Memo

To: Sago Investigation File
From: Professor Patrick C. McGinley
CC: J. Davitt McAteer
Date: 7/10/2006
Re: MSHA 20 psi Seal Standard / Report of Investigation 7581

I. INTRODUCTION

This memorandum addresses an issue that has arisen in the course of the Sago Investigation. It relates to the MSHA regulatory standard applicable to seals constructed in the International Coal Group’s Sago Mine. Specifically, the memo will consider whether the present 20 psi regulatory standard is consistent with the “explosion proof” standard of the Federal Mine Safety and Health Act, 30 U.S.C. §863 (z).1 The MSHA regulatory standard states that abandoned areas of a mine must be either ventilated or isolated from active workings through the use of seals capable of withstanding a static horizontal pressure of 20 pounds per square inch (“psi”). 30 C.F.R. §75.335 (a) (2).2

1 Act of Dec. 30, 1969, P.L. 91-173, Title III, § 303, 83 Stat. 767. (hereafter “Mine Act” or “the Act”) Unlike the MSHA regulation, the Act itself does not identify a psi standard for mine seals. The Act states in relevant part:

“In the case of mines opened on or after the effective date of this title . . . the mining system shall be designed in accordance with a plan and revisions thereof approved by the Secretary and adopted by such operator so that, as each working section of the mine is abandoned, it can be isolated from the active workings of the mine with explosion-proof seals or bulkheads.” Id. (emphasis added).

2 30 C.F.R. §75.335 (a) (2) states in relevant part:

Alternative methods or materials may be used to create a seal if they can withstand a static horizontal pressure of 20 pounds per square inch provided the method of installation and the material used are approved in the ventilation plan. Seals are also used to isolate fire zones or areas susceptible to spontaneous combustion.
Part II of this memorandum will identify the law, regulations provisions and related legislative and regulatory history relevant to the 20 psi standard. Part III will summarize U.S. Bureau of Mines Report of Investigations 7581 upon which the 20 psi standard was based. Finally, in Part IV the memorandum will analyze Report 7581 to determine the extent to which it provides an adequate legal and factual basis for the adoption of the 20 psi standard of 30 C.F.R. §75.335 (a) (2).

II. LEGISLATIVE AND REGULATORY HISTORY OF 20 PSI STANDARD

In 1969 the Federal Coal Mine Health and Safety Act was enacted by Congress. Section 863(z) (2) and (3) of the law provide in relevant part that:

(2) Within nine months after the operative date of this subchapter, all areas from which pillars have been wholly or partially extracted and abandoned areas, as determined by the Secretary or his authorized representative, shall be ventilated . . . or be sealed, as determined by the Secretary or his authorized representative. . . . When sealing is required, such seals shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active workings of the mine.

(3) In the case of mines opened on or after the operative date of this subchapter . . . the mining system shall be designed . . . so that, as each working section of the mine is abandoned, it can be isolated from the active workings of the mine with explosion-proof seals or bulkheads. When sealing is required, such seals shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active workings of the mine.

30 U.S.C. 863 (z) (emphasis added).

The Conference Committee Report attendant the Act provides insight into the legislative intent underlying section 863:

Under the conference substitute, paragraph (2) of section 303(z) provides that, within 12 months after enactment, all areas from which pillars have been wholly or partially extracted, and abandoned areas, shall be ventilated by bleeder entries or by bleeder systems or by equivalent means or be sealed.

***

The determination of which method [sealing or ventilation] is appropriate and the safest at any mine is up to the Secretary or his inspector to make, after taking into consideration the conditions of the mine, particularly its history of

---

3 Report 7581 is titled: “Explosion-Proof Bulkheads: Present Practices” and will hereafter be referred to as “Report 7581” or “the Report.”
methane and other explosive gases. *The objective is that he require the means that will provide the greatest degree of safety in each case.*

When ventilation is required, the Secretary or his inspector must be satisfied that the ventilation in such areas will be maintained so as continuously to dilute, render harmless, and carry away methane and other explosive gases within such areas and to protect the active workings of the mine from hazards of such methane and other explosive gases. In other words, *he must be assured that such ventilation will be adequate to insure that no explosive concentrations of methane or other gases will be in this area.*

***

When sealing is required, such sealing shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active working of the mine.

Under the conference substitute, paragraph (3) of section 303(z) provides that, . . . the mining system shall be designed . . . so that, as each set of cross entries, room entries, or panel entries of the mine are abandoned, they can be isolated from active workings of the mine with explosion-proof bulkheads approved by the Secretary or his inspector. The managers expect the Secretary to take the lead in improving technology in this area of controlling methane accumulations in job areas and to improve upon this important section 303(z).4

Regulations implementing 30 U.S.C. § 863 were proposed on August 14, 1970 and final regulations were promulgated on November 20, 1970.5 The final regulation as promulgated in November, 1970, established construction standards for seals that would isolate the environment within the sealed area from the active mine workings:

75.329-2 . . . pending the development of specifications for explosion-proof seals or bulkheads, seals or bulkheads may be constructed of solid, substantial and incombustible materials sufficient to prevent an explosion that may occur on one side of the seal from propagating to the other side.6

In 1988 MSHA proposed to revise rules relating to coal mine ventilation including those relating to mine seals. In proposing these revisions MSHA stated that:

The proposed rule would *clarify, reorganize, and update the existing ventilation standards that were promulgated more than 15 years ago.*

---

6 30 C.F.R. §75.329-2. (*emphasis added.*)
Miner safety and health would be improved by providing standards for and encouraging the use of advances in ventilation technology.


