REPORT OF

THE ROYAL COMMISSION

Appointed to Inquire into the

Explosion and Fire in No. 4 Mine at Springhill, N. S.

On the 1st Day of November, 1956

HALIFAX, N. S.
Queen's Printer
1957

In the matter of the explosion and fire in No. 4 Mine at Springhill, Nova Scotia, which occurred on the 1st day of November, 1956.

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REPORT

of the

ROYAL COMMISSION

APPOINTED UNDER THE
PUBLIC INQUIRIES ACT

DONALD McINNES
G. A. VISSAC
F. E. GRIFFITH

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TERMS OF REFERENCE

PROVINCE OF
NOVA SCOTIA

BY HIS HONOUR THE HONOURABLE
ALISTAIR FRASER, M.C., Q.C., LL.D.,
LIEUTENANT GOVERNOR, OF
NOVA SCOTIA.

To: Donald McInnes, Q.C., Halifax, County of Halifax;
G. A. Vissac, Montreal, Province of Quebec;
J. E. Griffith, Pittsburg, State of Pennsylvania, United States of America.

GREETING:

WHEREAS it is deemed expedient to cause inquiry to be made into and concerning the public matters hereinafter mentioned in relation to which the Legislature of Nova Scotia may make laws;

NOW KNOW YE that I have thought fit, by and with the advice of the Executive Council of Nova Scotia, to appoint and do hereby appoint you, the said Donald McInnes, Q.C., G. A. Vissac and F. E. Griffith, to be during pleasure a Commission in this behalf under the provisions of Chapter 236 of the Revised Statutes, 1954, the Public Inquiries Act, the first named to be Chairman, to inquire into and concerning the following public matters:

1. The explosion and fire in No. 4 Mine at Springhill in the County of Cumberland, operated by Cumberland Railway and Coal Company, on the first day of November, 1956 and all matters and things related thereto;

2. Whether there was any defect in or about the mine or the modes of working the mine which caused or contributed to the explosion;

3. Whether there was compliance with the provisions of the Coal Mines Regulation Act and any general or special rules applicable to the working of the mine;

And to make such recommendations as you deem proper respecting such matters.

And to report thereon to the Lieutenant Governor.

GIVEN under my Hand and Seal at Arms at Halifax, this 10th day of January, in the year of Our Lord one thousand nine hundred and fifty-seven and in the fifth year of Her Majesty's reign.

BY COMMAND: (Sgd.) G. I. Smith,
Provincial Secretary

II. FOREWORD

The Commissioners appointed under the provisions of the Public Inquiries Act, Chapter 236 of the Revised Statutes of Nova Scotia, 1954, now beg leave to report as follows:

We have held public hearings at Springhill in the County of Cumberland, Province of Nova Scotia, from the 11th day of February, 1957 to the 15th day of February, 1957 and as well from the 16th day of June, 1957 to the 18th day of June, 1957. The hearings were adjourned until the month of June to permit an examination of the mine. Prior to that time access to the workings and place of explosion could not be obtained. It was thought desirable to have statements under oath as to the appearance of the mine and factual evidence to determine what had occurred. We have examined fifty-six witnesses and considered eighty-five exhibits. Recommendations were submitted to the Commission which deal with further steps that might be taken for safety in the mines, by the officials of the Department of Mines, Officers of District No. 26 United Mine Workers of America, and by Mr. H. C. M. Gordon, General Manager of the Dominion Coal Company Limited. We have considered also the recommendations of Overman Conrad Embree who was one of the survivors of the disaster and who displayed great qualities of leadership during the trying days which enabled the survival of a number of the men who were entombed.

The witnesses who have been examined represented the Dominion Coal Company Limited, the Cumberland Railway & Coal Company Limited, District No. 26 United Mine Workers of America and the miners, and as well departmental officials of the Department of Mines. Every assistance was given to ascertain the facts giving rise to the explosion and subsequent events.

From the evidence we have heard, and from our examination of the exhibits and as well the mine itself, we believe that we have sufficient information to enable us to report fairly, and in accordance with the terms of reference. The hearings were attended by a great many people who were anxious to hear testimony bearing on the events which occurred. The attitude of the public at large was at all times helpful and cooperative.

We would like to express our appreciation of the services of Mr. T. A. Giles, Commission Counsel. His preparation of the case was ably done and we consider that all the evidence that could be usefully given was submitted to the Commission. We would like also to express our appreciation of the able assistance given by the reporter, Mrs. F. A. Swetman, who took all the evidence. The Springhill District of the Canadian Legion, B.E.S.L. made available its building and facilities at Springhill

and such facilities added materially to the conducting of the proceedings.

