FEDERAL MINE SAFETY AND HEALTH REVIEW COMMISSION

OFFICE OF ADMINISTRATIVE LAW JUDGES
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March 16, 2006

WABASH MINE HOLDING CO., Contestant	:	CONTEST PROCEEDINGS
	:	Docket No. LAKE 2005-83-R
	:	Citation No. 7580994; 03/28/05
v.	:	Docket No. LAKE 2005-93-R
	:	Order No. 7598049; 5/16/05
SECRETARY OF LABOR, MINE SAFETY AND HEALTH ADMINISTRATION (MSHA), Respondent	:	Wabash Mine
	:	Mine ID 11-00877

DECISION

Appearances: Christine Kassak Smith, Esq., Office of the Solicitor, U.S. Department of Labor, Chicago, Illinois, for the Petitioner; R. Henry Moore, Esq., Julia K. Shreve, Esq., (on brief), Jackson Kelly PLLC, Pittsburgh, Pennsylvania, for the Respondent;

Before: Judge Feldman

These contest proceedings arise from a 104(a) citation and a related 104(b) withdrawal order issued to Wabash Mine Holding Company (Wabash). The citation and order concern the fitness for purpose of five ventilation control seals constructed of cementatious foam material rather than traditional concrete block. The hearing was conducted from August 30 through September 1, 2005, in Evansville, Indiana. The parties' post-hearing briefs and replies have been considered.

I. Statement of the Case

At issue are five seals located at the 2 West South area of the Wabash Mine that separate an abandoned area from the active mine. Seals, as a ventilation control, have two objectives. First, seals separate unventilated, contaminated air in an abandoned area from active areas of a mine. The Secretary does not assert the cited seals failed to perform this function in that the Secretary admits the seals were not leaking methane into the active workings. (*Sec'y br.* at p.36, n.8). Second, seals must continue to maintain their structural integrity so that they can withstand convergent pressure from the mine roof and floor, as well as lateral pressure from an explosion, to prevent the escape or propagation of gases from the abandoned area into the active area. Section 75.333(h), 30 C.F.R. § 75.333(h), the cited mandatory safety standard, requires that

"[a]ll ventilation controls, including seals, shall be maintained to serve the purpose for which they were built." It is the cited seals' ability to withstand lateral pressure, also referred to as static horizontal pressure, in the event of an explosion, that is the focus of this proceeding.

II. Findings of Fact

Both the Mine Safety and Health Administration (MSHA) and the State of Illinois require abandoned mine areas to be either sealed or ventilated. Sealing an abandoned area eliminates the necessity for ventilation or examination of the area. After an area has been sealed, the atmosphere behind the seals stabilizes over time. Methane levels rise above the explosive limit of 15 percent as oxygen levels decrease below the amount necessary for ignition. However, leakage of concentrated methane from behind a seal into the active mine results in dilution of the methane with fresh air that could create an explosive range of 5 to 15 percent methane in the active workings.

Section 75.335, 30 C.F.R. § 75.335, of the Secretary's regulations governs the construction of seals. Section 75.335(a)(1)(i) specifies that seals constructed after November 15, 1992, shall be "[c]onstructed of solid concrete blocks at least 6 by 8 by 16 inches, laid in a transverse pattern with mortar between all joints." However, section 75.335(a)(2) permits "[a]lternative methods or materials to be used to create a seal if they can withstand a static horizontal pressure of 20 pounds per square inch [(20 psi)] provided the method of installation and the material used are approved in the ventilation plan."

The approved Wabash Mine ventilation plan allowed several alternatives to solid concrete block seal construction. (Joint Stip. 15; Joint Ex. 1). Among them was pumpable material seals. The ventilation plan provided:

> Pumpable Material Seals - Will be constructed using cementatious foam with a compressive strength of at least 200 psi and will have a minimum thickness of four (4) feet. All formwork [sic] and framing will be left in place on both sides of the seal if deemed necessary by mine supervisory personnel. Hitches and footings are not required for this type of seal.

(Joint Ex. 1).

The 2 West South seals (the south seals) were installed in 1993 by Alminco, Inc., (Alminco). Consistent with the ventilation plan, the seals were constructed using a cementatious foam material that is pumped between wood forms that are constructed to mine specifications. The seals in issue were poured into the forms to dimensions of 4 feet thick, 6 to 7 feet high, and 18 to 19¾ feet wide, depending on the width and height of each entry. (Tr. 33, 92-93, 122; Joint Ex. 1).

The cementatious foam material for the south seals was poured into the wood forms constructed in each of the five entries. The material was pumped into the forms in a wet mix that

forms a slurry which undergoes a curing process whereby the seals harden and acquire their compressive strength. The seal remains in the entry for the life of the seal.

During the pouring of the seals, Alminco obtained a total of nine representative samples taken in cylinders 3 inches in diameter by 6 inches tall from nine standard pre-determined locations from the top, middle and bottom of each seal. The cylinders were allowed to cure for 28 days at which time they were tested for vertical strength. This was accomplished by exposing the cylinder samples to vertical forces to determine the amount of pressure each sample could withstand. The Secretary does not contend that Alminco's sampling process was flawed or otherwise contrary to industry standards. The average compressive strengths for the nine cylindrical samples taken from each of the five south seals were:

South Seal # 1 - 600 psi
South Seal # 2 - 322 psi
South Seal # 3 - 238 psi
South Seal # 4 - 340 psi
South Seal # 5 - 460 psi

(Resp. Ex. 11). The average compressive strength for each of the five seals at installation was 392 psi. These results do not reflect any curing problems with the sampled material.