In 1988 MSHA proposed to modify the then existing § 75.329-2, creating a new section --- § 75.335 --- which would provide specific requirements for the construction of seals, although no psi standard was mentioned.

---

MSHA also noted that:

Comments on the pre-proposal draft indicated some confusion over whether operators would be permitted or required to seal areas of a mine. This proposal would permit sealing in lieu of ventilating worked-out areas. It would also require sealing if results of air measurements indicate that the ventilation system is not effectively moving gases out of a worked-out area. For clarification, the option to seal worked-out areas where no pillars have been recovered is specified in paragraph (a) of this proposal.

53 F.R. 2382, at 2394 (January 27, 1988).

The proposed § 75.335 provided:

(a) Except as specified in paragraph (f) of this section, each seal shall be:

(1) Constructed of noncombustible material with mortar or equivalent fire-resistant material between all joints;
(2) Constructed in solid floor, roof, and ribs, and hitched at least one foot into the ribs; and
(3) Coated on all accessible surfaces with fire-resistant material that will minimize leakage.

(b) A sampling pipe or pipes shall be installed in each set of seals for a worked-out area. Each pipe shall:

(1) Extend into the sealed area for a sufficient distance to obtain a representative sample from behind the seal, but in no case shall pipes extend less than 15 feet into the sealed area;
(2) Be equipped with a cap or shut-off valve; and
(3) Be installed with the sampling end of the pipe approximately 12 inches from the roof.

(c)(1) A corrosion-resistant water pipe or pipes shall be installed in seals at the low points of the area being sealed and at all other locations necessary to drain water from sealed areas; and
(2) Water traps shall be installed on the outby side of the lowest point of each set of seals.

(d) Seals shall be at least 16 inches thick. When the thickness of the seal is less than 24 inches and the width is greater than 16 feet, a pilaster shall be interlocked near the center of the seal.
However, the final regulation, ″75.335 (a) (2),″ promulgated in 1992, contained the 20 psi standard:

(a) (2) Alternative methods or materials may be used to create a seal if they can withstand a static horizontal pressure of 20 pounds per square inch provided the method of installation and the material used is approved in the ventilation plan. If the alternative methods or materials include the use of timbers, the timbers also shall be coated on all accessible surfaces with flame-retardant material having a flame-spread index 25 or less, as tested under ASTM E162-87.9

The preamble to the final ″75.335 explained:

The final rule adopts 20 pounds per square inch gauge (psig) as the threshold for determining whether a seal is explosion proof. This threshold is based on the U.S. Bureau of Mines Report of Investigations No. 7581. According to that report, a seal or bulkhead may be considered explosion proof when its construction is adequate to withstand a static load of 20 psig if there is sufficient incombustible material on both sides of the seal to abate the explosion hazard. According to the Bureau's report, with adequate incombustible material and minimum coal dust accumulations, it is doubtful that pressures exceeding 20 psig could occur very far from the origin of the explosion. The construction requirements in the final rule provide seals that will withstand a static load of 20 psig.10

(e) When timbers are used to create a seal in heaving or caving areas, they shall be coated on all accessible surfaces with fire resistant material having a flame-spread index of not more than 25, as tested in accordance with ASTM E-162.

(f) Alternate construction methods or materials may be used if they provide at least equivalent protection and are specified in the ventilation plan.

MSHA stated that “[t]he purpose of seals includes preventing methane or other harmful gases in worked-out areas from escaping, and preventing air from being diverted into the worked-out area.” 53 FR at 2394.

9 __ FR __. The 1988 proposal did not mention or otherwise give public notice that MSHA was considering a psi standard and the preamble to the final regulation does not indicate that commenters suggested such a standard.
10 The preamble explained that:

In developing the final rule, MSHA conducted a series of tests with the U.S. Bureau of Mines to learn whether seals constructed according to the specifications would withstand a 20 psig explosion. In all cases where the seals were built in the manner required by the final rule, the seals withstood the pressure of a 20 psig explosion. Seals not correctly constructed sustained substantial damage or were destroyed. MSHA concludes that the requirements
As proposed, paragraph (a) (2) permits alternative methods to be used to create seals, as well as alternative materials. This provision allows the development of improved technology for seal construction. The final rule clarifies, however, that the alternative methods or materials may be used only if they can withstand a static horizontal pressure of 20 psig when installed. If the alternative seals can withstand this pressure, they will provide the same protection to miners as seals constructed as specified in the final rule. If alternatives are used, these methods or materials must be specified in the approved ventilation plan.

