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Refuge Alternatives for Underground Coal Mines-Request for information

Comment On: MSHA-2013-0033-0019
Refuge Alternatives for Underground Coal Mines Request for information; extension of comment period.

Document: MSHA-2013-0033-0021
Comment from Nathan Joslin, NA

Submitter Information

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General Comment

See attached file(s)

Attachments

MSHA RFI Response 04-02-2015

AB79-COMM-7

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April 2, 2015

MSHA, Office of Standards, Regulations, and Variances
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RE: Response to RIN 1219-AB79 Request for Information Regarding Refuge Alternatives for Underground Coal Mines

To Whom It May Concern:

Thank you for the opportunity to comment on MSHA's request for information per document RIN 1219-AB79, regarding refuge alternatives for underground coal mines. After a brief statement regarding RA's in general, I will discuss the items within RIN 1219-AB79 that I feel need addressed as well as document some vital points that have not been included in the request.

As a mining ventilation and safety equipment manufacturer, with decades of real world mining knowledge, it is now more apparent than ever that the final rule regarding refuge alternatives for underground coal mines must be altered. The current regulations were written and enacted with such haste that sufficient research and testing was set aside in order to simply get something out there. The three separate factions, Safety (MSHA and State Officials), Refuge Alternative Manufacturers, and Mine Operators seem miles apart on what needs to happen to achieve the safest, yet most practical solution to ensure miner's safety when escape is impossible. The goal of all three groups can be, and must be, wrapped up in a single word...SAFETY. I have no doubt that all involved think that their regulations, product, or ERP provides 'enough' safety, but it is obvious that some involved have far different views of what safety really means, or what it is really worth. Safety is not writing and enforcing regulations that have no scientific or empirical research to back them up. Safety is not manufacturing a product that only meets the letter of the law, making believe that it will all be okay when disaster strikes. Safety is not budgeting for the cheapest refuge alternative, just to be in compliance, knowing full well that it may not save lives. It's time to take a step back, focus on what is important, and what is not, and make sure we act as a three-part cohesive team to develop the next generation of regulations, products, and mining practices that achieve that one goal...SAFETY.

Below are my comments in the order the topics appear in RIN 1219-AB79. Italicized text comes directly from RIN 1219-AB79, with my response directly below it.

A. Miner Training on Refuge Alternatives

MSHA requests comment on the effectiveness of training provided to miners under the existing rule for deploying (e.g., the tent component of a prefabricated unit); operating (e.g., the air monitoring or breathable air component); and using (e.g., the airlock) refuge alternatives and components.

As with any procedure, device, or piece of equipment utilized underground, training is essential. The results are certainly directly affected by both the quality of the training compared to real-life scenarios and the interval at which training occurs. I feel that there isn't much need for me to comment on the effectiveness of the training, but rather the first example mentioned above.....deploying the tent component of a prefabricated unit.

A common thought among some, if not most, of the parties involved in RA regulation, production, and end use is that it is acceptable for miners to be expected to perform work to deploy the RA. Let's think about this. Miners are trained that there absolute number one priority is to escape the mine after an event if at all possible. Therefore, if able, a miner would likely don an SCSR and search for an escape route. Should that person find that escape is impossible, the last resort is a refuge alternative. After finding his way back to the RA, after searching all available escapeways for an exit, he is expected to not only have to think clearly but actually perform physical activity just to get it deployed?! This scenario is the best case scenario, when an able-bodied clear thinking miner may arrive at the refuge alternative with enough time left in his SCSR to perform the work before expiring due to carbon monoxide poisoning or lack of oxygen. Now, let's look at a miner who was injured or disoriented during or after the event. How can one conscionably expect this person to be able to perform mentally and physically to deploy a tent?

Refuge alternative deployment must be extremely simple, meaning very little thought required, and must be non-taxing physically. Entering the RA through the airlock, reading a chart based on the number of occupants, and turning the knob(s) is all that should be expected or required. A prime example of this is the Kennedy Chamber, a portable steel refuge alternative that has been thoroughly engineered and tested to meet these criteria without a doubt. Put simply, SAFETY was and still is our number one concern.

Along the same lines as the comment above, airlock usage and purge efficiency have been examined with a bit of a blind eye to the obvious to accommodate design deficiencies. MSHA has proposed training miners to use a mathematical formula for determining the number of air changes required based on the number of miners waiting to enter the chamber, to develop an adequate purge time for each group entering as to not contaminate the main chamber. As stated above, the mental and/or physical ability for occupants to perform such tasks has a high likelihood of not being sufficient, therefore failing miserably, no matter how well they are trained.

