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To: zzMSHA-comments@dol.gov and MSHA, Arlington via US Mail

From: Bill Kennedy, President, CEO

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Please be advised we have the following comments regarding the Proposed Rule relative to Refuge Alternatives for Underground Coal Mines. The order of the comments follows the order found in Part II, Section-By-Section Analysis, and relates to the extended statements therein, and then in a second section below to those specifically in the proposed rule itself in the order found in the proposed rule.

Comment 1. A. Part 7 Approval

We suggest that Design Criteria approval be used instead of individual model approval. This is the scheme Pennsylvania and West Virginia used (at least in our case) as we have over 400 different models. This is commonly done in engineering practice where standards related to the design are proposed and accepted. As an example, for structural components, a given stress level as a percentage of the material's strength can be specified as acceptable.

With this scheme it would not be necessary to go through the approval process with every dimensional change to a chamber, for instance. Our submittal would include standards for all criteria of concern, and thereafter Kennedy Chambers would be built under that approved criteria. It is worthy of note that nearly every customer requires a different model.

We respectfully suggest that Design Criteria be used for approval, not individual approval of specific models.

Comment 2. Section 7.501 Purpose and Scope

We question the 5 year or 10 year maximum regarding the service life of Kennedy Chamber components and Kennedy Chambers in service at the time of the rule implementation. It is our opinion that the service life should be determined by the manufacturer's criteria and specification. As an example, we have components that do not have a 5 year life and other testing that is done annually that could easily be expected to show a Kennedy Chamber to be serviceable past 10 years. Specific items that do not have a 5 year life are mine phone and permissible flashlight batteries. Annual testing of the envelope for leakage could well indicate the envelope itself is satisfactory past 10 years. Unless there is physical damage, we would expect that to be true. It may be unreasonable to expect a perfectly good Kennedy Chamber to simply be abandoned or replaced on the sole basis of chronology.

We respectfully suggest that the service life should be determined by the manufacturer's criteria and specification.

Comment 3. Section 7.502 Definitions

Apparent Temperature. We do not agree that the international scientific community generally recognizes the Steadman chart as viable for heat stress in people, but rather consider apparent temperature and heat stress to be more accurately evaluated using the International Standard ISO 7243, 'Hot environments - Estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature)'. Steadman's chart and the value stated as 95 degrees do not take into account the criteria ISO 7243 uses, but rather is a simplification of the ISO standard that gives only an approximation of the heat stress. In fact, the Steadman chart is well known for overstating values. . . for instance, ordinary hot summertime conditions in Illinois are reported on the Steadman chart as 150 degrees F, yet there is never a day when farmers and construction workers cannot work outside in Illinois. It may be stressful and they certainly have to be careful, but the Steadman chart is not a good indicator of heat stress on people. ISO 7243 takes into account criteria for which Steadman only assumes fixed values. The 'number' that is correct for heat stress under mine refuge chamber conditions is 90 degrees F using the ISO criteria. . . not 95 degrees F. The stress on people cannot be simply determined by the temperature and humidity with some fixed approximations for other factors as

Steadman indicates. This method is incorrect and most inappropriate for the important work of refuge chambers where life and death are concerned. The proposed rule Section-By-Section Analysis states that NIOSH indicated other indices or standards could be used, such as the Wet Bulb Globe Temperature.

While Steadman may have coined the term 'apparent temperature' in 1979, Steadman only provided a method to approximate the WBGT, the basis of which comes from U.S. Military Studies from 1957. See: 'Yaglou P., Minard D. (1957) Control Of Heat Casualties At Military Training Camps. Am A Arch Ind Health 16, 302-16'. Steadman did not do this work and provides nothing useful for refuge chamber criteria.

We respectfully suggest that the ISO 7243 WBGT standard needs to be adopted, and references to Steadman dropped.

Comment 4. Section 7.504 Refuge Alternatives and Components; General Requirements

Sub-paragraph (b). See reference to Apparent Temperature above.