A compressive strength (vertical strength) of 200 psi is very important in determining the stability of a seal and ensuring its ability to withstand at least 20 psi horizontal force. (Tr. 314, 320). Increasing the vertical strength of a seal will increase its horizontal strength, although not in linear proportion. (Tr. 314).

Cementatious foam seals are designed for use in mine areas where convergence of the roof and floor is expected. (Tr. 123-24, 537). There is approximately 800 feet of overburden at the Wabash Mine causing coal pillars to compress into the floor. (Tr. 60, 236; Gov. Ex. 3). Roof sagging and floor heaving in the 2 West South area began within months of installation of the seals, causing destruction of the wooden forms used to construct the seals. Wooden forms are installed to control the dimensions of the poured seal. The wooden framing does not affect the structural strength of the seal.

Wooden cribs and posts in the area have also compressed over the past 12 years. Pressure from the roof and from the seals increased the floor heaving at the base of the seals. Thus, although the seals were originally 6 to 7 feet high, they now also are compressed to approximately 3½ to 4½ feet. Precise measurement is difficult, if not impossible, because of the significant floor heaving that surrounds the base of the seals.

Illinois law requires the examination of seals prior to every shift. MSHA requires only weekly examinations. Tests for methane are taken at the south seals during these examinations. (Tr. 546). Seals are not intended to be leak-proof. (Tr. 360). Virtually all seals leak in either direction, towards or away from the active mine, depending on barometric pressure. On days when barometric pressure is low, leakage would be in the direction of the active mine.

Conversely, high barometric pressure would cause the mine atmosphere to leak through the seals in the direction of the abandoned area.

Bottle samples and readings from hand-held detectors are taken from the accessible active mine side of a seal to determine if a seal is structurally compromised with respect to leakage. Obviously, the abandoned mine side of a seal is inaccessible. Aside from the effects of normal barometric changes, the evidence reflects both State and MSHA mine inspectors determined that the subject seals were not leaking.

The Wabash Mine is a large mine. There is a constant presence of MSHA inspectors at this mine in that the statutorily mandated quarterly mine inspections can take the entire quarter to complete. (Tr. 54-55). Illinois state mine inspectors are also frequently performing their duties at the mine. The Secretary concedes that the subject seals were designed and installed in accordance with the approved ventilation plan at the time of their installation in 1993. (Tr. 212).

a. MSHA Witnesses

MSHA mine inspector Steven Miller, the issuing inspector, testified that "[t]here is a long history behind these seals."[1] (Tr. 102-03). Prior to beginning his quarterly inspection, Miller discussed the condition of the seals with Michael Renny, an MSHA inspector who had conducted the previous quarterly inspection at the mine. Renny expressed concern about whether the seals were being adequately maintained. A seal that is not structurally sound cannot be repaired and must be replaced. (Tr. 231-32). Dave Whitcomb, Miller's supervisor, instructed Miller to take a closer look at the seals. (Tr. 103-04, 375-76).

Miller inspected the south seals on or about March 28, 2005. Approaching the seals required crawling or stooping uncomfortably because of the significant compression of the roof and heaving of the mine floor.

The faces of the seals had been sprayed with a polyurethane material several years before. Wabash maintains the spray was applied to minimize exposure of the faces to the mine atmosphere to retard further deterioration. (Tr. 774). Although the polyurethane spray can obscure the condition of faces, an Illinois mine inspector testified spraying seals is neither prohibited nor unusual. (Tr. 489). On the other hand, Miller testified that while spraying foam material on the top or side of a seal to fill gaps is common, he had never seen a spray applied to the face of a seal. (Tr. 111). In any event, the evidence does not support an inference that Wabash applied the spray material to obscure observation of the subject seals.

[1] MSHA inspector Steven Miller and union safety committeeman James Miller testified in this matter. All references to "Miller" refer to inspector Steven Miller unless otherwise noted.

As noted, the seals were compressed to heights varying from approximately 3½ to 4½ feet. The faces of the five seals were somewhat buckled and the faces generally were granular to the touch. As noted, the wood framing material had become dislodged.

Specifically, the No. 1 seal exhibited the most facial deterioration. (Tr. 84). There was a 3 inch diameter hole in the center of the seal that was approximately 6 inches deep. (Gov. Exs. 4, 5). The hole was just big enough to stick the tips of the fingers in. (Tr. 493). Miller also observed facial cracks in the No. 1 seal. Methane readings taken by Miller and Illinois mine inspectors were negative reflecting that neither the 6 inch hole nor the facial cracks in the No. 1 seal penetrated the seal or otherwise caused leakage. (Tr. 84, 96-97, 472). The No. 2 seal's center exhibited powdered material to an approximate depth of 4 inches. (Tr. 308; Gov. Ex. 6, 7). The No. 3 seal's wood frame was broken, and there were surface cracks on the face of the seal. (Tr. 81, 83; Gov. Ex. 8). The No. 4 seal had facial cracks. (Tr. 90, Gov. Ex. 9, 10). The No. 5 seal contained a sampling pipe that was used to sample the atmosphere on the abandoned side. (Tr. 118, 258). The exterior was granular to the touch, although the No. 5 seal appeared to be the best of the south seals with respect to structural integrity. (Tr. 119-20). In short, even Wabash's expert witness conceded the faces of the seals were "unsightly." (Tr. 535).