The manner in which the whole of the community of Springhill met this disaster is a matter of particular comment. The great courage and fortitude which was made manifest during the time of the disaster won the admiration of all Canadians. The whole of the community shared in the united effort that was put forward to save the men who were below ground. For a long period of time it was not known what number, if any, were alive. The Commission wishes to refer to the efforts made by the mine rescue teams, the bare-faced miners and as well the great display of leadership and resourcefulness that was shown by the officials of the Company, the Department of Mines and the Union officials. The courage and bravery shown by so many during the disaster and following days is a matter of great pride to everyone who knows what took place. At no time was there any dissension as to what steps should be taken in the work of rescue and the efforts of all were united.

We wish to refer to the leadership given by members of the clergy of all faiths, and to the professional skill of physicians, nurses, and to comment on the help of many others who assisted in the rescue and comfort of men employed in the rescue work during the critical days. The fact that so many were saved was wonderful and is in itself the greatest tribute that can be paid to all those persons whose skill and bravery will forever be remembered.

The Commission wishes to express its deepest sympathy to the wives and families of the men who were lost. The Commission considers that every effort was made by all those who took part in the rescue work to make sure that everything was done to save as many men as possible.

The Order-in--Council requires the Commission to make answers to the several specific questions:

(a) Whether there was any defect in or about the mine or the modes of working the mine which caused or contributed to the explosion.

In this respect we find:

(i) the dangerous location of the power cable was known to the Mines Department and Company officials for some time prior to the explosion;

(ii) the mine cars were coupled in such a manner that on occasions they broke loose and thereby gave rise to a dangerous situation;

(b) Whether there was compliance with the provisions of the Coal Mines Regulation Act and any general or specific rules applicable to the working of the mine.

In this respect we find:

There was not complete or strict compliance with the provisions of the Coal Mines Regulation Act.. Attention is directed to the following matters:

(i) Reports were not always completed in compliance with the Statute. (See Minutes of Evidence Vol. III—Pages 280, 282, 287, 290, 291 and 298);

(ii) The Mine was worked when the methane content in the atmosphere was greater than the permissible limit set forth in the Statute. Section 83 (2) Rule 9. (See Table of Air Analysis Appendix "B".)

The Commission considers that there was no single or particular defect in the working of the mine or any particular failure to comply with any regulation of the Coal Mines Regulation Act which caused the explosion. The explosion resulted from an unfortuante combination of circumstances for which no blame can be attached to any individual.

Hereinafter set forth is a statement of the factors and circumstances which the Commission feels contributed to the cause and origin of the explosion or which might contribute to explosions in the future. Recommendations are given with a view to preventing or avoiding the happening of a similar tragic occurence and which may provide for greater safety in mines. Photographs and plans and various appendices are attached hereto to assist in appreciating and understanding this report.

Your truly,

(Sgd.) Donald McInnes

(Sgd.) G. A. Vissac

(Sgd.) F. E. Griffith

ROYAL COMMISSION REPORT

ON

EXPLOSION AND FIRE DISASTER
No. 4 MINE

CUMBERLAND RAILWAY AND COAL COMPANY
SPRINGHILL, CUMBERLAND COUNTY, NOVA SCOTIA

NOVEMBER 1, 1956

By

Donald McInnes, Chariman of Commission
G. A. Vissac. Member of Commission
F. E. Griffith, Member of Commission

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III. INTRODUCTION

A coal dust explosion followed by fires occurred in the No. 4 Mine of the Cumberland Railway and Coal Company, Springhill, Cumberland County, Nova Scotia, at 5:07 p.m., November 1, 1956, and caused the death directly and indirectly of 39 men.

At the time of the explosion, 118 men were underground; of these, 30 were killed by flame and violence or died from breathing deleterious gases; and 88 were rescued on the 3rd, 4th and 5th days after the explosion. On the surface, 42 men were working in the tipple and preparation plant; of these 7 died as a result of flames and violence, and the remainder escaped relatively uninjured. During the rescue operations 2 mine rescue men, or Dragermen, died a short distance inside the mine portal apparently from breathing carbon monoxide.

The names of the victims, their ages, martial status and occupations are listed in Appendix "A" to this report.

Rescue and fire-fighting operations were started almost immediately following the explosion. The men in the tipple were given emergency aid. Steps were taken to extinguish the burning wooden structure housing the tipple which had been ignited by flames from the explosion. Attempts were made to reestablish the No. 4 Mine ventilation that had been destroyed, and men were directed to enter the No. 4 Mine through the emergency escapeway rock tunnel from No. 2 Mine at the 3200 foot level.

Efforts made to reestablish ventilation by the No. 4 Mine fan were unsuccessful. Subsequently, the No. 2 Mine fan was utilized to induce and circulate fresh air into the affected No. 4 Mine at the 3200 foot level. Such ventilation permitted the entrance of rescue teams through the escapeway rock tunnel. This access, together with compressed air, proved to be the salvation of the entrapped miners who were left alive in the lower levels of No. 4 Mine.