57 FR 20868, at 20887-20888.

Thus, it is clear that the 20 psi standard promulgated by MSHA in 1992 is based entirely upon U.S. Bureau of Mines 1971 Report of Investigations 7581. The findings and conclusions of Report 7581 will be summarized in Part III, infra. Part IV, infra, will analyze the Report to determine if which it provides an adequate legal and factual basis for the adoption of the 20 psi standard found in 30 C.F.R. §75.335 (a) (2).

III. SUMMARY OF FINDINGS AND CONCLUSIONS OF REPORT 7581

The scope of U.S. Bureau of Mines Report of Investigations 7581 was described by its author, D.W. Mitchell, as summarizing “experience and past research on methods for sealing abandoned areas of a coal mine and areas from which the pillars have been wholly or partially extracted.”

The Report contains several important caveats worth noting. It concedes that “much remains to be learned about isolating areas in a mine in which methane and other explosive gases have accumulated and that materials” and that “methods for constructing bulkheads are being reappraised.” Importantly, it asserts that the 20 psi seal standard was tentative “pending development of definitive specifications.” Finally, the Report acknowledges that while formulas for determining bulkhead dimensions had been established for static loads of 50 psi, “comparable formulas to withstand a static load of 20 psig have not been developed as yet.”

---

for seal construction in paragraph (a) are appropriate for providing a significant level of protection for miners in underground coal mines.

Id.

11 The seals used by IGC in the Sago Mine were made from an alternative material (“Omega Block”) approved by MSHA pursuant to 30 C.F.R. §75.335 (a) (2).

12 Report 7581 at 5. Moreover, Report 7581 also cautions that “[s]ealing may not protect men in active workings unless the means taken to control gas leakage are effective.” . . . “To protect men in active workings from gob-gas leakage, pressures within sealed areas must be relieved and gas-air exchanges must be controlled.” Id. at 3, 4 & 7-8. In addition to discussing resistance to bulkhead forces which this memo examines, sections of Report 7581 address “the hazard of gas leakage from sealed areas,” and “reducing the gas-leakage hazard,” issues
Report 7581 begins by paraphrasing §863(z) of the Mine Act:

[The Act] requires that such [abandoned] areas be ventilated or sealed with explosion proof bulkheads.\(^{13}\)

Following its identification of the statutory basis for regulation of seals placed in abandoned areas of coal mines, the Report’s introduction briefly describes past practices and research relating to coal mine seals. Sealing unused and abandoned areas, the Report states “was a common practice in coal mines prior to World War II” but apparently that practice was generally abandoned.\(^{14}\) “The few seals (bulkheads) since built were principally in areas having a potential for spontaneous combustion.”\(^{15}\)

Because few seals had been built in the post WW II era, the Report’s introduction discusses conclusions reached by “European miners [who] have had much experience building seals (bulkheads) for control of active fires and spontaneous combustion.”\(^{16}\)

Apparently, these European seal building efforts were often unsuccessful in limiting injuries and deaths. The Report states that “[d]isasters, during construction and subsequently because of improper placement, led to major reappraisals by German and British commissions and then to extensive research, particularly since 1967” which are summarized in the text of Report 7581.\(^{17}\)

The Report’s introduction concludes with the observation that “on-going research and development” at that time (1971) was incomplete and that pending completion “present rules which are not the subject of the memorandum. However, it is worth mentioning that current MSHA regulations to not address these issues, although Report 7581 deems them crucial to mine seal protection strategy.

\(^{13}\) Report 7581 at 1. Section 863(z) uses mandatory language:

When sealing is required, such seals shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active workings of the mine.

\(^{14}\) For this proposition the report cited a 1936 publication, W.J. Montgomery, Theory and Practice of Mine Ventilation. (The Jeffrey manufacturing Co., Columbus, Ohio), at 109; and Section 109 of Pennsylvania’s 1961 Bituminous Coal Mining Law for Underground Mines. Report at 1.


\(^{16}\) Report 7581 at ___.

\(^{17}\) Report 7581’s references contain citations to three post-1967 German publications and only one tangentially relevant British report. See Report at ___ and accompanying text.
for bulkhead construction must be followed.” 18 Report 7581 acknowledged that the present rules require that bulkheads be constructed of solid, substantial, and incombustible materials in such a way as to prevent an explosion which may occur in the atmosphere on one side from propagating to the atmosphere on the other side.” 19

Following the introduction is a section titled “resistance of bulkheads to explosion forces.” 20 The text of Report 7581 addresses issues most pertinent to the Act’s mandate that seals constructed in abandoned mine areas be “explosion-proof.” The lead sentence to the section acknowledges the statutory mandate that seals be “explosion-proof,” but then dilutes the unambiguous “explosion proof” mandate with the conclusory statement that:

“[n]o one . . . can foretell what forces would be exerted on a bulkhead in the event of an explosion.” 21

In support of its’ assertion that the level of force caused by an explosion in the abandoned area of a coal mine cannot be foretold, the Report gives examples of “propagating explosions” in the Bureau of Mines’ Experimental Mine:

. . . propagating explosions have developed from 1 to 127 psig, and in a few trials pressure piling caused higher, unrecordable pressures, and considerable damage. 22