Further, we do not consider it appropriate to state some required interior temperature without stating a corresponding ambient rock temperature. It must be considered that whenever a chamber is called upon to be used that there will be NO ventilating air and therefore no forced convective cooling.

Whatever caused the chamber's use may certainly have stopped all air movement in the mine. It must also be assumed that there is little or no conduction of heat from the chamber from contact with ribs or roof of the entry. That leaves whatever conduction is available through the floor of the chamber, and radiation. . . radiation being the only clearly quantifiable and certainly the most important cooling mechanism for a chamber.

With radiation being the major player in cooling, the surrounding rock temperature becomes the determining criteria in heat transfer for a given chamber design. Radiation (and floor conduction) heat transfer occurs because of the difference in temperature. If the chamber and rock are nearer the same temperature, heat transfer will be little. If they are at greater difference in temperature, the transfer will be greater. The stagnant air will quickly take the temperature of the rock in the entry.

Kennedy Chambers are designed using proprietary heat transfer algorithms and are then tested at the heat input equivalent of full occupancy (with full

accountancy for parasitic heat generators like the CO2 scrubbing process) in a full scale test facility where the rock temperature can be adjusted for whatever ambient air and rock temperatures are required to match that of the intended mine. To simply ignore the factor of the rock temperature makes the statement of the interior temperature meaningless. If a given chamber design didn't provide sufficient cooling for a given calculation or test, a lower rock temperature could be assumed or created. At a low enough ambient condition, any chamber would be able to maintain an acceptable interior temperature.

Therefore a given chamber's interior temperature maintenance capability must be stated with reference to a specific rock temperature. Kennedy Chambers are always designed and specified with a given mine's conditions as part of the design criteria. Without the rock temperature being specified, any interior number is meaningless.

Comment 5. Sub-paragraph (c) (3). The volume of waste created by the occupants of a high capacity chamber over four days is considerable and we do not deem it practical to use chamber interior space to contain it. We believe that the most practical disposal method regarding the waste is 'overboard'. This allows toilet facilities to have infinite capacity so they can always be washed clean and there is never a concern regarding containment volume. We believe that it should be made clear in the regulation that the statements regarding containment of waste do not preclude simply flushing the waste outside the chamber. With this simple system the possibility of a big problem is eliminated, the chamber interior is virtually guaranteed to be dry, sanitary, and odor free.

Comment 6. Section 7.505. Sub-paragraph (a)(1).

After an event that causes a chamber to be used, we consider the possibility of a second event much more likely than the first. Scotia and two events at JWR mines are examples, but those aside, one must consider that no matter what caused the first event, it has likely caused at least some disruption to the mine's ventilation system. Therefore there is a greatly enhanced chance of an ignition from some source -- and this may occur after the refuge chamber has been deployed. Only structurally sound chambers can offer any meaningful protection to people inside refuges.

The requirement in this sub-paragraph of 15 square feet of floor space and 60 cubic feet of usable volume per person is excessive. It will be impractical to provide 'hard' chambers with that much interior space. The entries and intersections in typical coal mines do not allow for movement of

chambers of that size. We respectfully recommend 6 square feet and 15 cubic feet per man for mining operations where 'hot-seat' shift changes require a chamber that has a low probability of being used at more than half capacity, and 8 square feet and 20 cubic feet per man where 'hot-seat' shift changes are not employed. Please note that this is in line with international standards. See 'Review Of Best Practices Regarding The Use Of Refuge Chambers In South Africa', September 2007 BBE Report No: 5207. The recommendation therein is for .6 square meters, or about 6.46 square feet per man. This is consistent with our own research and testing. In a properly designed chamber it allows for travel to the toilet facilities, room for a man on a stretcher or sleeping on the center aisle floor, etc.