A fire was discovered and extinguished with much difficulty near the bottom of the main haulage slope. Another fire, in the vicinity of the auxiliary haulage slope hoisting engine, could not be controlled by direct attack and had to be sealed with temporary stoppings. The gases which originated from this fire escaped through these stoppings and appreciably retarded the rescue operations.

On November 5, 1956 at 5:50 a.m. the explosion doors between No. 4 and No. 2 mines were closed after all the men who were alive had been rescued. Owing to an imminent danger from a second explosion, the No. 4 mine main slope portals were sealed at 3:45 p.m. on November 7th. Of necessity 26 bodies were left in the mine at this time.

From the evidence of witnesses, exhibits and the physical evidence found by an inspection of the mine, it is believed that the explosion originated along the back or auxiliary slope at a point approximately 30 feet above the 4400 foot level where a cloud of coal dust was ignited by an electric arc. While it is generally agreed that the explosion originated primarily as a dust explosion, the possibility that the presence of gas played a part cannot be discounted, particularly in the propagation of the explosion. The resulting explosion was propagated by coal dust, with the possibility of some assistance from gas in return air slopes, up the auxiliary slope; through the transfer tunnels, and up the main slopes to the surface. Downward propagation from the point of origin was stopped in the vicinity of the 5400 foot level on the auxiliary slope, apparently because rock dusting was adequate in this area. The suspended coal dust and the igniting arc resulted from the uncoupling and descent of six cars of a seven car train which were being hoisted in the auxiliary slope. The derailed, loaded mine cars, tumbled down the steep slope (about 35° at this point), collided with a steel wire armored 2200 volt alternating current transmission cable at several points and crushed it near the 4400 foot level where evidence of much arcing occurred. The cable was burned to separation at this point. The tumbling of the loaded cars and the downward movement of a high velocity air current suspended the coal and coal dust.

Coincidental with the uncoupling and running away of these mine cars, another train of loaded mine cars was being hoisted in the main haulage slope toward the surface. Coal dust blown from them by the high velocity air current undoubtedly added fuel to intensify the violence of the explosion.

IV. GENERAL INFORMATION

(1) No. 4 mine of the Cumberland Railway and Coal Company

The No. 4 mine of the Cumberland Railway and Coal Company is opened in the No. 6 and 7 coal beds and is served by the Canadian National Railways. The Company is a wholly owned subsidiary of the Dominon Coal Company. The operating officials of the Cumberland Railway and Coal Company at the time of the explosion were:

H. M. C. Gordon	President and General Manager	Cape Breton Island Nova Scotia
Hubert S. Haslan	Assistant General Manager	New Glasgow, Nova Scotia
Louis Frost	Chief Mining Engineer	Cape Breton Island Nova Scotia
William Campbell	Superintendent	Springhill, Nova Scotia
Randolph Carter	Mines Manager	Springhill, Nova Scotia
Robert Bowden	Underground Manager	Springhill, Nova Scotia

(2) Geology

The coal seams operated in No. 4 Mine of the Cumberland Railway and Coal Company are part of the Cumberland Coal Basin, a narrow syncline which has been subjected to intense pressure and folding by an upthrust of precarboniferous rocks and through the carboniferous measures. The coal seams in this area are only workable over a front of about 2 miles where pressure was applied by the upthrust. To the south, on the contrary, tension was developed and the seams were torn out and are unworkable. Accordingly, maximum folding is to be found on the edge of the basin where the seam pitch is as much as 36°. They flatten to 12° at a depth of about 4,000 ft. As a consequence of the folding, tremendous latent pressures have been stored in this area and are reflected by heavy roof pressure and "bumps" or sudden loss of roof equilibrium. Violent underground movements thereby result.

Heavy layers of sandstone rock over the coal tend to increase the underground weights and pressures and large quantities of explosive gases may be released by crevices or "feeders".

(3) Coal Seams and Mine Layout

The mine is opened by two rock slopes that are driven on a pitch of 35° to the 3200 foot level. There transfer rock tunnels connect them with the No. 7 coal bed. A connection is also provided at the bottom of these slopes with a rock tunnel escapeway to the No. 2 mine which operates in the No. 2 coal bed. This escapeway follows an irregular course to reduce velocity pressure in the event of an explosion. It is equipped with steel explosion doors which are normally kept closed. Four rock tunnels connect the No. 7 bed of coal with the No. 6 bed. These openings are at the 4400, 5400, 5700 and the 6100 foot levels. Active mining in the No. 7 bed had been discontinued, and all coal was being recovered from the No. 6 bed by way of entry development and longwall faces.

