Seal ETS
Compliance Assistance Questions and Answers
Friday, June 08, 2007

Q1. When does the ETS take effect?

A. The ETS became effective on May 22, 2007.

Q2. When do I have to submit a ventilation plan revision to address the sampling protocol?

A. Mine operators must submit a ventilation plan revision by June 21, 2007.

Q3. How long do I have to comply with the training requirements of the ETS?

A. Training for certified persons sampling sealed areas must be completed by June 21, 2007. Miners who construct or repair seals, certified persons who examine seals during construction and senior mine management officials who certify completed seals shall be trained prior to constructing, examining construction or repairing a seal.

Q4. Are PIB 06-16 and PIL I06-V-09 still in effect?

A. No, these documents were superseded by the ETS.

Q5. What about approved seals that are currently under construction? Do we have to stop working on these until we can get them re-approved in the ventilation plan?

A. No, you may complete any set of seals that is currently under construction. This construction must be completed by June 21, 2007. However, the mine operator must comply with the new seal requirements for construction examination and certification under § 75.337.

Q6. Does MSHA have a specific sampling method, type of equipment or other requirements for the sampling protocol?

A. No, the sampling methods, equipment and techniques must be appropriate for sampling conditions. Any sampling method should use generally accepted methods to assure that a representative sample is obtained from the sealed area and should employ detectors or analyses that are appropriate for the actual gas concentrations.

Q7. Do I have to sample the sealed atmosphere using both sampling pipes in each new seal?

A. During the 14-day sampling period, the sealed atmosphere must be sampled through both sampling pipes in each seal. To determine which sampling pipe in which seal should be used for monitoring under the protocol, mine operators should use the results of the 14-day sampling period. For example, if the results of the samples taken during the 14-day sampling period through

both sampling pipes are similar, then only one pipe may need to be used. Additionally, if sampling results for all seals in a set of seals are similar, then only one seal in that set of seals may need to be sampled. The District Manager may require additional sampling as necessary.

Q8. What does MSHA consider to be an inert atmosphere?

A. An atmosphere is considered inert if it contains less than 10% oxygen, or less than 3% methane, or more than 20% methane.

Q9. I have built solid concrete block seals outby 20-psi alternative seals; do I only have to sample the area between the solid-block seals and the old 20-psi seals?

A. Both the area between the solid concrete block seals and the 20-psi alternative seals and the area inby the old 20-psi seals must be monitored and maintained inert as specified in § 75.335(b). The area inby the 20-psi seals may be monitored through boreholes from the surface, from within the mine, or from another method that is approved by the District Manager.

Q10. The ETS does not discuss gob isolation stoppings. Will these installations still be required to meet the 20 psi standard?

A. MSHA no longer has a 20 psi standard for new seal construction. The ETS applies to all seals. If at any time a gob isolation stopping is used as a seal or becomes a seal, then it must meet the ETS requirements. Sampling and monitoring must be addressed in the protocol as specified in the ETS and in the spontaneous combustion control plan submitted as part of the ventilation plan.

Q11. Section 75.336 states that an engineering design application shall, among other things, address a pressure-time curve. The preamble to the ETS states that pressure-time curves for the 50-psi and 120-psi seal strength requirements of ETS Section 75.335(a) are provided in the 2007 NIOSH Draft Report. Alternative pressure-time curves may be used for designs provided the pressure-time curves are submitted to MSHA's Office of Technical Support for approval. Can I use the 120-psi pressure time curve for 120-psi seals from the 2007 NIOSH Draft Report in my engineering design application?

A. The 120 psi pressure-time curve in the 2007 NIOSH Draft Report may be used if atmospheric conditions within the sealed area are consistent with those assumed in the 2007 NIOSH Draft Report. The pressure-time curve provided by NIOSH for the 120-psi overpressure is based on an explosion occurring from an accumulation of methane located adjacent to the seal with an inert atmosphere in the rest of the sealed area. Therefore, if the 120-psi pressure-time curve from the 2007 NIOSH Draft Report is used, it must be specified in the design application that the mine operator will determine that an explosive mixture may be present only for a short distance behind the seal, but the rest of the atmosphere in the sealed area will be inert. MSHA expects mine operators to sample the sealed area for a sufficient length of time to determine if the design specifications have been implemented.

Alternatively, a different pressure-time curve may be used based on the possibility of an explosion within the sealed area creating an overpressure at

the seal. This condition can be represented by an instantaneous application of the 120-psi pressure followed by a constant loading period at 120 psi, as indicated in the pressure-time curve shown in the chart below. Therefore, if a pressure-time curve is used that is similar to the one in the chart; the design application would not need to address explosive mixtures in the sealed area. MSHA expects that mine operators will not have to sample the sealed area to determine if the design specifications were followed.