As a note of practicality, consider a typically sized Kennedy Chamber for 20 men, which is a popular size. If 60 cubic feet is to be allowed for each man, that would require 1200 cubic feet. If the chamber is limited to 8 feet in width and 5.5 feet in height, the length of the main portion would have to be about 27 feet. With the air lock added to that plus bumpers, draw bar connections, exoskeleton, etc., the length would grow to be in excess of 30 feet. While a simple exercise in making a scale drawing of a mine intersection would quickly tell you that a unit of that size cannot be easily towed around a corner with typical mine equipment (scoop, etc.), consider a unit only four feet high. The unit becomes over 40 feet long. Realistically a unit about half that length would be all that can be handled underground without greatly increased potential for damage in handling. Incidentally, in the 'hot-seat' shift change densities we recommend (above), the side to side seat spacing is about that of a commercial airliner coach seating. It isn't unreasonable even for long term occupancy.

PLEASE NOTE that there is an important consideration here. If regulations are codified that require excessive space in chambers, the chambers that offer the best protection, that is, hard chambers, will be eliminated. The health and safety of the miners that could have been provided second event protection is effectively lost. Please note also that NIOSH stated in their comments that the space requirements stated here are "not to be considered absolute".

We respectfully suggest that chamber minimum floor space be 6 and 8 square feet, and 15 and 20 cubic feet per man for 'hot-seat' shift change and non 'hot-seat' shift change operations, respectively.

Comment 7. Sub-paragraph (a)(4), (5) and (6)

The language in these sub-paragraphs relates to tent chambers, inflatable stoppings, etc. Further to our remarks in Comment 6 above, we want to clearly state that while Kennedy can build any sort of refuge we would like, including tent types, we do not consider it conscionable to do so. There is a significant likelihood of a second event that will require mechanical

protection to people within refuges. Hence we do not consider that it would be responsible to offer tent products, and we further consider that it would be equally irresponsible and unconscionable for regulations to be codified that allow such protection devices. There is no logic to requiring protection devices that will offer little or no protection from high possibility subsequent events. Such a requirement would waste resources, provide false security and burden the industry for reduced benefit.

Additionally, there is another factor that is of concern to us. The proposed rule states that the structure must be fully active within 10 minutes. That is, several minutes of 'work' is acceptable for the implementation of the refuge. Those of us that have been through any sort of underground event, even one so 'slight' as being blown down, perhaps being hurt 'a little', and effectively being blinded by incredibly dense dust entrained in the air, realize that it is unrealistic to expect people under these circumstances to do much work. In the design of the Kennedy Chamber we were even concerned about how difficult it was to operate the door latches. . . maybe with one arm broken. The expectation that people will be able to do much more than get to the refuge and go inside is unrealistic in at least some potential cases. You can be inside, in fresh, clean air and have the oxygen on in a Kennedy Chamber in maybe 15 seconds.

What is minutes of work for an able bodied person may be not only very time consuming in bad conditions, it may be impossible for an injured person.

One of the highest and best uses of refuge chambers may be simply to provide a place with good air where everyone can get together, get the SCSR mouthpiece out of their mouths so they can talk, and develop a plan or evaluate other schemes for escape while being able to assess everyone's condition. It may not always be to provide extended 'barricade' functions.

If the refuge isn't readily accessible, it can't do that job. Only a pre-erected chamber can do that. To ignore that function is to ignore what could be a significant safety benefit.

We respectfully suggest that only structures that meet the 15 PSI criteria while deployed and that are always ready for use be permitted.

Comment 8. Sub-paragraph (c)(1)(iv)

The concept of a relief valve to prevent over pressurization is valid. We have deep concern about the stated value of .25 PSI, however. .25 PSI is 7 inches of water. In a chamber door that is 2.5 x 5 feet (12.5 square feet), 7 IWG would create an air pressure of 65 pounds on that door. If the outer

door was released without regard to that pressure it could hit a man and injure him or knock him down. If that pressure was on the inner airlock door it would make the door unnecessarily difficult to open.

We respectfully suggest that the pressure be limited to 2.5 IWG nominal.

That is the standard to which Kennedy Chamber relief valves are built, and is sufficient to keep the chamber pressurized to prevent the entrance of outside gasses. . . the only purpose for over pressurization of the chamber.

Excess pressure beyond that required to insure the chamber's gas integrity provides no benefit and becomes a detriment.