(4) Method of Working

No. 4 mine is worked by the advancing longwall system. The coal faces are about 300 feet long. Mechanization includes the use of electric longwall coal cutters, electric shaker conveyors, and electric hoists for the main slope.

(5) Mine Output and Labour Employed

Annual outputs for 1955 and 1956 were as follows:—

	No. 2 Mine	No. 4 Mine	Total
1955	409,000 tons	265,000 tons	674,000 tons
1956	343,000	205,000	548,000

or, on the basis of 250 working days the average production for No. 2 mine was 1,372 tons per day; and for No. 4 mine 820 tons per day.

The Number of Men Employed in the Mine in 1956

Surface	385 men
Underground	1200
	1585 men

The output per man per day was:

No. 2 Mine—2.20 tons
No. 4 Mine—2.02 tons

V. CONDITIONS AND EQUIPMENT

(1) Explosives

The explosives used are such as are permitted under the provisions of the Coal Mines Regulation Act and are used exclusively for blasting coal and rock. All use of explosives appears to have been in accordance with the provisions of the Coal Mines Regulation Act.

(2) Ventilation

Air is induced into the mine by a centrifically operated exhausting fan which is located near the top of a slope running parallel to the main hoisting slope. This fan, together with a Booster fan located at the 5400 foot level (which operates in tandem with the main fan) circulated approximately 75,000 c.f.m. As the average cross-section of the main airways is 75 sq. ft. there is an air velocity of approximately 1,000 ft. per minute.

Readings taken on October 31, 1956, showed that the main fan was exhausting 73,000 cu. ft. per minute under a 16 inch water gauge. The Booster fan was handling 52,900 cu. ft. per minute under a 6.3 inch water gauge. Small auxiliary fans were used to ventilate the advancing levels. Overcasts and stoppings were constructed of incombustible materials and such temporary stoppings as were used were constructed of lumber and brattice cloth. Attached hereto and marked as Appendix "C" is a monthly record of ventilation of No. 4 mine from January 1956, to October 1956.

It may be significant and should be pointed out that the record of ventilation measurements for the month of September, 1956, was 83,700 cu. ft. per minute and the ventilation records for the month of October, 1956 were 72,700 ft. per minute, a drop of almost 10,000 cu, ft. per minute. (See table of Ventilation Measurements Appendix "C".

(3) Gas Condition

Analysis of gases made in January 1957, two months after the mine was sealed off, showed a methane content of approximately 60%. During normal operations the amount of gas in the atmosphere would indicate that No. 4 mine could properly be called a gassy mine.

Witnesses testified to the effect that because of a very thin seam of coal of about 2½" thickness, underlying No. 7 seam, large quantities of gas are given off into the old working. As a consequence this circumstance has from time to time caused

a great deal of trouble in working No. 7 seam. Various attempts were made to clear up the gas condition; such as changing the method of ventilation from force to the exhaust system; and the use of bleeder pipes to take the gas from the old workings and discharge it into back entry returns. The Commision considers that this gas condition was causing the Company concern as late as the day of the occurrence of the explosion. The situation is made manifest by the fact that on the morning of November 1st work was being done on the bleeder pipe at the 4400 foot level with a view to the removal of accumulations of gas from this area and to repair leakages on the bleeder pipe.

The air measurements and menthane determination made and supplied by the Company show a variation in the total air volume from a low of 73,900 c.f.m. to a high of 84,600 c.f.m. and a variation in the methane determination from a low of 1.1% to a high of 1.2% in the main return covering the months of January to October, 1956 inclusive. (See record of Air Analysis Appendix "B"). It is to be observed that the methane determinations as supplied by the Company also showed a methane content in the atmosphere in the return airway at the 4400 foot west level for the month of April 1956, or 1.66% which is 31% higher than the 1.25% which is permissible methane content under which the mine is allowed to be operated by the Coal Mines Regulation Act. (Section 83 (2), Rule 9). It might be noted that Section 83 of the Statute covers the "Use of Electricity". Rule 2 deals with gas and dangerous dust accumulations at the site of any piece of electrical equipment. Rule 9 deals with gas content "in any part of a mine where electrically driven machines are worked." It is considered that such Rule 9 includes and is intended to cover the air return. The Regulations do not specifically say that the mine cannot be worked when the methane content exceeds 1.25% but merely that the electrical machines must be stopped and the electrical power cut off until the gas is cleared. Air analysis for the months of January to October, 1956, showed other methane contents in excess of the permissible methane content under which the mines can be worked, as follows:—

January	1956	Return 4400 West Level	1.33
March	1956	Return 4400 West Level	1.40
April	1956	Total Return No. 6 Seam	1.36
July	1956	Return Top main fan slope	1.26

Attached hereto and marked Appendix "B" is a record of air analysis as supplied by the Cumberland Railway and Coal Company Limited for the months of January to October inclusive, 1956.