Immediately prior to issuance of the subject citation, Miller took methane readings at all five of the south seals. Despite the surface cracks and powdery exterior described by Miller, all sampling revealed an absence of methane at the seals. (Tr. 96-97). As noted, there were no methane readings taken by federal, state or mine personnel at the cited seals that evidenced any abnormal leakage. Significantly, the presence or lack of leakage is the criterion MSHA uses to pass or fail seals of various designs after they are exposed to 20 psi explosions in laboratory test settings. (Tr. 359).

Although Miller maintained that the deterioration of the seals was excessive, Miller agreed that facial deterioration of cementatious foam material is a natural consequence of compression. In this regard, Miller acknowledged that deterioration in a mine environment is a fact of life, and that, without drilling a sample from the seals, he had "no way of knowing what's behind that buckling." (Tr. 120-21).

As a result of his observations on March 28, 2005, Miller issued 104(a) Citation No. 7580994 citing a violation of the mandatory safety standard in section 75.333(h) because the south seals allegedly no longer served the purpose for which they were built. Specifically, the citation stated:

> The 2 West South Seals have not been maintained to serve the purpose for which they were built. They are found in an area that experienced squeezing and convergence and show signs of stress. The seals show signs of buckling as well as fracturing of the outer portion of the seal material. New seals must be built in an area where overburden pressures will not affect the structural integrity of the seals.

(Gov. Ex 1).

Miller explained that he designated the cited violation as non-S&S in nature because there was no methane present and there were no conditions that created potential ignition sources. (Tr. 58). Generally speaking, a violation is properly designated as non-S&S if it is unlikely that the hazard contributed to by the violation will result in a serious injury. *Nat'l. Gypsum Co.*, 3 FMSHRC 822, 825 (April 1981).

The abatement period was initially established as April 28, 2005. The abatement date subsequently was extended until May 16, 2005, to provide an opportunity for MSHA's Technical Support personnel to examine the seals. (Gov. Ex. 1).

MSHA technical personnel and Wabash representatives observed the south seals on May 9, 2005. MSHA was represented by Clete Stephan, MSHA's technical support seal expert, inspector Miller and Mark Eslinger, MSHA's supervisory mining engineer. Wabash's principal representative was by Jack Trackemas who is the Director of Technical Services for Foundation Coal Company, Wabash's parent company.

Mark Eslinger is a registered professional engineer in the State of Indiana. He has been employed by MSHA and its predecessor agencies since 1971. Miller enlisted Eslinger to accompany him and Stephan during their May 9, 2005, inspection of the seals. (Tr. 207). Eslinger opined there is no way to test a seal for horizontal strength once it is installed. (Tr. 218).

Eslinger testified about the industry standard testing (ASTM) procedures for ensuring the compressive strength of cementatious seals that were utilized by Alminco with respect to sampling and 28 day curing. In this regard, Eslinger stated:

> Question:. So how do you tell if a seal is good or bad?
>
> Eslinger: Well, it has to be built like I said in accordance with what's approved, okay. And in a case like the pumpable seals, to assure that there is a minimum compressive strength to the concrete or I'm calling it concrete because its very similar to concrete, it's low-strength concrete . . . . There is a standard test for testing concrete cylinders, and it's the same test that's used there to determine the compressive strength of the material.

(Tr. 215-16).

Eslinger further testified that based on his May 9 observation of the powdery consistency and surface cracks on the faces of the south seals, he concluded:

> I think [the seals] had enough vertical pressure of the roof and floor such that the seals have cracked and that they would no longer withstand the 20 psi if we subjected it to the 20-pounds-per-square-inch pressure weight.

(Tr. 218).

Clete Stephan is a registered professional engineer in the State of Pennsylvania and a nationally Certified Fire and Explosion Investigator (CFEI). (Gov. Ex 12). He has been employed by MSHA in supervisory and engineering positions since 1977. During his tenure at MSHA, Stephan has investigated numerous underground coal mine explosions. He currently serves as a General Engineer in MSHA's Ventilation Division. Stephan testified that, while solid concrete block is generally stronger than cementatious foam seals, it is unforgiving under stress. Thus, cementatious foam is the material of choice in applications where convergent roof and mine floor forces cause squeezing. (Tr. 302-03).

Stephan explained that curing problems arise in seals when moisture leaves the slurry mix prematurely before the cementatious material hardens and acquires its compressive strength. (Tr. 297-98). Based on his May 9, 2005, observations of the south seals, Stephan concluded that the granular surface and facial cracks, that he estimated were 4 to 5 inches in depth, were attributable to improper curing. (Tr. 306, 309). Stephan opined ". . . that the powdered material that was there would really give an indication that those seals didn't really have the compressive strength that they needed throughout the body of the seal to survive that kind [20 psi] of an explosion." (Tr. 311).