RA designs should be as simple as possible, allowing miners to enter using an airlock, in groups as large as possible, then purge the entire chamber including the airlock after everyone is in. It is by far the only way to ensure the interior atmosphere is safe enough for miners to remove their SCSR's. The Kennedy Chamber is the only portable refuge alternative available that has had the forethought and empirical testing to back this concept up. This is the only way to ensure that the entire structure is safe. There's that keyword again, SAFETY.

B. In-Place Shelters

6. Currently, refuge alternatives are required to be located within 1,000 feet of the face. Provide options for the location of in-place shelters that provide equivalent protection and include your rationale for the options.

In order for in-place shelters to become practical, the 1,000 feet distance must be increased due to the rapid advancement of most coal mines. Built in-place RA's have some advantages over portable chambers, but are currently regulated out of normal use due to the minimum distance to the face rule. Outby built in-place RA's are the only current practical use currently.

Consider a mine with the seam thickness sufficient for miners to walk at a moderate to normal pace of three miles per hour. Using the logic of the RA being 1,000 feet from the working face so that miners at the face can quickly get there (which is a bit contradictory to the ideal that you should always attempt escape and only come back to the chamber as a last resort), walking at a pace of three miles per hour will allow you to reach the RA in approximately 3.8 minutes. Even if you consider a low coal seam where one could only travel at say half that speed, or 1.5 miles per hour, you could still travel the 1,000 feet in under eight minutes.

If the regulation were extended to allow a greater distance from the working face, yet still be within a reasonable travel time for miners to reach safety, in-place shelters likely would become a more desirable option for most mines. There is an enormous amount of labor spent moving portable chambers which also inherently increases the risk of damage to the chamber.

9. What are appropriate design characteristics, including doors, for a stopping used to construct an in-place shelter to ensure an isolated atmosphere following a mine emergency?

For in-place shelters to become a safe, economical solution based on the current distance regulations, they must be recoverable for re-use. Engineered solutions that provide light, but adequate components that can be constructed and taken down in a timely manner is essential. The 15 PSI overpressure rating seems reasonable, but the language should be modified to explain the nature of the loading. In a typical coal mine explosion, the structure will likely see supersonic waves of pressure that apply both 'push & pull' forces on the structure that most do not consider. Therefore, a simplistic approach is that the structure must be able to withstand 15 PSI loading from either direction, in order to withstand the 'pull' force exerted during part of the pressure wave. Anchorage of the structure must be examined for both the stopping anchorage components and the strata itself, as to not overload the strata causing stopping failure. Doors must be fabricated using the same design criteria as in portable refuge alternatives. Characteristics such as stiffening, latching, leakage prevention, ease of used, etc... must be examined. The only true way to ensure all of the above mentioned criteria have been met and the structure will actually perform adequately in the field is empirical testing. Actual full scale explosion testing is essential to truly understand all phenomena associated with structure loading and behavior. All Kennedy refuge alternative designs, including the Kennedy Chamber and the Kennedy 15 PSI recoverable bulkhead, have been tested in actual full scale explosions exceeding 15 PSI. Computer generated analysis, such as FEA, can be useful at times to get the ball rolling, but the only safe way to accurately be able to predict behavior of materials in such an event is to expose it to an explosion. SAFE...seems like I've heard that somewhere before.

E. Part 7 Testing and Approval

21. Based on your experience with the part 7 approval requirements for refuge alternatives and components, provide other options that offer equivalent product performance, thus assuring equivalent or greater protection for miners.

First and foremost, there is no other product available that provides equivalent or greater protection for miners with all safety concerns considered than the Kennedy Chamber. Having said that, an improvement that I feel most of the industry can agree on is that the floor space and volume per occupant regulations should be reduced. We have to keep in mind that in order for portable refuge alternatives to be economical, they must be allowed to be built as small as possible for function and survivability. The size restrictions that are to be enforced after the remainder of the current Final Rule takes effect are ridiculous. There will be wasted space in each chamber resulting in larger, heavier chambers as well as more of them to accommodate the same number of miners. There is zero logical backing as to why one would need this much space to survive. Not only is it way too much space when the RA is fully occupied, the chances of the RA being fully occupied after an event is extremely low...thus providing even more space. Serious consideration should be given to reducing these values to be more consistent with the original West Virginia guidelines which were based on SAFETY and survivability rather than making sure everyone is comfortable.

F. Apparent Temperature

Apparent temperature inside RA's has probably been and continues to be one of the largest hurdles for overall RA approval simply due to the lack of information provided for regulations and testing. The regulation states that you must provide the maximum mine air temperature that the RA can safely operate within at full capacity without exceeding 95 degrees apparent temperature. Many questions today still go unanswered, such as:

What method should be used to determine the mine air temperature?
Where in the mine should the temperature reading be taken?
Should all air flow be stopped prior to taking the mine air temperature reading, and if so, how do you safely accomplish this?
What affect does the mine strata or 'rock' temperature have on the RA apparent temperature?
Etc...