(4) Coal and Rock Dust

In most parts of No. 4 mine the coal dust conditions were reasonably well under control. The evidence indicates that rock dusting was not always practiced in the most scientific and efficient manner. However, the proof that rock dusting as a whole was reasonably efficient is established by the fact that the explosion was limited to the two main slopes and the 3200 foot rock tunnel. They were vulnerable parts of the mine owing to the spillage of coal from mine cars in the course of being hoisted from the mine.

Under the existing conditions of the mine roads, namely — excessive pitch of the slopes; high velocity of ventilation and hoisting; two turn abouts with resulting bumpings in the rock tunnel, it is recognized that it is very difficult under present methods of rock dusting to maintain such roads to the degree of rock dusting required and prescribed by the Coal Mines Regulation Act.

(5) Transportation

Coal in wall face areas is hand loaded on shaker conveyers which load the coal into 1¼ ton capacity steel and aluminum mine cars. Coal is also hand loaded into these cars in development work. Compressed air and electric-motor driven wire rope hoist systems are used to move trains or rakes of these cars over a 24 inch gauge railway track which is installed in level and slope entries.

Seven car trains of loaded and empty mine cars are raised and lowered in two haulage slopes known as the main slope where the coal is hoisted from the 3200 foot level up a 35° pitch entry. Such entry has been developed in the rock. A back or auxiliary slope opens in the No. 7 bed of coal. Coal is hoisted from producing long wall face levels in the No. 6 coal bed to the 3200 foot level.

Mine cars are transferred by wire rope-hoist between slopes at 3200 foot levels through a relatively flat entry driven in rock. This is known as the transfer tunnel.

The mine cars are rectangular in shape, and are called boxes. A three-link coupling is used to attach the cars by a drawbar hook. A full scale model of this arrangement is shown in Figure 20 appended hereto. Evidence given at the Hearing shows that a twisted coupling, as shown in Figure 20, sometimes flips the link from the drawbar hook. Apparently this occurs at times of derailment or the sudden slacking of rope tension.

On several occasions during 1955 and 1956, cars or trains of cars unfastened and ran free on the auxiliary slope. On January 11, 1956, it was reported that an empty rack (train) going down the auxiliary slope jumped the road at the 4800 foot level and cut the armored electric power cable. This accident resulted in the ignition of the wooden lagging over the roof supports or booms. The testimony of some witnesses indicates that no action was taken to prevent these accidents which occurred before the explosion on November 1, 1956. Even now, witnesses seem to have the feeling that nothing can be done to minimize or eliminate the obvious hazards that exist in the mine's haulage system on account of the excessive grade of the main slope (36° pitch).

(6) Electricity

Electric power is purchased from the Maccan Power Plant located near Amherst, Nova Scotia. Such power is transmitted to the surface plant area of the mine at 69,000 volts with 3 phase 60 cycle alternating current. It is transmitted underground to the 5700 foot level by a 3 conductor 4/0 armor sheathed cable at 2200 volts. Branch circuits from this main underground transmission cable are taken off at the 3200, 5400 and the 5700 foot levels to furnish power for the operation of electric motor driven wire-rope hoists and booster fan operation. This main underground transmission cable is reduced to 1/0 conductor size at the 5700 foot level rock tunnel and extends to a 150 KVA transformer located on the 5700 foot level west in the subjacent No. 6 seam. The voltage is reduced by this transformer from 2200 to 550 volts. A 3 conductor No. 6 wire size trailing type rubber covered cable transmits power for the shaker conveyor operation which is used to convey coal from the wall faces and as well for long wall mining machines. At a few points the voltage is reduced from 2200 to 110 for incandescent lighting purposes.

Circuit is provided for the main and branch circuits by oil submersed circuit breakers, known as Reyrolle pillars. These are classified by the Department of Mines as permissible. They are equipped with overload and inverse-time element short circuit protection.

All cables are installed on intake air haulage roads and are suspended near and from roof supports by 3/8 inch hemp ropes at intervals of about 10 feet. At connection boxes additional anchorage is provided. On steep pitches the cable is attached with chains fastened to the armor of the cable by metal clamps.

Cable conductor splices are made with copper sleeves clamped to the conductors, adequately insulated and enclosed in a cast steel box. Such box is filled with an insulation compound. This compound, when properly mixed and prepared, becomes semi-solid when cured. Photographs taken of this connector box and submitted in evidence are shown in Figure 24 annexed hereto.