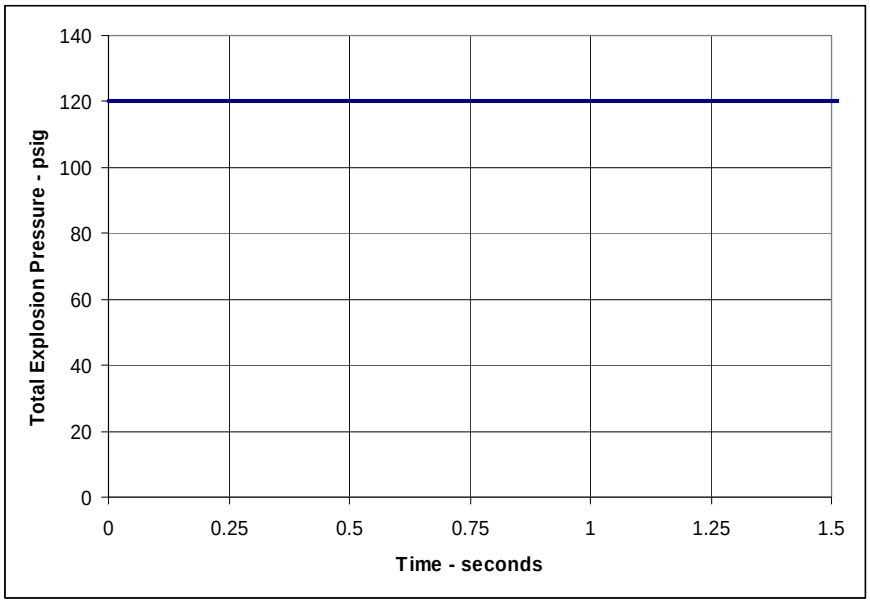

Figure 1. - 120 psi pressure-time curve.

Seal ETS
Compliance Assistance Questions and Answers
June 11, 2007

Q1. If during the sampling process methane concentrations are between 4.5 percent and 17.0 percent in a sealed area, and the approved plan requires the injection of an inert gas, what time frame will be allotted for the operator to complete this process?

A. Once the miners are withdrawn from the affected area or the action plan is implemented, the mine operator may take as long as necessary to inert the sealed area.

Q2. If a mine elects to inert, does the mine have to be evacuated during the inert process?

A. The mine operator must withdraw the miners from the affected area if the sealed atmosphere is in the explosive range.

Q3. If mines with large gobs containing several seal sets find one set with an explosive mixture and elect to install 120 psi seals in the affected set, will this bring the gob into compliance or will the entire gob require the additional 120 psi seals?

A. All seals around the affected sealed area would have to be at least 120 psi.

Q4. Have many operators received approval for a 120 psi seal design? If so, how can an operator get copies of the approval and seal design?

A. Two approved 120 psi designs are posted on the single-source web page.

Q5. For existing seals and future seals built to a 50 psi standard, it is understood that an "action plan" must be developed and approved in the vent plan that defines the steps to be taken when the area behind the seal is not inert. It would be helpful to have more specific guidance on what is expected in the action plan that "must provide protection to miners equivalent to withdrawal." Particularly, what corrective actions (other than inerting) can be taken when oxygen is > 10% and methane is between 3.0% and 4.5% or 17.0% and 20%, and what provides protection equivalent to withdrawal when methane is found to be between 4.5% and 17%?

A. For potentially explosive mixtures (oxygen is greater than 10% and methane is between 4.5 and 17%) miners have to be withdrawn from the affected area. For action levels between 3.0% and 4.5% methane and between 15.0% and 17.0% methane, the operator must undertake steps defined in the approved action

plan to diligently monitor and prevent the sealed area atmosphere from becoming explosive. Alternatively, the operator may elect to withdraw the miners except those referred to in section 104(c) of the 1977 Mine Act until the hazard is abated. Diligent monitoring may include hourly samples. Steps to prevent the sealed atmosphere from becoming explosive may include: repairing leaking seals, pressure balancing the mine ventilation around the sealed area, replacing seals with at least 120 psi seals, and injecting inert gas into the sealed area, or ventilate the abandoned area. Note opening and ventilating a sealed area will require approval by the District Manager.

Q6. Convergence is a well known, extremely important factor in seal strength in the majority of underground coal mines. The ETS only mentions that convergence must be considered in the design of a seal such that the seal won't yield to high levels of convergence. Most normal levels of convergence greatly enhance seal strengths and should not be ignored in seal design.