Comment 10. Section 7.506 Sub-paragraph (g)

Kennedy Chambers contain a proprietary system of devices that could be considered respirators (they are actually 'rebreather masks'), but are not designed to supply the full air supply to the user. They can be used in two manners. First, the masks can be used to give one or a few occupants high concentration oxygen should they be having heart or respiratory difficulty.

Second, they can be used by all occupants to partially isolate themselves from a higher than desired CO atmosphere due to uncontrollable CO in the chamber because of the requirement to 'air lock' a great number of times with a very high exterior CO level, loss of purge capability, chamber envelope damage, or other 'unforeseeable' extreme difficulties.

We respectfully suggest that these breathing masks used for these purposes should be clearly differentiated from the equipment described in this paragraph and exempted from its requirements.

Comment 11. Section 7.510

Kennedy Chambers are available as short as 2' 3". The Section-By-Section Analysis states that "MSHA recognizes that using the refuge alternatives in low coal mines could be problematic.". We are not aware of many thin seam operations where this height chamber could not be used directly, or could not be used in areas where they traditionally take rock to gain transportation height, and therefore do not consider thin seam applications to be problematic.

Comment 12. Section 75.1506 Sub-paragraph (a)(1)

Please see comment 6 above. Additionally note that refuge chambers typically have to be shorter than what one would consider if one only examines the working section height or the seam height. In most operations the main entries have experienced convergence that requires equipment to be shorter than what could be used in active working sections in the mine.

Therefore chamber volumetric considerations are more critical than one would first assume, even in relatively thick seam mines.

Further, in the fourth paragraph there is comment regarding providing passive CO2 scrubbing curtains and providing space for them as part of the interior volume consideration. The curtains need no space consideration. They can hang in the aisle, toward one end of the chamber, and be of little concern to the occupants. There is no logic to making the chamber even bigger in order to account for curtain space.

Comment 13. Section 75.1506 Sub-paragraph (a)(2)

Please see comment 6 above. Consideration needs to be given to the probability of two crews being present during shift change. Higher density that still provides acceptable life support and heat dissipation is justified in the case of very low probability of the chamber being used at more than half capacity.

Comment 14. Section 75.1506 Sub-paragraph (a)(6)

References here and at other locations are made to a final concentration of CO and / or CH4, but in most cases there is no beginning concentration given as part of the specification. Section 7.508, sub-paragraph (c)(2) gives a starting value of 400 ppm CO. Is this the value from which it is intended to achieve a final value of 25 ppm in all cases where a final concentration is referenced?

Further, the statement mentions the air lock, not the entire chamber. I think it would be helpful to examine the typical use of a chamber in a bad atmosphere emergency. As miners come to the chamber, whether or not it is

positively pressurized, they will enter the chamber through the air lock.

Unless the air lock is purged every time it is used, CO will enter the main chamber. It could also enter the chamber through improper operation of the air lock due to excitement of the people on the outside opening the outer door before the inner door is closed, envelope damage, etc. Note that positive pressure has little effect on whether or not the air lock will allow gas to enter the main chamber. The air lock only prevents direct communication of a contaminated atmosphere from entering the main chamber. When either air lock door is open there is no difference in pressure across the doorway.

We do not believe it to be practical to provide enough air to purge an isolated chamber (i.e. a chamber NOT connected to a surface blower) air lock each time it is used, but even if it could be done reasonably, there would still be the need to purge the interior because of unintended contamination.

Hence it is our opinion that the entire chamber, air lock and all, be capable of being purged. This should not be taken lightly. The main reason for the envelope is to isolate the miners from a contaminated atmosphere.

It is therefore of the utmost importance to be very sure that CO can be controlled. If it is not, there is little value to anything else being done here.

Additionally, it is important to note that purging is more difficult than might be first envisioned. It takes huge quantities of air to simply dilute gasses to low gas concentrations. The mathematical dilution is significant in itself, but it should be considered that the mixing efficiency of a straight dilution attempt may not be great, and even more air would be required.