Much damage was done to the main transmission cable installed in the main slope, transfer tunnel and auxiliary slope by the runway derailed mine cars and by explosion forces. These locations are noted on the mine map, Appendix "D". Photographs of portions of the cable presented in evidence and shown here in Figure (11) indicates the two ends of the cable where intense and sustained arcing developed and burned the cable to separation near the 4400 foot level in the auxiliary slope. The point where the two ends of the cable were separated as a result of the intense arcing coincides with a place where the falling mine cars collided with the transmission cable.

A telephonic communication system was connected from the surface to all important locations underground. Signal transmission was by means of multiple conductor rubber covered cable. The cable was installed along haulage roads and together with the telephone units were in fresh air.

(7) Compressed Air

Six-inch compressed-air pipelines are installed on the return air slopes and on haulage levels. It is understood that all drilling equipment, pumps, and most of the wire-rope hoists are operated by air at 125 p.s.i.

Compressed air from these lines undoubtedly saved the lives of some 55 men who barricaded themselves between a set of air-lock doors on the 5400 east level. A 3/4 inch valve was opend in the barricaded area, and the contaminated air was flushed and diluted with the compressed air. Later, because the air in the area became contaminated, a length of 3/4 inch rubber hose was attached to this compressed-air outlet. The barricaded men cut slits in the hose, laid down, and breathed the escaping air. Men were in this barricade from about 6:00 p.m. on November 1st to the late afternoon of November 4th or the early hours of November 5th. The location of this barricade is shown in Figure 7(a) appended hereto. All of the rescue operations were carried on from the 3200 foot level, and the men escaped through a rock tunnel opening into the No. 2 mine.

(8) Illumination

All employees except supervisors and mine examiners used permissible electric cap lamps for portable illumination under-

ground. Electric incandescent lamps were installed at underground booster fan and hoist locations.

Supervisors and mine examining personnel used only approved flame safety lamps as is required by the Coal Mines Regulation Act. Testimony given and recommendations offered by Government and Company witnesses suggest that this provision of the Act be amended to permit also the use of electric cap lamps by these employees.

(9) Mine Rescue and Rescue Equipment

The rescue organization at the Cumberland Railway and Coal Company's operation in Springhill is made up of 5 rescue crews, each consisting of 7 men with 1 spare man. The crews are in charge of Frank Stevens who is known as the Superintendent of the Mine Resuce Station. The mine rescue equipment consists of one McCaa type breathing apparatus for each man, with several spare sets of equipment for use should the regular equipment become unserviceable.

The Superintendent is in complete charge of training the men. He gave evidence of the method by which the men are trained.

It would appear that immediately following the explosion the rescue organization began to function and did function efficiently during the whole rescue operations and subsequent recovery of the bodies.

The individual bravery of all men was particularly noteworthy. It would also appear that the training for the most part was adequate, yet the fact cannot be overlooked that almost immediately after the beginning of the rescue operations, two men who were trained in the use of the rescue apparatus lost their lives from carbon monoxide poisoning. They died a distance of within 130 feet of the surface. Another man experienced some difficulty. This fact would seem to indicate either a lack of proper training in the use of the apparatus, or a lack of the proper physical condition on the part of the men necessary for ardous and hazardous operations such as was required of them.

In addition to the aforementioned equipment, there are 6 self rescurer type breathing apparatuses at the Mine Rescue Station. These were used during the rescue operations by the rescue crews or draegermen. Supplies of oxygen bottles, respirators and stretchers were also available at the plant.

It is significant, as is established by the evidence of Mr. Stevens, that when the apparatus was tested following the

rescue operations, no defect was found. This circumstance would bear out the contention that the loss of life of the rescue men must have either resulted from an unavoidable accident or a human failure brought about by lack of training or substandard physical condition.

(10) Inspection by Department of Mines Personnel

Evidence of the Department of Mines Inspectors at the Inquiry would indicate that the inspection of the mine was not always carried out in strict accordance with the provisions of the Coal Mines Regulation Act. There is no question that the Inspection officials were sincere and conscientious and performed their duties to the best of their ability as they saw it. However, lack of complete harmony and accord between the various Inspectors must have hindered the efficient operation of the Department.

It would seem that the mine was travelled very frequently by the local Inspector. Perhaps his visits to the mine and travel therein were too frequent to enable him to do anything more than to carry out cursory examinations. It would seem, from the evidence, that it would have been practically impossible for him to have carried out an inspection on every occasion that he entered the mine that would conform with all the provisions of the Coal Mines Regulation Act.

(11) The Requirements Imposed on Company Officials by the Coal Mines Regulation Act.