Stephan ultimately opined that the south seals could only withstand 5 psi horizontal pressure. (Tr. 337). Stephan's opinion was not based on any quantitative analysis. Rather, he concluded the south seals were not significantly structurally stronger than standard ventilation controls such as stoppings, regulators and overcasts, that can withstand approximately 2 to 4 psi lateral pressure. (Tr. 337).

Stephan also expressed concern over the degree of convergence of the south seals. Stephan opined that while convergence tightens the center area of the seal where convergence occurs, it weakens the outer perimeter. (Tr. 336-37). Thus, Stephan initially opined that MSHA would accept "around 20 percent convergence." (Tr. 355). Whether he initially mis-spoke is unclear because he immediately changed the maximum acceptable convergence to 30 percent. *Id.* Thus, Stephan opined convergence of 1.8 feet in a 6 foot entry and 2.1 feet in a 7 foot entry was the maximum vertical pressure the south seals could withstand and still maintain structural rigidity at 20 psi horizontal force. (Tr. 355-57).

The exact magnitude of convergence for each of the 5 south seals is unclear. While the entries have converged from 6 to 7 feet high to 3½ to 4½ feet high, it is doubtful that the seals have compressed to 3½ to 4½ feet high because the seals have been driven into the floor causing the floor to heave around the seals. For example, the mine floor has heaved around the sampling pipe in the No. 5 south seal although the pipe originally protruded from the seal approximately one foot above the mine floor. (Tr. 551, 562-63, 606-07; Gov. Ex. 17).

Despite Stephan's concern about the extent of convergence, Stephan also testified that he believed the south seals never had the ability to withstand more than 5 psi since they were installed in 1993 because of improper curing. (Tr. 395-96). However, Stephan was unable to explain satisfactorily why he concluded the south seals were capable of withstanding only 5 psi explosive force, initially relying on laboratory observations of similar seals at the National

Institute of Occupational Safety and Health (NIOSH) Lake Lynn testing facility[2] that failed when exposed to explosive forces, and later relying on his observations at mine explosion accident sites where seals failed. (Tr. 390-397).

b. 104(b) Order

On May 16, 2005, MSHA representatives met with Wabash mine management. Wabash informed MSHA that it intended to contest the citation and that it did not plan to replace the seals until the matter was litigated. On that day, following the meeting, MSHA inspector Elzia Napier was directed by his supervisor to issue 104(b) Order No. 7598049 with respect to the south seals.[3] The Order stated:

> No effort has been made by the mine operator to replace or rehabilitate the 2nd West south seals, citation #7580994, dated 3/28/2005. All persons are to be withdrawn from the 2nd West Cut Thru area from 1W3 belt underpass to the doors at crosscut #4 on 2nd West.
>
> No one is to enter this affected area except those persons designated by the operator or an authorized representative of the Secretary necessary to correct the condition or any public official whose official duties require him to enter the area and any representative of the miners who in the judgment of the operator or an authorized representative of the Secretary whose presence in such area is necessary for the investigation of these conditions and any consultant to any of the foregoing.

(Joint Stip 12; Gov. Ex. 2).

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[2] Lake Lynn is an experimental coal mine facility where tests have been performed and documented in various publications by NIOSH, the Bureau of Mines, MSHA and seal manufacturers, concerning a variety of seal designs including cementatious foam seals. (Tr. 213-14, 297-99).

[3] Section 104(a) of the Mine Act provides that a citation issued by the Secretary ". . . shall fix a reasonable time for the abatement of the [cited] violation." 30 U.S.C. § 814(a). Section 104(b) provides that if on follow-up inspection the Secretary finds:

> (1) that a violation described in a citation issued pursuant to subsection (a) has not been totally abated within the period of time as originally fixed therein or as subsequently extended, and (2) that the period of time for the abatement should not be further extended, [she] shall . . . promptly issue an order requiring the operator . . . to immediately cause all persons [affected] . . . to be withdrawn . . . until . . . the Secretary determines that such violation has been abated.

The 104(b) order prevented inspection of the south seals by Wabash's preshift examiners as well as examination of a second set of seals known as the north seals, which were on a separate split of air. Since the order precluded regular preshift examinations, the State of Illinois directed its mine inspectors to inspect the seals on a weekly basis. (Tr. 438-39). During those inspections, Illinois personnel took bottle samples both in front of the seals and from the sample pipe in the No. 5 seal that draws air from the sealed area. These samples did not reveal any leakage. (Tr. 443).

At the hearing, the record was left open for MSHA to modify the 104(b) order to relieve the Illinois inspectors of performing the functions of Wabash's preshift examiners. (Tr. 833-35). 104(b) Order No. 7598049 was modified by MSHA on September 16, 2005. The modification specified:

> Order #7598049 is hereby modified to allow preshift and weekly examinations along the normal examination routes through the area now covered by this order. No other work or travel through the 2nd West entries is allowed except for correcting hazards identified during the examinations.

Letter from R. Henry Moore, Esq., to Judge Feldman (Sept. 9, 2005).

c. Wabash Witnesses

Jerry Odle is a State of Illinois inspector who has been inspecting the Wabash Mine since 1993. In May 2005 Odle began performing frequent inspections of the south seals in lieu of preshift examinations after the 104 (b) order was issued. Odle's bottle samples did not reveal any leakage.