Another serious concern is whether the 95 degrees apparent temperature is an appropriate value? The original West Virginia guidelines were hastily drafted without proper research which resulted in the 95 degrees apparent temperature. The term 'apparent temperature', otherwise known as heat index, comes from a mathematical derivation of air temperature and relative humidity developed by Robert G. Steadman. To put it bluntly, this is simply a glorified number that makes certain conditions seem worse than they really are as a tool for television weather personnel to broadcast. It is not used for scientific or physiological research, reporting, or regulation derivation due to the fact that it does not take into account the effect from radiation, among other things. The world standard for effects on the human body from radiation, humidity, temperature, and wind speed is a composite temperature known as the WBGT (wet bulb globe temperature). It is the standard (ISO 7243) used by industrial hygienists, athletes, and the military to determine appropriate exposure levels to high temperatures...not to mention the fact that it is also used by NIOSH.

It should be noted that even the author and lead engineer for the West Virginia Task Force has publicly stated that he was likely wrong in using 95 degrees 'apparent temperature', but due to time constraints was forced to provide a number that would

be used. His later research has since provided enlightenment on a more scientific approach.

H. Additional Requests for Information

29. Currently, state-approved, prefabricated structural components that were accepted in ERPs prior to March 2, 2009, are grandfathered until December 31, 2018. What would be the impact of changing the grandfathering allowance for structural components and requiring an earlier date for part 7 approvals?

An earlier date will likely prove to be unattainable. With the speed at which the approval and testing process proceeded for the other three major components (breathable air, harmful gas removal, and air monitoring), it would be foolish to think that an earlier time table could be met.

30. How can an inflatable stopping (to be installed post-event) be an effective and safe means for creating a protected, secure space with an isolated atmosphere? What factors should MSHA consider when determining whether to allow the use of inflatable stoppings in conjunction with boreholes or piping to provide effective shelter?

There is no place for anything inflatable in an underground mine for safety related use. Whether that be a tent style chamber or an inflatable stopping, it is simply unconscionable to even consider using one if you are even a little interested in the SAFETY of miners. As mentioned above, the deployment of any refuge device must be swift and effortless. While some have survived mine disasters by constructing a barricade post-event, others have not...simply due to the fact that they either didn't have the time or physical ability to do so.

One thing that seems forgotten, or purposely ignored, is the likelihood of a second event. Underground explosions are a likely scenario of when a refuge alternative may be required for use. After an underground explosion, the likelihood of the mine ventilation being compromised is significant. Therefore, the likelihood of a second explosion is increased dramatically due to the lack of ventilation air caused by either lack of power or ventilation structure damage. The absolute only SAFE refuge alternative is a rigid structure. Portable or built-in-place is sufficient, so long as they are designed and tested to withstand 15 PSI explosion forces. There is no other alternative if miner's SAFETY is the reason for having one in the first place.

31. Please provide information regarding the prevention of oxygen enrichment (greater than 23%) in the interior atmosphere of a refuge alternative when only oxygen is provided by breathable air components over a period of 96 hours.

Pure oxygen should only be provided at a rate of 0.5 LPM per occupant inside the refuge alternative. The human body, at rest, can only consume 0.5 LPM. Therefore, the only way oxygen enrichment can occur is if the oxygen flow is not set properly, or if one or more occupants were to expire while inside the chamber. The air monitoring device required inside the RA will alert occupants of high levels of oxygen, but proper flow meter setting is the only certain way of knowing it will not occur. The Kennedy Chamber is equipped with a simple Archimedean flowmeter, exactly like what is in every hospital in the country, and a simple chart that instructs occupants where to set it based on how many occupants are in the RA. Simple, and SAFE.

In conclusion, I would like to leave you with three major points that have been either ignored or dismissed regarding refuge alternatives and miner's SAFETY.

1. Tents or structures that are not explosion resistant after deployment are simply unconscionable and could very well simply get a group of otherwise surviving miners killed.

2. If real world thermodynamics and survivability are not used to generate the space and volume requirements instead of a Cold War era fallout shelter specification, good and practical chambers are made impractical. They are deemed to be too big to be practical and useful in the underground coal mines that they serve, and for no good reason related to survivability.

3. For built in-place bulkhead survival rooms to be practical, the distance to them from the face must be increased. If this is to be an option, it must be done at reasonable distances. Bulkheads have strong advantages compared to portable chambers and are worth some allowance on the distance to them.

Sincerely,

JACK KENNEDY METAL
PRODUCTS & BUILDINGS, INC.

Nathan P. Joslin,
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