A. Convergence of mine entries takes time to develop and the recent history of fatal seal explosions all occurred soon after seal construction. Since the resistance to potential explosive forces is necessary soon after the seal construction is completed, seals must be designed to provide full design strength without relying on convergence effects. However, the seal design should establish the maximum allowable convergence a seal may undergo without affecting the structural integrity of the seal [ETS Preamble Sec. 75.336(a)(1)]. Most seals are built in stable areas of mines that are not subject to significant convergence. The recent history of fatal explosions in sealed areas have occurred very soon after the seals were built (Moura No. 2, Queensland, Australia, August 7, 1994, the explosion occurred about 22 hours after seal construction; Sago Mine, January 2, 2006, the explosion occurred within 22 days after seal construction; and Darby Mine No. 1, the explosion occurred 59 days after seal construction).

Q7. It is understood that a water drainage system capable of withstanding the applicable rated overpressure must be installed in each set of seals. The 120 PSI seal examples provided on the MSHA website do not show a 120 PSI water drainage system, additional guidance would be useful.

A. Please refer to 120 psi designs on single-source web page as we have added this information.

Q8. Can insulated cables be grounded rather than removed?

A. All insulated cables must be removed from the area to be sealed.

Q9. Does the designated professional engineer as outlined in 75.336(b) have responsibility to certify that the approved seal meets the mine conditions and is applicable at that mine? Does the professional engineer have to certify the physical construction of the seal?

A. Yes. The mine operator must designate a professional engineer to conduct or have oversight of seal installations and certify that the provisions in the approved seal design have been addressed. A copy of this certification must be submitted to the District Manager.

Seal ETS
Compliance Assistance Questions and Answers
July 19, 2007

Q1. May I build new 50 psi seals using seal construction plans that were approved by MSHA Tech Support and the District Manager prior to May 22, 2007?

A. Yes, provided the seals are certified by a professional engineer and all provisions of 75.336(b) are met.

Q2. If the seal is ingassing during weekly sampling, can you sample later in the week when the barometer has changed and the seal is outgassing?

A. Yes. You may sample later in the week. Section 75.335(b)(1) states that if a seal is ingassing during the weekly examination, a sample must be collected during the next weekly examination. The ETS does not prohibit sampling earlier, provided the seal is outgassing.

Q3. Does a professional engineer have to be onsite to oversee the construction of every set of seals?

A. The professional engineer (P.E.) must inspect the set of seals during construction as part of the oversight and certification required by § 75.336(b)(2). To accomplish this oversight, MSHA expects the P.E. to: 1) verify that the seal application is suitable for the local conditions, 2) confirm that the site preparation is adequate, 3) confirm that the workforce is adequately trained to properly build the seals, 4) verify that the correct materials and procedures are being used to construct the seal, and 5) confirm that adequate quality controls are in place and being followed. The P.E., however, does not have to be onsite the entire time that seals are being built.

Q4. When establishing the initial baseline analysis, how many consecutive days must an operator take a sample at a seal to determine that it will not outgas?

A. The ETS does not specify the length of time that the seal must be examined to determine if it will outgas. Although the period of outgassing will depend on the local weather conditions, MSHA intends for mine operators to attempt to sample for at least 14 days to begin establishing a baseline. If a baseline cannot be established, you must contact the District Manager and develop an alternative sampling

protocol for the District Manager's review within a reasonable timeframe.

Q5. May training be documented on an MSHA Form 5000-23, or will a separate form be required?

A. Mine operators may use MSHA Form 5000-23 for certifying the training required by the ETS. You may also use a book or other suitable record to document training.

Q6. Does my Part 48 training plan have to be revised?

A. No. The seal ETS training is in addition to Part 48 training.

Q7. Can gob wells and degassing pumps be used as alternate sampling points?

A. Evaluation bore holes should be placed in open entries or cross-cuts and not in gob or caved areas. Degas pumps can be used on these evaluation points. All evaluation points must be approved by the district manager.

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Q8. Will MSHA continue to consider water sealing?

A. Yes, with district manager approval.

Q9. How will MSHA determine the 150-foot distance limit for welding, cutting, and soldering with an arc or flame near sealed areas?

A. MSHA intends to measure the distance by following the shortest distance that air can travel (tight-string distance) through crosscuts, entries, or other openings.

Q10. May we drill boreholes in lieu of sampling at the seal sets?

A. No. However, the District Manager may approve these or other alternate sampling locations based on individual mine conditions.

Q11. A mine operator would like to construct seals that can withstand 120-psi overpressure outby existing 20-psi or 50-psi seals. Where does the mine operator need to install sample pipes and take samples?