Donald McBride is Odle's supervisor. McBride has been employed by Illinois for 16 years. McBride did not believe the south seals needed to be replaced. McBride testified:

> Question:. Did you come to a conclusion as to whether or not those seals needed to be replaced?
>
> McBride: Not just from looking, no. The seals are – the wood, the cribbing, the timbers on the approaches to the seals, the walking height, is no cakewalk. In fact, it's what we call a duck walk or a monkey walk from in between each seal.
>
> Now, the approaches to the seals was [sic] no problem, once you got to the sealed area, the heaving that's been talked about, had caused the walking height to be uncomfortable at best. But we didn't see anything top-wise that I would consider a hazardous condition.
>
> Question: Okay, in terms of the seals themselves, did you come to a conclusion that they were doing what they were supposed to?

McBride: They separate the two atmospheres. We have very bad air behind the seals because there hasn't been any fresh air ventilation there since 1993. Methane goes up, oxygen goes down, and you want to make sure that stuff stays contained behind the seal.

(Tr. 442-43).

McBride further testified that he "[had] no way of knowing" whether a seal with surface cracks that was not leaking could withstand an explosive force. (Tr. 492). Thus, both Odle and McBride believed the south seals were performing their function.

James Miller is a United Mine Workers Union safety committeeman who has worked at the Wabash Mine since 1974. Miller believed, based on normal methane readings, that the south seals separated the sealed area from the active area of the mine. (Tr. 645).

Alan Campoli has a Ph.d. in Mine Engineering and Master's degrees in Mining and Industrial Engineering. Campoli's Ph.d. dissertation was on high stress failure of coal pillars in underground mines. Campoli's dissertation is applicable to the issues in this case that concern the structural sufficiency of seals that are exposed to convergent underground mine stresses.

Campoli was employed as a research engineer by the United States Bureau of Mines in Pittsburgh, Pennsylvania from 1979 to 1995. Campoli specialized in ground control and methane drainage system design. As a consequence of his employment, Campoli was familiar with the testing procedures and results for seals at NIOSH's Lake Lynn facility.

Since 1997, Campoli has been the Business Development Manager for Minova, USA, a leading supplier of seals that performs services related to the design and installation of cementatious seals. (Tr. 528; Resp. Ex. 12). In fact, some of the seals evaluated at Lake Lynn were designed by the Minova company. Campoli's duties include consulting with mine operators with regard to the suitability of a particular type and size of cemetatious seal for a particular mine.

Campoli examined the south seals at the Wabash Mine in April 2005. (Tr. 533). After viewing the seals Campoli concluded:

> And I believe after - - after a view of the seal faces and looking at the - - they are unsightly, as everyone has said, but they - - they - - they- - my inspection revealed them to be basically solid. And I believe that in their condition, considering the test results from the grab samples that were taken when they were placed, combined with the amount of deformation that they had experienced in the mine, that they meet or exceed the [20 psi] standard that was set at Lake Lynn.

(Tr. 535).

Campoli stated that the weakest area of a mine that is exposed to stress will experience the most deformity. In the vicinity of the south seals, Campoli concluded the weakest area was the mine floor. In this regard, Campoli opined that the primary convergent force was from the roof through the coal pillars and seals transferring weight to the bottom causing heaving of the mine floor. (Tr. 535-36). Campoli testified that it was significant that the south seals were strong enough to deform the mine floor, yet maintain their integrity at the bottom of the seal. In other words, it was the seal that was pushing on the mine floor causing it to heave. (Tr. 542-43). He stated, "[a] granular material that runs like sand cannot do that." (Tr. 544).

Campoli attributed the facial cracking to the dilation (expansion) of the face of the seal. Thus, he concluded a four inch deep facial crack does not reflect a four inch loss of width of the seal because of the expansion at the face due to vertical stress. (Tr. 545-46). He explained that, since the seal is not pliable enough to bow at the center, surface cracks are created. (Tr. 545).

Campoli disagreed with Stephan's conclusion that the granular consistency at the faces of the seals was evidence of improper curing. Rather, Campoli opined that the sand-like particles were a result of the long-term exposure of the faces to the mine atmosphere. (Tr. 548). To support his opinion, Campoli explained:

> . . . if the material was poorly cured throughout the entire seal, under this - - under this heavy loading and under this dramatic deformation, it would be rolling out. But its not rolling out. If you look at your pictures, your Honor, the crack is still vertical. How can sand stay vertical in that situation? The material must have set properly to - - to be able to react to this - - to this abuse in this manner.

(Tr. 550).

Finally, Campoli addressed Stephan's concern regarding the degree of convergence. Campoli explained:

> Also I want to address the fact about the shortening. I believe that the shortening of the entry cannot be - - cannot be viewed as a one-to-one correlation with the shortening of the seal. I believe in this case the seal has pushed into the bottom and measuring - - when you measure the convergence of the entry, I think only a portion of that has actually been experienced by the center of the seal, because the center of the seal had been strong enough to push down and extrude the bottom [of the mine floor] into the front of it.