This assertion is not supported by reference to any authority, nor is the subsequent statement that:

Seldom, however, do pressures 200 feet and more from the origin of an explosion exceed 20 psig unless coal dust accumulations are excessive and the incombustible content of the dust is less than required by law. 23

---

18 Report 7581 at 2. Bredenbruch, E., Bekämpfung von Grubenbranden (Fighting Mine Fires). Gluckauf, v. 90, July 17, 1954, at 769-779. Oddly, this citation following this admonition that “present rules” be followed is to a German language publication.
20 Report 7581 at 2-3. The assertion that “no one can foretell what forces would be exerted on a bulkhead in the event of an explosion,” is not supported by any authority or reference to research studies.
21 Id. at 2.
22 Id.
23 Id. The Report’s statement that explosion generated pressures seldom exceed 20 psi 200 or more feet from a point of ignition seems to be in irreconcilable conflict contradicts its assertion that “no one can foretell what forces would be exerted on a bulkhead in the event of an explosion.”
Having begun with the assertion that it is impossible to predict the forces generated by an explosion, the Report implies that, historically, without such predictability the “explosion proof” standard had been based upon a “consensus” of experts.24

In light of the Reports’ assertion of the unpredictability of explosion pressures that might be generated in a coal mine ignition, the Report looks to what was (in 1971) a forty year old Bureau of Mines Bulletin for a definition of “explosion proof” as the term is used in §863(z) of the Act. Report 7581 relies on the 1931 study for the proposition that the term “explosion proof” “has been a consensus interpretation.”25 Interestingly, Report 7581 gives a 1921 federal regulation for mine seals as an example of such consensus.26 That federal regulation required that coal mine stoppings withstand a pressure of 50 psig.27 That 50 psi regulation, Report 7585 states, was “based on the general opinion of men experienced in mine-explosion investigations.”

The Report, also, recognizes that research over a three decade period had led Commissions in the United Kingdom to conclude that “pressures of 20 to 50 psig may develop” and that “...it is desirable in designing explosion-proof bulkheads to assume such pressures.”29 The Report acknowledged that the British Commissions were of the opinion that . . . the figure of 50 psig

---

24While it may be true that the outer limits of the pressure generated by a coal mine explosion cannot be identified within one hundred percent accuracy, such an observation surely cannot be interpreted to mean that it is impossible to calculate with reasonable specificity the limits of forces seals can be designed to withstand.


27 Id. citing, U .S. Interior Dept., “Operating Regulations to Govern Coal Mining Methods and the Safety and Welfare of Miners on Leased Lands on the Public Domain.” §104 (Apr. 30, 1921). Interestingly, the 1921 federal regulation required “stoppings” rather than seals/bulkheads to meet a 50 psig standard. It is not clear if the 1921 regulation’s reference to “stoppings” recognized the modern distinction between “stoppings” which are used to manipulate the direction of air flow in a coal mine ventilation system and “seals” which are used to isolate abandoned mine sections from active mining areas. In any event, Report 7581 does not explain why the 1921 regulatory standard of 50 psig was not considered by the Reports’ author for application to modern underground coal mining fifty years later.

28 Id.

gives a good margin of safety in practice.” The Report further relates that groups in Poland and Germany had established that bulkheads should withstand at least 72 psig. Report 7581 identifies 72 psig as “the upper limit of static pressure reached by an explosion of moderate strength.”

Protection of Sealed Areas

Report 7581 indicates that in 1914 the very first studies were undertaken by the United States Bureau of Mines (“BOM”) to determine how to protect sealed areas from explosions propagating from active mining areas. Subsequently, 1930 BOM studies resulted in the design of concrete bulkheads which are described in Report 7581’s appendix 11; these bulkheads withstood 50 psig and failed at 55 psig explosion in trials that developed impulses of more than 200 psi-seconds. Comparable bulkheads withstood more than 140 psig when impulses were less than 50 psi-seconds.

The most recent studies of protection of sealed areas were those in 1968 and 1969. Those studies addressed development of bulkheads for mines in the United Kingdom and in the Ruhr and Saar districts of Germany. They described gypsum bulkheads which withstood 215 psig and failed at 260 psig in explosion trials that developed impulses of up to 100 psi-seconds.

---

30 Id.
33 Id., citing, G.S Rice, H.P. Greenwald, H.C. Howarth, and S. Arins, “Concrete Stoppings in Coal Mines for Resisting Explosions: Detailed Tests of Typical Stoppings andStrength of Coal as a Buttress,” supra at note ____.
35 M. Genthe, “Untersuchungen und Versuche zur Frage der Explosionssicherheit von Vordammen bei der Grubenbrandbekampfung” (Research on Explosion-Proof Bulkheads for Mine Fire Control). Gluckauf, G.m.b.h, Essen, Germany (1968); A. Steffenhagen, A. Meerbach, D. Fischer, “Explosionversuche mit Sperren und Dammen” (Explosion Research
Report 7581 contrasts these results with a study wherein an 8-inch-thick bulkhead made of solid concrete blocks laid in mortar and recessed into the ribs, roof, and floor withstood at best an explosion pressure of 5 psig.\(^\text{36}\) Other contrasting studies identified in Report 7581 examined a 22-foot-long seal of rock and dust that could be collapsed by an explosion developing 20 to 30 psig and an 18-inch-thick seal of brick laid in mortar and recessed into the ribs which also failed to withstand an explosion developing 20 to 30 psig.\(^\text{37}\)