We respectfully suggest that the entire enclosed volume be capable of being purged multiple times, with a total of at least three times the volume of the total enclosed space, and that the purging be demonstrated to be capable of bringing even high CO concentrations down to respirable levels in the main and air lock volumes.

Comment 15. Section 75.1507 Sub-paragraph (a)(11)(i) and (ii)

The provisions for locating chambers 'not within direct line of sight of the working face', may merit some reconsideration. Elsewhere in the proposed rule the chambers have been specified to be distant from the face in order to protect them from a face origination event. While in general it is better to be out of the direct pressure wave, a chamber located in a

'longwall train', for instance, may be adequately protected by its location near the outby end of the train, particularly if it is equipped with end protection from flying objects. Kennedy Chambers are available with 'end armor' to provide such protection and it is considered that where entry space is tight and maneuvering the units into crosscuts beside the train is difficult, the chambers may be more serviceable than in the entry than if they were in a crosscut.

Similarly, in mines where chambers are required to be relatively large and intersections relatively tight, much potential damage to a chamber can be avoided if it is not required to remove it from and place it into a crosscut at every move. Again, chambers with adequate end armor and located in main entries may be more serviceable than chambers that are constantly moved into and out of crosscuts. From a view of practicality, chamber damage that could render it compromised is much more likely to occur if the chambers are constantly being maneuvered into and out of crosscuts rather than simply traversing a straight line as the face advances.

We respectively suggest that chambers with adequate 'end armor' be allowed to be utilized in main entries, with or without track.

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Comments specific to the proposed rule itself (not the Section-By-Section Analysis). . .

Comment 16. Section 7.503 (a)(1)

Please see comment 1 above. It is impractical to approve every model separately. Approval needs to be based on design criteria.

Comment 17. Section 7.503 (a)(2)(iii)

The requirement for the materials used in "each component or part" to be noncombustible is confusing to us. There will certainly be components or parts that would not be considered noncombustible. Upholstering or rubber seat padding material, oxygen mask components, oxygen and air flow meters,

gas tubing, high pressure gas regulator diaphragms and seals, door seals, ammunition box lid seals used for provisions storage, etc., are examples.

Comment 18. Section 7.504 (b)(1) and (2)

Please see comments 3 and 4 above. The temperature needs to defined as provided by ISO 7243, and the ambient rock temperature must be referenced.

Comment 19. Section 7.504 (c)(3)

Please see comment 5 above. It needs to be made more clear as to what 'contain' means, particularly that the object is to effectively minimize objectionable odors and insure sanitary conditions INSIDE the chamber, not to attempt to contain what could be in excess of over 130 gallons of waste from a relatively large chamber.

Comment 20. Section 7.505. (a)(1)

Please see comment 6 above. The specified area and volumes in this section are excessive and detrimental to the ultimate goal of providing protection to miners.

Comment 21. Section 7.506(c)(1)(iv)

Please see comment 8 above. The requirement that the relief valve setting be .25 PSI is excessive. 2.5 inches water gauge is safer and more practical for the purpose intended.

Comment 23. Section 7.506 (g)

Please see comment 10 above. Masks need to be differentiated from 'respirators or breathing apparatus'.

Comment 24. Section 7.508 (a)(1)

Please see comment 14 above. Beginning concentrations of the gas to be removed or diluted need to be specified as does the effectiveness of the purge. Further, effective purge of the entire envelope volume, not just the airlock, needs to be demonstrated.

Also, the 20 minute time is excessive. It needs to be purged before anyone can remove their SCSRs. They may not have 20 minutes remaining on their SCSRs or may need to get them off for other reasons.

Comment 25. Section 75.1506 (a)(1)

Please see comment 6 above. If these high areas and volumes are required by law, the best protection available (hard chambers) will have been legislated out.

Comment 26. Section 75.1507 (a)(i)

Please see comment 15 above. Chambers in 'longwall trains' and chambers with appropriate end armor may be satisfactorily or even advantageously located in main entries, with or without track.

End comments from Bill Kennedy, President, CEO, Jack Kennedy Metal Products and Buildings, Inc., Taylorville, Illinois