(Tr. 551).

In the final analysis, Campoli agreed with State inspectors McBride and Odle that the only way to determine if a seal has lost its structural ability to withstand the force of an explosion is to test for leakage (Tr. 551-52). Based on his observations of the south seals, given no evidence of leakage reflecting cracks penetrating the width of a seal, Campoli concluded that the south seals continued to accomplish their intended purposes of separating the mine from the

sealed atmosphere, as well as providing an explosion resistant barrier that is capable of withstanding at least 20 psi horizontal force. (Tr. 534).

As noted, Jack Trackemas is the Director of Technical Services for Foundation Coal Company, Wabash's parent corporation. Trackemas is the Director of a group that is responsible for all aspects of mine engineering with respect to such areas as ventilation, roof control and geology. On May 9, 2005, Trackemas tested the south seals for leakage in the presence of Miller, Eslinger and Stephan. The south seals were performing their intended function of separating the abandoned mine atmosphere from the active workings as there was no evidence of leakage.

Trackemas has participated in the design and testing of seals at the Lake Lynn site. (Tr. 678-81; Resp. Ex 10). Although Campoli believed the seal width was not compromised significantly by surface cracks that were caused by dilation at the face, Trackemas concluded the only way to address MSHA's concerns that the facial deterioration caused a functional reduction in the width of the seals was to perform a computerized model finite element analysis. (Tr. 695-96).

Trackemas conducted a finite analysis model (model) of seals and incorporated his findings in a report entitled "Comparison of 4-ft Converged Seal with 8-ft Standard Seal." (Resp. Ex. 9; Tr. 694-95). The model is a computer program that is used for design applications in the aviation, automotive, structural engineering industries, as well as underground mining. Computer models are particularly useful in addressing roof control issues at mine sites. (Tr. 727-28). Trackemas created a computerized model to determine the stress on, and within, two seals, one 8 feet high by 4 feet wide, and the other 4½ feet high by 3 feet wide. (Tr. 695, 715, 727). The latter computer model represented a compressed seal. The models revealed that reducing a seal's height as a consequence of vertical compression increases its resistance to horizontal forces. (Tr. 715). Specifically, the models demonstrated that 20 psi exerted on the shorter seal had less effect than 20 psi exerted on the taller seal. (Tr. 717-18). Put another way, the shorter compressed seal had a greater density of molecular structure, and it was more stable and less prone to movement when subjected to 20 psi horizontal force. (Tr. 719-20; Resp. Ex. 9, fig. 4, 6). Trackemas' model was conservative in that it assumed a compressive strength of 200 psi while the Alminco test samples reflect that the south seals' compressive strength was considerably greater. (Tr. 769; Resp. Ex. 11).

III. Discussion and Evaluation

Section 75.333(h), the cited mandatory safety standard, requires that "[a]ll ventilation controls, including seals, shall be maintained to serve the purpose for which they were built." The purpose of a seal is twofold: (1) to maintain separation of the air between abandoned and active areas of a mine; and (2) to provide an explosion-resistant barrier between the two atmospheres so that the seals prevent an ignition or explosion on either side of the seal from penetrating through the seal. As the evidence does not reflect leakage, the focus shifts to whether the south seals retain the requisite horizontal structural integrity to survive an explosion.

Although section 75.333(h) does not contain the minimum horizontal strength requirements for a cementatious foam seal, section 75.335(a)(2) requires that alternatives to solid concrete block seals must be capable of withstanding at least 20 psi static horizontal pressure. Wabash does not dispute that the minimum 20 psi standard must be satisfied in this case. Moreover, the Secretary's incorporation of the 20 psi standard into the fitness for purpose provisions of section 75.333(h) is reasonable and entitled to deference. *See, eg.*, *Energy West Mining Co. V. FMSHRC*, 40 F.3d 457, 463 (D.C. Cir. 1994).

The criteria for ensuring that cementatious seals are capable of withstanding a minimum horizontal force of 20 psi were developed at Lake Lynn. Namely, seals must be at least 4 feet thick, and they must have a compressive (vertical) strength of at least 200 psi. MSHA accepts a sampling methodology of nine cylindrical samples taken from standardized locations from each seal during the installation process. The samples, after curing for 28 days, are subjected to laboratory compressive forces to ensure a 200 psi convergent force tolerance. The evidence reflects that, when installed in 1993, the subject seals satisfied the 4 feet width requirement and significantly exceeded the 200 psi compressive strength requirement based on Alminco's sampling results. Although Wabash asserts the seals may have been poured to widths of as much as 4½ feet, the claim is self-serving and based on a purported general company policy without any documentation or company knowledge of the specific widths of the south seals. (Tr. 772-73).

The Secretary argues that a violation of section 75.333(h) exists because the seals do not currently have the requisite 20 psi horizontal strength because of either improper curing at the time of their installation, or, deterioration caused by compression from exposure to convergent forces. It is axiomatic that the Mine Act imposes on the Secretary the burden of proving the fact of occurrence of the cited violation by a preponderance of the evidence. *Garden Creek Poccahontas Co.*, 11 FMSHRC 2148, 2152 (Nov. 1989). The Commission has articulated that the Secretary satisfies her preponderance of the evidence burden by demonstrating "that it was more likely than not" that the cited violation occurred. *Enlow Fork Mining Company*, 19 FMSHRC 5, 13 (January 1997). The Secretary has not offered an objective quantitative test for determining the residual horizontal structural strength of an existing cementatious foam seal exposed to many years of underground stress. Thus, the Secretary has not presented direct evidence to support her case.