Report 7581 then observed that:

Analysis of research in this and other countries indicates that a bulk-head designed to withstand a given static load will have a considerable margin for safety should it be subjected to a greater dynamic load.\(^\text{38}\)

The only examples of such research given in the Report are then “present trials in the Experimental Mine” for which no references were given. Those trials were stated as involving “a bulkhead designed to withstand a static load of 14 psig withstood 27 explosions developing from 5 to 50 psig” and “50 psig was the highest pressure developed in these trials.”\(^\text{39}\)

Analysis indicates, Report 7581 asserted:

that an explosion pulse of high pressure and short duration would be less destructive than one in which the pressure is lower but continuously rising. High pressure of short duration could develop should the explosion involve a large body of methane. The duration might be increased and a continuously rising pressure could be developed should flame propagate into a belt entry or to where float coal overlies rock-dusted surfaces.\(^\text{40}\)

---


\(^\text{38}\) Report 7581 at 3.

\(^\text{39}\) Id.

In concluding the section of Report 7581 subtitled “Resistance Of Bulkheads To Explosion Forces” it observed that: *From the above it follows that a bulkhead may be considered “explosion proof” when its’ construction is adequate to withstand a static load of 20 psig.*

Report 7581 then addresses “the hazard of gas leakage from sealed areas,” and “reducing the gas leaking hazard.” The Report observes that “sealing may not protect men in active workings unless means are taken to control gas leakage” and that “pressures within sealed areas must be relieved and gas–air exchanges must be controlled.”

The final section of Report 7581 outlines approaches to construction of airtight bulkheads (seals) including discussions of bulkhead dimensions, materials and water bulkheads. This discussion includes the admonition that the thickness of air-tight bulkheads will depend on formulas set forth in Table 1 of the Report. Interestingly, these formulas are based on the assumption that “[t]he bulkhead should resist [a] static load of 50 psig acting in the direction of the axis of the entry . . . .” Moreover, the Report also states that “[c]omparable formulas to withstand a static load of 20 psig have not yet been developed as yet.”

Report 7581 ends with a “concluding statement.” That statement concedes that “[m]uch remains to be learned about isolating areas in a mine in which methane and other dangerous gases have accumulated” and repeats the observation made in the introduction that “no one can foretell what forces might be exerted on bulkheads in the event of an explosion.” “Therefore,” says the Report, “present studies are directed toward preventing flames from propagating into sealed areas and toward minimizing gas flows into the paths of the flame.”

---

41 *Id., (emphasis added), citing,* G.S. Rice, L. M. Jones, W. L. Egy, H. P. Greenwald, “Coal-Dust Explosion Tests in the Experimental Mine, 1913 to 1918, Inclusive.” U.S. Bureau of Mines Bull. 167, (1922). This conclusion is tempered by a proviso: “that the area to be sealed contains sufficient incombustible to abate the explosion hazard in that area and that adequate incombustible is maintained in the adjoining open passageways. Should the area to be sealed be inaccessible or unsafe to enter then rock-dust or water-trough barriers on both sides of the bulkhead would prevent propagation of a coal-dust explosion from one side to the other.”

42 *Id., at 3.*

43 *Id.* at 3-5.

44 *Id.* at 4-7.

45 *Id.* at 5.

46 *Id.* at 5. The formulas also assume that “future ground movements should not be excessive.” The formulas are applicable to such bulkhead materials such as concrete, gypsum, rock/cement grout, sandbags/steel reinforcement and loose rock with dust or sand.

47 *Id.*

48 *Id.* at 7-8.

49 *Id.* at 7. These statements suggest that the focus of BOM research at the time Report 7581 was published was on fire suppression rather than identifying seal strength sufficient to satisfy the Mine Act’s “explosion proof” requirement.
The Report’s conclusion indicates that “materials and methods for constructing bulkheads” were being “reappraised.”50 However, the Report admonished that:

Pending development of definitive specifications, bulkheads may be considered "explosion proof" when they withstand a static load of 20 psig provided that the area to be sealed contains sufficient incombustible to abate the explosion hazard in that area and adequate incombustible is maintained in the adjoining open passageways.51

IV. ANALYSIS OF § 863 & 30 C.F.R. § 75.335’s MINE SEAL REQUIREMENT

Subsequent to the January 2, 2006 mine explosion at International Coal Group’s Sago Mine located near Buckhannon, West Virginia, the question arose as to whether the 20 psi standard found in 30 C.F.R. § 75.335 (a) (2) is adequate to protect the health and safety of miners in the event of a coal mine explosion consistent with the mandate of the Federal Coal Mine Health and Safety Act of 1969, 30 U.S.C § 863 (z).

