remember when implementing such a plan are as follows

- Depth of the first cut into a crosscut should be established to keep the remote control continuous miner operator, the remote control continuous miner helper, and the shuttle car operators out of the no work/travel zone usually designated as the “Red Zone.” Typically, crosscut first cuts are limited to 20-to-24 feet in depth.
- The allowable cut depth into a crosscut can be dependent on the type and configuration of equipment in use (e.g. standard vs. off-standard or end-driven vs. center-driven shuttle cars). Limits should consider these factors to ensure that shuttle car operators remain in a safe operating position.



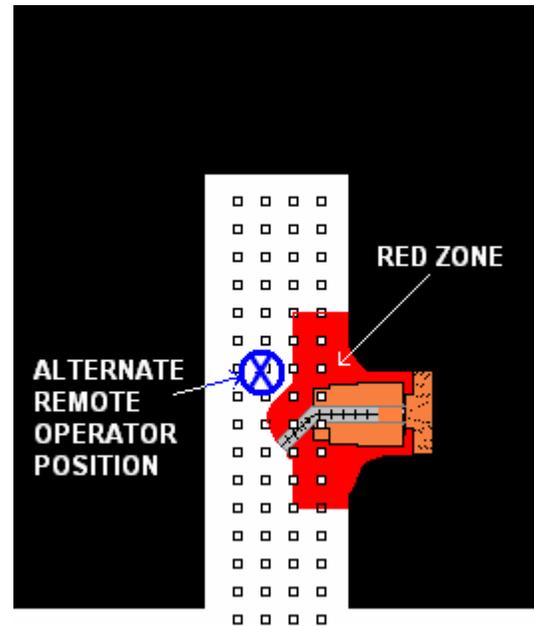
- Crosscuts angled at 60 degrees do not tend to create the same roof control hazard and are thus generally excluded from cut depth limits along with sections utilizing miners with integral bolters.
- Ventilation plans which specify a maximum curtain “set-back” distance may impact cut depth limits.
- Changing roof and rib conditions and methane liberation will limit the depth of projected cuts.

## ***BEST PRACTICES: Turning a Crosscut with a Remote-Controlled CM***

### **#3 - Allowing the CM operator to be positioned up the straight, on the inby side of the intersection**

Depending on specific mining circumstances, an additional best practice for turning crosscuts is to allow the remote-controlled continuous miner (CM) operator the option to be positioned on the inby side of the intersection. For example, if turning a right-hand crosscut, the miner operator could position himself on the left side of the machine. This work position removes the operator from the dangers of the haulage equipment, and the possibility of going inby supported roof, while greatly improving visibility. Since these issues often become more critical

as cut depth increases, operators may opt to start a crosscut from a more traditional location outby the crosscut and assume an opposite position once the machine has advanced some fixed distance.



In some instances, negative aspects of this operator position (e.g. noise, dust, and egress issues) may outweigh the positives (e.g. reduced equipment and roof fall hazards and improved visibility). However, the concept merits consideration.

A few important points to remember when implementing such a plan are as follows:

- The most common type of face ventilation is blowing line curtain on the right side of the entry with the scrubber discharge on the left side of the mining machine. Therefore, the suggested work position, with the miner operator inby the miner on the left side of the machine while turning right could then result in the miner operator in the vicinity of the scrubber discharge. Depending on dust and noise considerations in your

mine, this may or may not be a problem. In some instances, these concerns can be mitigated simply by moving slightly away from scrubber. Although exposure level may be higher in the inby location, the time per shift in this location should be relatively short; thus, average exposures necessary to remain in compliance with allowable levels may not be substantially affected. In addition, exposure time can be reduced by limiting the number of “turned” crosscuts (see Best Practice #4).

In some instances it is recognized that the ventilation plan may require the CM operator to be positioned directly adjacent to the line curtain in order to remain in fresh air at all times (for instance, this might be the case if a mine is on a reduced dust standard). Obviously, such a requirement takes precedence, and it would not be possible for the miner operator to be positioned on the inby side of the intersection.

However, discussing this situation may lead to a more ideal scenario for both dust and noise considerations as well as for a more desirable CM operator work location away from unsupported roof at the mouth of the crosscut. By turning crosscuts to the **left**, with the blowing line curtain on the right, both goals are achieved—the miner operator is in fresh air away from the scrubber, he is away from the unsupported roof at the just-created crosscut, and his visibility is much better. Mining plans that result in this scenario are encouraged.