While the Secretary may satisfy her burden of proof by relying on reasonable inferences drawn from indirect (circumstantial) evidence, such inferences must be inherently reasonable and there must be a rational connection between the evidentiary facts and the ultimate fact to be inferred. *Garden Creek Pocahontas,* 11 FMSHRC at 2153 *citing Mid-Continent Resources, Inc.*, 6 FMSHRC at 1132, 1138. Here, the Secretary seeks to prevail on the ultimate fact to be inferred, *i.e.*, inadequate horizontal structural strength, based on inferences drawn from observations of the faces of the seals from the active side of the mine. The faces on the abandoned side of the seals are not accessible.

The parties draw conflicting inferences from the condition of the south seals. It is for the trier of fact to determine the more reasonable inferences and conclusions. *Sec'y of Labor on*

behalf of Jackson v. Mountain Top Trucking Co., 23 FMSHRC 1230, 1236 (Nov. 2001). Before addressing the inferences to be drawn, inspector Miller conceded that fundamental engineering principals dictate that structures must be designed with a margin of safety. (Tr. 121-24). Thus, when seal specifications require a minimum of four feet in width and at least 200 psi vertical strength to assure horizontal strength of at least 20 psi, reasonable departures from those specifications due to construction variations or deterioration are contemplated. In this regard, as Stephan explained, unlike concrete block, cementatious seals are "forgiving" in that they are designed to deform when subjected to convergent stress. Virtually all witnesses, including Miller, Stephan and Campoli, agree that as a general proposition, facial deterioration is an anticipated result of exposure to convergent stress, and that such deterioration does not necessarily establish a lack of structural integrity.

Alminco's sample results, not challenged by the Secretary, reflect the average compressive strength of the five south seals at installation was 392 psi. Stephan conceded increasing the vertical strength of a seal will increase its horizontal strength, although not in linear proportion. (Tr. 314). Thus, we begin with seals that significantly exceeded the minimum requirements for structural strength at the time they were installed in 1993, notwithstanding the margin of safety.

Turning to the Secretary's case, it is noteworthy that the "long history behind these seals" related by Miller evidences a history of indecision with respect to the functionality issue. (Tr. 102-03). The culmination of this "long history" resulted in Miller's issuance of Citation No. 7580994 on March 28, 2005, despite: no evidence of leakage to warrant the conclusion that the seals had been structurally compromised; Miller's admission that facial deterioration is a natural consequence of convergent stress; Miller's acknowledgment that he had "no way of knowing what's behind" the face of the seal; and the fact that the seals have retained there vertical tolerance despite being subjected to the weight of approximately 800 feet of overburden since 1993.

Significantly, Miller designated the cited violation in Citation No. 7580994 as non-S&S, purportedly because an explosion was unlikely because of a lack of methane and a lack of ignition sources. (Tr. 58). However, the likelihood of explosion and propagation, which are constant hazards in an underground mine, must be viewed in the context of continued mining operations. *U.S. Steel Mining Co., Inc.*, 6 FMSHRC 1573, 1574 (July 1984); *see also Halfway, Inc.*, 8 FMSHRC 8, 12 (January 1986). Yet the non-S&S designation represents the Secretary's contention that it was not reasonably likely that the alleged structurally compromised seals will result in an event; *i.e.*, an explosion and rupture of the seals, that will cause serious injury. *See U.S. Steel Mining Co.*, 6 FMSHRC 1834, 1836 (August 1984). Rather, a more plausible explanation for the non-S&S characterization is MSHA's inability to determine the likelihood of failure (the residual horizontal strength) of the south seals in the event they were subjected to an explosion.

It is noteworthy that Miller's issuance of Citation No. 7580994 on March 28, 2005, occurred six weeks before technical support personnel visited the mine. Thus, Miller did not have the benefit of technical support's opinions when the citation was issued. Consequently, the

observations and opinions of Eslinger and Stephan serve only to support MSHA's after-the-fact issuance of the citation rather than as a basis for Miller's action on March 28, 2005. This is the context in which Eslinger and Stephan's testimony must be viewed.

Miller's citation alleging that the seals no longer serve their intended purpose is not adequately supported by Eslinger or Stephan's testimony. Eslinger testified the primary way of knowing whether pumpable seals are sound is if proper sampling is performed during the installation process. As noted, proper sampling of the south seals was performed. It reflected an average compressive strength of 392 psi. Moreover, there is no evidence that the samples revealed any curing problems. Eslinger's testimony that "he thinks" the seals can no longer withstand 20 psi horizontal force based on his observations of facial deterioration fails to approach the Secretary's preponderance of evidence burden. (Tr. 218).

Stephan's testimony concerning the underlying basis for his assertion that the seals no longer serve their intended purpose is contradictory. Stephan contends the south seals had "no compressive strength" since they were installed in 1993 because of improper curing. (Tr. 315). Stephan also testified the seals are defective because of the degree of compression. Yet, Stephan concedes the purportedly improperly cured south seals, that allegedly lack compressive strength, do not leak despite their exposure to significant compressive forces for 12 years. (Tr. 363-64).