Obviously, there was a failure of the seals constructed in the Sago Mine to isolate an abandoned area from active workings. Federal and State inspectors entering the mine subsequent to the explosion found many of the seals to have been destroyed by the blast. Sago investigators are exploring related issues such as whether the seals were constructed properly and in accordance with both government regulations and manufacturers’ specifications and whether the alternative materials (“Omega Blocks”) used were adequate to meet the 20 psi regulatory standard. Notwithstanding the investigations’ probe into these related issues, the

50 Id. at 7-8. The Report noted that: “[i]nvestigations indicate that in many instances bulkheads will be built where movement of equipment and supplies could be difficult.” Thus, said the Report, “present studies were concerned principally with techniques that require limited preparation of the site, minimal construction of forms, and pipeline transport of materials that swell during hardening to optimize the air-tightness of the bulkhead.”

51 Id. at 8. The Report’s conclusion ended with the following statement;

Should the area to be sealed be inaccessible or unsafe to enter, then rock-dust or water-trough barriers . . . should be on both sides of each bulkhead. . . . To isolate sealed areas from the active workings, pressures within sealed areas must be relieved; gas-air exchanges between sealed and open portions of a mine must be controlled; and gas leakage from sealed areas must be directed into the main return air courses, preferably through a bleeder entry. Further, sealed areas should not adjoin intake air courses. If they must, then the atmosphere in the intake air should be monitored continuously by a system that gives warning should harmful gases be detected or by other suitable means that protect the health and safety of the men in the mine. The dangers of gas leakage also can be averted by using mining plans that leave small gob areas surrounded by competent pillars.

Id.
underlying question of the appropriateness of the 20 psi standard itself is important and must be resolved by investigators.

There are several levels of legal analysis that are appropriate to pursue. First, it must be determined whether the regulatory standard is consistent with the mandate of the enabling statute; and second, whether the factual basis for MSHA’s adoption of the 20 psi standard is arbitrary, capricious or otherwise not in accordance with law. Resolution of each of these issues is governed by the federal Administrative Procedure Act, 5 U.S.C. § 706 (2) (a) and relevant case law.

**20 psi Standard’s Consistency with 1969 Mine Safety and Health Act**

When analyzing a federal agency interpretation of its’ enabling statute courts and agencies are bound to adhere to the principle first delineated by the Supreme Court of the United States in *Chevron v. N.R.D.C.,* 467 U.S. 837, at 842-843 (1984). *Chevron* instructed that “[w]hen a court reviews an agency's construction of the statute which it administers, it is confronted with two questions. First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress.”

Section 863 (z) of the MSHA of 1969 contains a mandatory, not a discretionary standard, by which MSHA is to determine the adequacy of mine seals:

> When sealing is required, such seals shall be made in an approved manner so as to isolate with explosion-proof bulkheads such areas from the active workings of the mine.

The legislative history of the Mine Act makes clear that § 863 (z)’s mandate of “explosion-proof” mine seals is intended to provide coal miners a very high level of protection from explosions:

> Under the conference substitute, paragraph (2) of section 303(z) provides that, . . . abandoned areas, shall be ventilated . . . or be sealed. . . . The determination of which method is appropriate and the safest at any mine is up to the Secretary or his inspector to make, after taking into consideration the conditions of the mine,

---

52 *Chevron* also described the process for determining whether an agency’s interpretation of an ambiguous statute should be upheld by the courts:

> If, however, the court determines Congress has not directly addressed the precise question at issue, the court does not simply impose its own construction on the statute, as would be necessary in the absence of an administrative interpretation. Rather, if the statute is silent or ambiguous with respect to the specific issue, the question for the court is whether the agency's answer is based on a permissable construction of the statute.
particularly its history of methane and other explosive gases. The objective is that he require the means that will provide the greatest degree of safety in each case.53

Thus, whether MSHA required an abandoned area to be ventilated or sealed, the protection afforded the miner was that which will provide the greatest degree of safety.

As set forth above, MSHA’s 20 psi seal standard was based entirely on Report 7581.54 Report 7581, however, did not construe the statutory mandate that seals be “explosion proof” to provide the greatest degree of safety for the coal miner. Rather, Report 7581 concedes that “[t]he federal coal mine health and safety act of 1969 requires that bulkheads be explosion proof,” but then opines that “[n]o one . . . can foretell what forces would be exerted on a bulkhead in the event of an explosion.”55 Instead of interpreting the unambiguous mandatory language of the statute --- “explosion-proof” --- as one intended to provide a very high level of safety, the Report relies upon an “historic” interpretation of “explosion-proof” gleaned from a 1931 U.S. Bureau of Mines publication.56

Report 7581 purports to rely upon a historic consensus of definition of “explosion proof” derived from “general opinion of men experienced in mine explosion investigations.”57 However, the Report subsequently documents the lack of a consensus regarding the appropriate standard necessary to create “explosion-proof” seals. For example, the Report identifies a wide range of seal standards adopted between 1921 and 1971. In 1921 the United States government regulation established a seal standard of 50 psi for coal mines located on government lands. The Report reveals that Commissions in the United Kingdom in 1933 and 1960 “reported that it is desirable in designing explosion proof bulkheads to assume that pressures of 20 to 50 psig may develop . . . and that the figure of 50 psig gives a good margin of safety.” Report 7581 also observes that Poland and German experts had “decided that bulkheads should withstand at least 72 psig . . . .”58 Report 7581 further relates that a number of experiments over decades had shown that seals could be constructed to withstand pressures of 50, 140, and 215 psig.59

Report 7581’s statement that “explosion proof” was a term as to which experts had historically come to a consensus interpretation is rebutted by its own subsequent examples of a variety of standards at which experts had found seals to withstand explosions at various pressure levels.