The Coal Mines Regulation Act requires that Company officials make fourteen daily reports, two weekly reports, six monthly reports and ten miscellaneous reports. There was evidence that there reports were not always completed by Company officials as required by the Coal Mines Regulation Act. An inspection of the books in which the reports were required to be made also indicates further that in many instances the reports were a mere formality and not made with the seriousness that the Statute calls for. However, it would seem reasonable to suggest that the great number of reports required to be made would involve so much time and effort in preparation that it would be practically impossible for Company officials to perform efficiently the duties required of them, and at the same time complete reports. It would also seem fair to suggest that there is considerable duplication of effort in the making of the reports. Consideration should be given to the number and nature of the reports called for by the Statute.

VI. EXPLOSION, RESCUE OPERATIONS AND RECOVERY OF BODIES

Thursday, Nov. 1st., 1956

(1) Explosion

The explosion in No. 4 Colliery of the Cumberland Railway and Coal Company, Ltd. occurred at 5:07 p.m. on the 1st day of November, 1956. On that day the mine was operating normally. The only unusual condition was that an accumulation of gas had been found on the 4400 foot level in the No. 7 seam in the vicinity of a 20-inch galvanized steel bleeder pipe which had been installed to relieve pressure from the abandoned and otherwise sealed 4400, 4800, 5100 and 5400 foot west wall levels in the No. 7 seam. Testimony was given that this gas condition was relieved and satisfactory repairs had been made to leaking joints of the bleeder pipe before the explosion occurred.

The afternoon shift of 118 men was at work in their respective work areas. At the time of the explosion 7 men were located at various places in the vicinity of the 3200 foot level transfer tunnel. All were killed by the flame and violence of the explosion. The remaining 111 men, all of whom except the Booster fan attendant at the 5400 foot level, and a pumper attendant below the 6100 foot level No. 7 seam, were in the 5700 and 6100 foot levels in the No. 6 seam, or in the rock tunnels connecting the two seams of coal. These men were uninjured by the explosion. Most of them did not know that anything of a serious nature had occurred. Telephone circuits to the surface and 3200 foot level were destroyed by the blast. All means of communication with the surface had been disrupted but the telephone in the lower areas of the mine remained serviceable. These were used by the men left alive to advise others that something of a serious nature had occurred. In attempting to escape, or reach a place of safety, 23 of those left alive died from breathing the after products of the explosion and fires that were ignited by the explosion. Eighty-six men barricaded, or partially barricaded themselves at two locations. They breathed compressed air from the discharge port of a compressed-air pump and from air escaping from holds cut in a rubber compressed air hose. Two other men remained in the vicinity of the 5700 foot level and were rescued.

Immediately following the explosion it was found that the concrete portal at the entrance to No. 4 main slope and No. 4 bankhead, which was burning, had been destroyed by the force of the blast (see Figure 2), indicating to those on the surface that the explosion had occurred in No. 4 mine. The local Fire Department aided in extinguishing the fire on the bankhead.

Surface employees injured by the explosion were sent to All Saints Hospital in Springhill. An attempt was made to communicate with the men (118) in No. 4 mine by telephone. When the telephone was found to be out of order an effort was made to send word through from No. 2 mine at the 3300 foot level to tell No. 4 men to come out through No. 2 mine. Meanwhile No. 2 men were ordered out of the mine.

No. 4 mine fan was examined. The fan was still in operation and drew 45 amperes. There was no reading on the water gauge. The water must have been either blown out or sucked out of the glass. Instructions were given to replace the water in the water gauge. A sample taken with the CO detector showed CO in the fan casing and the main slope. It was also noted that the air was drawing up the main slope instead of down, the main slope ordinarily being the intake.

(2) Rescue Operations

Immediately after the explosion the Rescue Station was opened and the gas analyzing apparatus prepared to run CO and CO2 determinations. Senior officials of the Campany, the Union and the Department of Mines were notified and additional rescue crews requested from the Acadia Coal Company at Stellarton, Nova Scotia.

It was decided to put a small quantity of air into No. 4 mine and to make this air travel the same course as before the explosion. It was thought that the men in No. 4 mine would, if possible, come to the main intake. To do this, a part of the intake had to be short-circuited at No. 1 slant and the air entering the mine regulated at the fan. A rescue team was sent down to No. 1 slant to examine the doors. This team travelled to the doors approximately 130 feet down the slope. See map Appendix "D". The team captain and two men returned and reported that two of the team were unconscious on the slope at the slant. They also reported that the slant doors had been blown toward the main slope.

The standby rescue team was sent down the main slope to recover the two unconscious rescue men. At this time, the fan stack door was reported closed. The fan was shut down, and the fan stack door opened 8 inches by inserting a piece of 8" x 8" timber between the stack door and the fan evasee. This caused a drag of air down the main slope to No. 1 slant. The fan water gauge showed 1/2 inch of water.

While the aforementioned steps were being taken the second rescue team successfully removed the two unconscious rescue men and brought them to the surface. However, one member

of the second team had collapsed some 30-40 feet down the slope and had to be brought to the surface. Artificial respiration was applied to the three men with the use of oxygen inhalators.