Moreover, Stephan's curing theory was challenged by Campoli who questioned how vertical surface cracks subjected to enormous convergent stress can maintain their integrity if the surrounding material was flawed due to improper curing. In addition, Stephan's opinion that the seals were structurally unsound is not supported by state inspectors Odle and McBride, as well as UMWA safety committeeman James Miller, who all opined that the seals were functional. As inspector Miller testified, without taking a drilling sample from the center of the seals, he had no way of determining structural integrity. (Tr. 120-21). Miller's testimony was echoed by state inspector McBride. (Tr. 492). In the final analysis, Stephan's belief that the south seals were improperly cured based on the degree of powdering he observed on the faces is based on conjecture.

With regard to compression, the evidentiary value of the degree of convergence described by Stephan is outweighed by the significant mine floor heaving that encapsulated the seals making it difficult to accurately determine the actual degree of compression. Stephan's testimony is further undermined by Trackemas' computer model that reflected that compression strengthens the horizontal resistance of a cementatious seal. In fact, Stephan admitted, consistent with Trackemas' findings, that convergence tightens the center of a seal while weakening the outer perimeter. (Tr. 336-37). The weakening of the outer perimeter occurs because cementatious seals are designed to "give" as a result of horizontal expansion due to vertical compression. As Campoli explained, while the effect of vertical compression alters the original dimensions of the seal with respect to height, it does not necessarily reduce the width of the seal because it causes expansion at the perimeter. Thus, surface deterioration does not establish that a seal no longer retains the required width. In this regard, Miller, Stephan and Campoli all agreed

that surface cracking and granular material are natural consequences of compression which, unlike concrete block, the cementatious seal was designed to withstand.

Thus, the evidence reflects that facial deterioration is not a reliable predictor of inadequate structural integrity. In this regard, at Lake Lynn, the continuing viability of seals that are exposed to a 20 psi explosive force is determined by whether there is leakage rather than the appearance of the exterior of the seal. (Tr. 359-60). In other words, testing for leakage after a seal is exposed to significant stress is the method of determining the seal's continuing effectiveness. It is the absence of leakage that is the central rub in the Secretary's case.

Moreover, Eslinger and Miller were considerably less sanguine than Stephan concerning their ability to predict the condition of the core of the seals based on limited exterior facial observations. Eslinger only "thought" the seals lacked the requisite horizontal strength and Miller conceded "he had no way of knowing what's behind" the facial deterioration. (Tr. 120-21, 218). State inspector McBride also testified that he did not believe the degree of resistance to explosive forces could be determined based solely on observations. (Tr. 486-87).

The futility of MSHA's attempt to evaluate the residual horizontal force tolerance of an existing seal based on observation is illustrated by Stephan's testimony. Stephan testified that, based on his observations, he concluded the south seals could not withstand more than 5 psi horizontal force. Stephan's opinion was based on comparing the condition of the seals to the post- explosion condition of failed seals he had seen during the course of his many years of investigating mine explosions. Stephan also testified that he compared the condition of the south seals to the condition of cementatious seals he had seen at the Lake Lynn testing facility that could only withstand 5 psi force. (Tr. 391-95). Stephan's asserted ability to confidently assess the residual horizontal strength of the south seals by comparing them to other seals he had previously observed that were constructed with different materials, and that were exposed to different conditions, is unpersuasive. Similarly, Stephan's vague assertion that he had observed similar curing problems at Lake Lynn on other cementatious seals that convinced him that the south seals had cured improperly is likewise entitled to little weight. (Tr. 296-97, 315).

While MSHA witnesses contend it is a matter of degree, their opinions are subjective and not amenable to objective quantitative analysis. Although subjective opinions can provide a basis for satisfying the burden of proof, in this case, in the absence of leakage, the opinions relied on by the Secretary are less convincing than the contrary opinions of Campoli, Trackemas and the State of Illinois mine inspectors.

As noted above, the Secretary has the burden of demonstrating that "it is more likely than not" that the south seals can no longer withstand a static horizontal force of 20 psi. *Enlow Fork Mining Company*, *supra*. The equivocal nature of the conditions observed at the south seals, and the absence of leakage despite longstanding exposure to significant stress, do not support the Secretary's inference that the seals' residual horizontal strength is inadequate. Thus, the Secretary has failed to satisfy her burden of proof. Consequently, 104(a) Citation No. 7580994 and 104(b) Order No. 7598049 issued as a result of Wabash's failure to abate the cited condition shall be vacated.

As a final matter, this decision should not be construed as trivializing the significant hazard posed by seals that no longer perform their intended functions. While I have considered the alternative of erring on the side of caution and affirming the citation, I decline to do so because it would alter the burden of proof and violate due process.

ORDER

In view of the above, **IT IS ORDERED** that Wabash Mine Holding Company's contest **IS GRANTED**.

IT IS FURTHER ORDERED that 104(a) Citation No. 7580994 and 104(b) Order No. 7598049 **ARE VACATED**.

Jerold Feldman
Administrative Law Judge

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