54 57 FR 20868, at 20887.
55 Report 7581 at 2.
57 Report at 2, citing, G.S Rice, et al., supra, note 45.
58 All of the examples discussed in this paragraph are found in Report 7581 at page 2.
59 Id.
The Report’s conclusory statement that “from the above it follows that a bulkhead may be considered ‘explosion proof’ when its construction is adequate to withstand a static load of 20 psig” is internally inconsistent with the specific examples contained in the Report itself.

The 20 psi standard in 30 C.F.R. § 75.335 must be consistent with the 1969 Acts’ mandate that only “explosion proof” seals be constructed to isolate explosive gases in abandoned areas from active mine work places. Notwithstanding Report 7581’s assertion that “explosion proof” is a historic standard based on a consensus of mining experts, the applicable standard is the clear and unambiguous language of the statute. See *Chevron v. N.R.D.C.*, 467 U.S. 837, at 842-843 (1984).60

That Report 7581 asserts “[n]o one can foretell what forces might be exerted on bulkheads in the event of an explosion . . . .” does not render the statutory mandate of “explosion proof” ambiguous. On the contrary, an “explosion proof” seal is one which will not allow an explosion of methane gas in a sealed area to break through (propagate) into an active mining area (or vice versa).

That one cannot foresee the highest possible pressure that a mine explosion might generate has no bearing on the standard that will, in the words of the Conference Committee Report, “provide the greatest degree of safety” for coal miners. Rather, it is reasonable to assume that a regulatory agency, charged with providing such a high level of safety, would comply with the statutory mandate of requiring “explosion proof” seals that can withstand explosive pressures that are foreseeable.

The research mentioned in Report 7581 indicates that seals that can withstand pressures greater than 20 psi can be constructed and that coal mines in other countries are required to meet much higher standards. German, Polish and British mine explosion experts identified a need for seals that would withstand from 50 to 72 psi because explosive forces at such levels in a coal mine are foreseeable. At a minimum, the statutory “explosion proof” requirement to provide the greatest degree of safety for coal miners mandates the construction of seals that will withstand foreseeable pressures.61

---

60 As quoted above, Chevron requires that “when a court reviews an agency’s construction of the statute which it administers, it is confronted with two questions. First, always, is the question whether Congress has directly spoken to the precise question at issue. If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress.” Chevron, 467 U.S. at 842-843.

61 Moreover, assuming the Sago mine seals were constructed according to specifications and thus met the regulatory 20 psi standard of 30 C.F.R. §75.335, the fact that the Sago explosion obliterated the seals leads, a fortiori, to the conclusion that the 20 psi standard is insufficient to implement the statutory “explosion proof” mandate of the Mine Act.
In sum, it is apparent that the 20 psi standard of 30 C.F.R. §75.335 is inconsistent with the unambiguous statutory mandate of the Mine Act that coal mine seals be “explosion proof.” When construed in accordance with the Supreme Court’s instruction in *Chevron v. N.R.D.C.*, it is clear that MSHA’s regulation failed to “give effect to the unambiguously expressed intent of Congress.” See, 467 U.S.837, 842, 843.

**Analysis of 30 C.F.R. §75.335 (A) (2)’S 20 Psi Standard Factual Basis**

The federal Administrative Procedure Act requires reviewing court’s to hold unlawful and set aside agency rules and regulations found to be “arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.” 5 U.S.C. §706 (2) (A). The most definitive description of the so-called “arbitrary and capricious test is found in the Supreme Court’s opinion in *Motor Vehicle Manufacturer’s Association v. State Farm Mutual Automobile Co.*:

> The scope of review under the “arbitrary and capricious” standard is narrow and a court is not to substitute its judgment for that of the agency. Nevertheless, the agency must examine the relevant data and articulate a satisfactory explanation for its action including a “rational connection between the facts found and the choice made.” In reviewing that explanation, we must “consider whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.” Normally, an agency rule would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.62

The following discussion analyzes the regulatory 20 psi standard of 30 C.F.R. §75.335 using the standard of review of agency rulemaking factual findings of *Motor Vehicle Manufacturer’s Association v. State Farm.*

**Rational Connection Between The Facts Found And The Choice Made.**

*Motor Vehicle Manufacturer’s Association* indicates that “the agency must examine the relevant data and articulate a satisfactory explanation for its action including a “rational connection between the facts found and the choice made.”