A. All sample pipes in the existing seals must be extended out through the 120-psi seals. In addition, if an opening exists between the 120-psi seal and the existing seals, another sample pipe must extend through

the new 120-psi seal into this void. If this open area is at least 20 feet deep, this sample pipe must extend 15 feet inby the new 120-psi seal. If the opening is less than 20 feet deep, the sample pipe should be extended to the middle of the void depth. If the open area extends for one or more cross-cuts, still another sample pipe must be extend into the center of the first connecting crosscut inby the new 120-psi seal. All sample pipes must be clearly labeled to identify the area each pipe would sample.

Q12. 75.335(a)(3)(ii) requires seals that will hold pressures greater than 120-psi in sealed areas where pressure piling is likely due to opening restrictions near the proposed seal area. Is the typical mouth of a section where 4 or 5 entries join up with several other entries a location where stronger unmonitored seals are required?

A. Usually, normal 90degree intersections should not contribute significantly to pressure piling. Tapered entries and angled intersections should be evaluated by a person knowledgeable in explosions and explosion overpressures.

Q13. Can the plan be generic in describing the equipment used for sampling? Will it suffice to state that a mine will use an approved detector that will detect methane in ranges from 0 to 100%?

A. No. The protocol approved by the District Manager must list all of the equipment specifically, the appropriate sampling procedures, and any limitations.

Q14. What is the maximum depth of water that may be impounded behind a seal?

A. Seals are not designed to impound water other than to a minimal, unavoidable depth and in no case should water be permitted to accumulate to a depth exceeding the height of a water drainage system that is appropriately installed.

Q15. Is it acceptable to have metal roof supports that are fully encapsulated in a seal?

A. Roof or rib support bolting and bearing plates should be left in place at the seal location. Metal objects such as roof mesh, straps, and beams that extend into either side of the seal must be removed.

Q16. Does 75.337*, Construction and repair of seals*, require that a certified person oversee and certify any repairs for existing seals (constructed prior to June 21, 2007)?

A. Yes.

Q17. Does the designated professional engineer as outlined in 75.336(b) have responsibility to certify that the approved seal meets the mine conditions and is applicable at that mine?

A. Yes. The mine operator must designate a professional engineer to conduct or have oversight of seal installations and certify that the provisions in the approved seal design have been addressed. A copy of this certification must be submitted to the District Manager.

Q18. If a Mitchell Barrett seal was built in front of an adequately constructed omega block seal, can we add the two seal strengths together in calculating the strength?

A. No. Credit will be given for the strength of the outby seal only.

Q19. Do we have to revise our training plans? If so, what additional items need to be covered?

A. No. There is no requirement in the ETS for training plans. However, the mine operator must certify that appropriate persons have been trained in accordance with 75.335(b)(2) and 75.337(e).

Q20. Is there a guideline established for an action plan?

A. A template for a typical action plan submittal is available on the seals single-source web page.

Q21. Can a mine use bottle samples during weekly atmosphere tests, or will the monitoring have to be conducted with instruments?

A. Bottle or bag samples may be taken, but the results of the analysis must be available and recorded in a timely manner. The results of the bottle or bag samples must be available within the one-hour intervals for additional samples required in 75.335(b)(4).

Q22. What do you do when an explosion occurs behind a seal?

A. Take appropriate actions necessary to protect the miners, such as withdrawing all miners from the affected area, and call 1-800-746-1553 to report the explosion.

Q23. Can a contractor's certified supervisor sign off that the seal was constructed according to the approved design? Can he or she be a certified person "designated by the mine operator?"

A. If designated by the mine operator, the contractor's certified supervisor may perform and certify the examinations specified in 75.337(b). The certification required by 75.337(c) must be done by a senior mine management official.

Q24. Are there any guidelines for determining the "affected area" (75.335(b)(4)(ii)) for each set of seals?

A. The affected area would be anywhere in the mine where miners could be endangered by the explosive pressures, flames, forces, smoke or toxic gases resulting from an explosive failure of those seals. This would include any miners in the vicinity of the seal, miners working inby the set of seals in question and miners working adjacent to an escapeway that could be affected by the seal failure.

Q25. Can the use of a tube-bundle system or a means to pump a sample from the seal to an automated gas analysis system be used to meet the weekly sampling requirement?

A. Yes, if approved in the protocol in the ventilation plan.

Q26. Can the mine operator embed non-metallic pipes in the seals for the injection of inert gas?

A. Yes, if approved as part of the seal design and in the approved ventilation plan.

Q27. Do seals have to be designed for overpressure from either direction?