Likewise, depending on other face ventilation scenarios, alternative locations for the scrubber discharge could be considered.

- Another possible objection to positioning the CM operator up the straight is a perception that the escapeway of the operator is blocked by the miner tailpiece. However, the CM operators who were observed working inby the intersection did not voice this objection. In fact, they stated that this was their preferred work location for both better visibility and to get away from the haulage vehicles.
- Some people have the misconception that the practice of working on the inby side of the continuous mining machine

amounts to working in by an unsupported opening, and is prohibited by the regulations. However, this is not the case. Section 75.222 (e), which discusses unsupported openings at intersections, states that “openings that create an intersection should be permanently supported ... before any other work or travel in the intersection.” This is intended to prevent work or travel in the intersection after the CM has been removed, and does not apply during the actual mining of the intersection.

- There may be increased difficulty in watching/handling the miner cable. In several mines where the CM operator was observed operating from the position in by the intersection there did not appear to be a problem with the cable. In several instances, shuttle car operators, the section foreman, a utility man, and the CM operator himself all combined to watch the miner cable. If however, this does not appear feasible for your mine, it is possible to alleviate this concern by relocating the miner cable connection point on the mining machine. Information obtained from several mining machinery manufactures revealed that it is possible to order a new machine with a cable connection box on both sides of the machine. In addition, it is also possible to retrofit an additional cable connection box to the off side of the mining machine. The only possible negative to this remedy is that the additional connection box adds slightly to the overall width of the machine.
- The miner operator needs to maintain his view of the machine-mounted methane monitor. Specific circumstances may dictate an additional readout or warning device such as a strobe light.

## ***BEST PRACTICES: Turning a Crosscut with a Remote-controlled CM***

### **#4 - Limiting the number of “turned” crosscuts**

One straightforward practice to reduce hazards associated with turning crosscuts is to minimize the number of crosscuts “turned”. The ideal practice is to turn only one crosscut in each row and develop the remainder in the row “head on.” However, any reduction in the overall number of turned crosscuts would be beneficial. This practice provides an added safety benefit in that the diagonal spans of intersections developed “head-on” are typically less than the diagonals across “turned” intersections.

Important points to remember when implementing such a plan are:

- Advanced planning and training are critical to the success of this safe practice. The cut cycle must be closely examined and explained to the section crew along with any required changes to the face ventilation and dust control.
- Mining the crosscuts “head-on” through the entries may allow for deep-cuts to be taken which can offset any overall negative impact on production.

## ***BEST PRACTICES: Turning a Crosscut with a Remote-controlled CM***

### **#5 - Installing additional roof support at the CM operator's projected work location**

Another best practice for turning crosscuts with remote-controlled continuous mining machines is to install additional roof support at the CM operator's projected work position. Examples of additional support include an "extra" bolt or bolts per "regular" row, extra bolts installed between regular bolt rows, larger bearing plates installed on the outside bolt in each row, and rib bolts installed just outby the location where the crosscut is to be begun.

A few important points to remember when implementing this best practice are as follows:

- The additional support will provide added protection and potentially increased visibility.
- The additional support can have an added benefit if second mining will be implemented in the area. The additional roof support can provide the miner operator with extra protection during pillar recovery.

## ***BEST PRACTICES: Turning a Crosscut with a Remote-controlled CM***

### **#6 - Using visual indicators, such as reflective markers**

Ultimately, individual remote-controlled continuous mining machine operators are responsible for selecting a safe operating position based on personal preferences and site specific conditions (e.g. roof or rib conditions). Although “prescribed” operator positions may be undesirable, establishing “no work/travel” zones is always appropriate. Regulations require that a “visible warning or physical barrier” be placed to indicate the end of permanent roof support. This best practice suggests that, in addition to what is required by 75.208, reflective markers be placed on the second row of bolts outby the crosscut being mined and also on the second line of bolts across the entry from the crosscut being mined. These markers will serve as a conspicuous reminder for all miners specifically while turning crosscuts.

A few important points to remember when implementing this best practice are as follows:

- Responsibility for installing the indicators should be well understood and communicated to all miners.
- The meaning of the reflective indicators should be made clear to all miners. Ideally, the indicators should be unique to this application. In effect, the same design or color of indicator should not be used for other purposes (e.g. to mark spads, test holes, hazardous ground, etc.).
- It is recommended to hang more than two reflective indicators. Some mines even use different colors to further identify different positions on the perimeter of the no work zone.