In the case of the 20 psi standard, MSHA’s explanation for choosing 20 psi as opposed to a lower or higher standard might be found in the preamble to the 1992 revised ventilation regulations and/or in Report 7581 (to the extent that the agency indicated its adoption of the reasoning contained therein).

---

The preamble to the final rule, ' 75.335 explained:

The final rule adopts 20 pounds per square inch gauge (psig) as the threshold for determining whether a seal is explosion proof. This threshold is based on the U.S. Bureau of Mines Report of Investigations No. 7581. According to that report, a seal or bulkhead may be considered explosion proof when its construction is adequate to withstand a static load of 20 psig if there is sufficient incombustible material on both sides of the seal to abate the explosion hazard. According to the Bureau's report, with adequate incombustible material and minimum coal dust accumulations, it is doubtful that pressures exceeding 20 psig could occur very far from the origin of the explosion. The construction requirements in the final rule provide seals that will withstand a static load of 20 psig.63

The preamble further explained that:

In developing the final rule, MSHA conducted a series of tests with the U.S. Bureau of Mines to learn whether seals constructed according to the specifications would withstand a 20 psig explosion. In all cases where the seals were built in the manner required by the final rule, the seals withstood the pressure of a 20 psig explosion. Seals not correctly constructed sustained substantial damage or were destroyed. MSHA concludes that the requirements for seal construction in paragraph (a) are appropriate for providing a significant level of protection for miners in underground coal mines.64

First, the explanation quoted immediately above to the effect that MSHA conducted tests with the Bureau of Mines “to learn whether seals constructed according to the specifications would withstand a 20 psig explosion,” begs the question of whether there is a rational connection between the fact that seals were constructed according to specifications and withstood 20 psi pressure and the conclusion that a 20 psi standard makes all mine seals constructed to withstand such pressure “explosion proof” as the Mine Act requires. At most, the tests show that seals built to withstand a 20 psi explosion will, in fact, withstand such explosive pressures.

The tests do not indicate that seals so constructed will withstand explosive pressures in excess of 20 psi or whether pressures above 20 psi might reasonably be expected as a consequence of coal mine explosions. However, Report 7581 itself documents that higher psi pressures can reasonably be expected in coal mines and that regulators in other countries as well as the U.S. have required seals to withstand much greater forces. Thus, it is impossible to conclude that MSHA’s tests with the Bureau of Mines provide a “rational connection between the facts found and the choice made.”

63 57 FR 20868, at 20887-20888. (emphasis added). Neither the MSHA preamble nor Report 7581 provides any or data to support the conclusory factual finding that it is doubtful that pressures exceeding 20 psig could occur very far from the origin of an explosion.

64 Id.
Next, MSHA’s explanation that its’ adoption of the 20 psi standard “as the threshold for determining whether a seal is explosion proof . . . is based on . . . Report of Investigations No. 7581 simply makes clear that the 20 psi rule must stand or fall on the findings and conclusions of the Report. Indeed, MSHA’s explanation is very specific in so identifying the Report:

According to that report, a seal or bulkhead may be considered explosion proof when its construction is adequate to withstand a static load of 20 psig if there is sufficient incombustible material on both sides of the seal to abate the explosion hazard.65

As explained in the first section of Part IV of this memorandum, Report 7581 used an interpretation of “explosion proof” grounded in an asserted historic “consensus” of mine explosion experts. However, the Report’s assertion of a “consensus” is definitively rebutted by other findings contained therein indicating the lack of any consensus as to what standard is necessary to insure that coal mine seals will be “explosion proof.” Moreover, the Report’s reliance on the assertion that “[n]o one . . . can foretell what forces would be exerted on a bulkhead in the event of an explosion . . .” without any analysis or discussion of what level of explosive pressure could be “foretold” strongly suggests that the 20 psi standard ignored perhaps the most relevant factor to be considered in establishing a psi standard --- the level of force that can be reasonably expected in coal mine explosions.

Identifying the level of foreseeable explosive pressure is consistent with the Mine Act’s legislative history that indicates mine seals must provide the “greatest degree of safety.”66 In reviewing that explanation, it must be considered “whether the decision was based on a consideration of the relevant factors and whether there has been a clear error of judgment.” As Motor Vehicle Manufacturer’s Association, supra., also explains, “[n]ormally, an agency rule would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.”

MSHA’s adoption of the 20 psi standard relied upon Report 7581 which was guided by a historic consensus rather than the very high standard of safety intended by the Mine Act’s “explosion proof” mandate --- thus relying on factors Congress did not intend for the agency to consider and ignoring foreseeable explosion pressures that its own research identified. The explanation offered by the agency --- that it relied exclusively on Report 7581 --- ignored the contradictory evidence in the report itself that explosion proof seals could be constructed to withstand foreseeable explosive pressures. Finally, MSHA’s meager explanation for choosing the 20 psi standard is totally implausible, given the fact that stronger seals have been designed to withstand foreseeable mine explosion pressures substantially in excess of 20 psig.

65 Id.
66 See discussion at note ____ and accompanying text.