A. Yes. The overpressure could come from within the sealed area toward the active area or from the active area toward the sealed area. In the case of the 50-psi seals, the seal must be capable of withstanding a 50-psi overpressure from both directions. In the case of 120-psi seals, the seal must be capable of withstanding 120-psi overpressure from the sealed area and at least a 50-psi overpressure from the active workings, as long as it remains inert.

Q28. Some of the seal designs shown on the single-source page are not certified by a registered professional engineer. Can these plans be submitted in a ventilation plan?

A. **Seal 50-75.336.1.07.01.0** – Concrete Block Seal, **Seal 120-75.336.1.07.01.0** – Reinforced Concrete Seal, and **Seal 120-75.336.1.07.02.1** – Concrete Plug Seal were designed by MSHA's Office of Technical Support to provide examples of seal designs that will be approved by MSHA. Before one of these seals is submitted in a ventilation plan, the design must be certified by a professional engineer (P.E.), as required by § 75.336(a)(1)(ii) of the ETS. If the P.E. is able to certify the design with no changes, it does not need to be re-submitted to Technical Support for approval. However, if the P.E. makes any changes to the design, then it must be submitted back to Technical Support for approval.

Q29. A sample taken from a sealed area has an oxygen concentration of 12% and a methane concentration of 10%, the carbon dioxide was 15% and there were no other combustible gases. Using the Zabetakis method (Zabetakis, M.G., R.W. Stahl and H.A. Watson, "Determining the Explosibility of Mine Atmospheres," U.S. Bureau of Mines, IC 7901, 1959), the atmosphere is not explosive. Are there any options other than withdrawal of the miners from the affected area?

A. MSHA recognizes that other gases other than methane and oxygen may impact explosibility. However, few U.S. coal mines have significant concentrations of in-situ carbon dioxide, carbon monoxide and longer chain hydrocarbons. When applicable, the mine operator could submit a protocol in the ventilation plan to address this situation. An alternative protocol and action plan that includes other gases, such as carbon dioxide, must provide similar levels of protection to the miners as the action levels specified in § 75.335(b)(5)(vii). Withdrawal of miners at a Zabetakis R-factor of 0.6 (or equivalent) and more frequent monitoring should be included in the protocol. MSHA will only consider this approach for mines with a demonstrated history of high carbon dioxide levels in sealed areas, post-mine fire recovery and mines with hydrocarbon leakage.

Seal ETS
Compliance Assistance Questions and Answers
August 8, 2007

Q1. When an initial sample shows that the sealed area is in the explosive range, can the two required additional samples be taken and analyzed before implementing the action plan and withdrawing miners from the affected area?

A. Yes, § 75.335(b)(4) requires that if the atmosphere in the sealed area contains an oxygen concentration of greater than 10% and methane concentration between 3% and 20%, two additional measurements must be taken at one hour intervals to substantiate the potential hazard. If both of the additional two measurements confirm the initial findings, the action plan in the approved ventilation plan, should be followed or persons must be withdrawn from the affected area with exception of those persons under Section 104(c) of the Mine Act. This issue is also addressed in MSHA's Procedure Instruction Letter I07-V-4, "Procedures for Inspection of Seals," issued on July 24, 2007.

Q2. An initial sample shows the sealed area is in the explosive range; the second sample also shows that the sealed area is in the explosive range. However, the third sample shows that the area is now inert. Do miners need to be withdrawn from the affected area?

A. No, the "if" in § 75.335(b)(4) applies to both of the "two additional samples". Three consecutive one-hour samples that are within the range specified by § 75.335(b)(4) are needed to trigger the action plan or withdrawal of miners.

Q3. The initial sample shows the sealed area is in the explosive range; the second shows that the area is now inert. Are additional samples required?

A. Yes, the approved monitoring protocol should specify an increased sampling frequency be implemented whenever any sample shows levels that are within the range specified in § 75.335(b)(4). A minimum of three consecutive acceptable one-hour samples must be obtained before the sampling frequency reverts back to the normal intervals specified in the approved protocol.

Q4. An initial sample shows that the sealed area is in the explosive range, and the two required additional samples also indicate that the sealed area is in the explosive range. Miners are withdrawn from the affected area and the action plan is implemented. Meanwhile, the barometer changes and the affected seals begin to ingas. Can the miners return to the affected area since the seals are now ingassing?

A. No, the potential hazard exists until the atmosphere moves outside the range specified in 75.335(b)(4). The mine operator should increase the frequency of sampling until a stable trend is established and three acceptable one-hour samples are obtained. The miners can only return if the atmosphere is out of the ranges specified in § 75.335(b)(4).