When it was learned that the doors on No. 1 slant were blown out it was reasoned that the remaining doors and hatches between the main slope and the fanway slope would in all probability have been destroyed, thus rendering the surface fan useless. A split was taken from No. 2 mine by opening the explosion doors in the escapeway rock tunnel between No. 2 and No. 4 mines. The doors were opened 2-1/2 inches and barefaced men followed the air in to No. 4 waiting head crosscut. The crosscut doors were found to have been blown out. Several pieces of lagging were found burning on the 3200 transfer bottom on the low side of the bottom at the foot of the main slope. The air passing through the explosion doors was measured at 10:20 p.m. November 1st. and found to be 8,400 c.f.m.

A brattice stopping was erected across the lower tunnel by the waiting head crosscut. The air was thereby diverted to the main slope. Acid soda extinguishers were used on the fire at the 3200 bottom. Such step merely spread the burning embers. Stonedust was used to extinguish the fire. One body was recovered from the waiting head and sent to surface.

The brattice stopping which had been erected across the back haulage tunnel inbye No. 1 slant was taken down and the fresh air followed along the back tunnel to the 3200 mine bord. The doors west on the 3200 mine bord between the back tunnel and No. 4 auxiliary slope were opened to short-circuit the ventilation by way of the haulage tunnel. A blue haze of wood smoke was lying in the uphill places on the 3200 mine bord. This indicated an active fire in the area above the mine bord.

Friday, Nov. 2nd., 1956

A fresh air base was established at the inbye end of the lower tunnel at the 3200 mine bord. Early Friday morning, November 2nd. 1956, a rescue team was sent from the fresh air base through the 3200 mine bord crosscut to travel out the haulage tunnel. This team travelled 600 feet outbye on the haulage tunnel. They were forced to return when one of their members got into difficulties as too much back pressure built up in the breathing bag. This team encountered no falls but reported that some arches were blown outbye one the haulage tunnel. A second rescue team was sent up the waiting head crosscut to travel the 3200 bottom transfer tunnel. The teams both reported no fires burning and the second team returned with one body recovered from the midway point on the transfer tunnel. This body was removed to the surface.

One rescue team was then sent away from the 3200 fresh air base through the 3200 mine bord crosscut up to the points above the 3200 main level on No. 4 auxiliary slope. At this point the visibility was very poor due to smoke. About one foot of smoke was encountered near the roof on the auxiliary slope below the 3200 mine bord. Such smoke appeared to be moving up the slope. This rescue team reported one box off the road on the auxiliary slope above the 3200 main level. A further box was hanging on the rope with one boom down on the box. A body was seen on the 3200 main level west.

The uphill places above the 3200 mine bord could not be travelled by rescue teams due to smoke. It was decided to seal off the fire area to the rise of the 3200 mine bord. Brattice stoppings built on the main auxiliary slope above the 3200 main level, in the door frame on the 3200 main level east and Nos. 1, 2 and 3 head above the 3200 mine bord were sealed with plaster. The rescue crews completed this work by Friday, November 2nd about mid-day. Then the men who were involved in the rescue operations were withdrawn from the mine.

At about 6:00 p.m. on November 2nd 1956, the mine was re-entered. It was found that the haze and CO on the 3200 mine bord had cleared to some extent. On the 11 p.m. - 7 a.m. shift November 2nd-3rd a brattice stopping was erected in No. 1 slant and across the small tunnel leading to the tunnel haulage.

Saturday, Nov. 3rd, 1956

The doors in the crosscut between the 3200 mind bord and the main auxiliary slope were partially closed to turn the ventilation in the 3200 mine bord east and down the east fanway. On this shift a Wilde or compressed air powered hoist, which was on the lower transfer tunnel at the bottom of the main fanway return, was dismantled. It was taken into the fresh air base at the 3200 and re-assembled. One body was recovered from the 3200 main level west by rescue teams. Two rescue teams were sent down the main auxiliary slope as far as the 3500 foot level. Work was also continued on tightening the stoppings to the rise of the mine bord entry.

Shortly before noon on Saturday, November 3rd 1956, one of the entrapped men came up the east fanway with the information that additional men were on the way up from the 4400 east level pump. See map Appendix "D". From this man it was learned that a number of men had barricaded themselves on the 5400 east level, No. 7 seam, inbye the booster fan. See map Appendix "D". Thirty-six (36) live men were recovered from the 4400 east level. Bare-faced crews were used to recover these men but due to CO which was created by the fire above the 3200 mine bord, it was necessary to limit each bare-faced man to one trip.

Sunday, Nov. 4th 1956

The hoisting engine, which had been shifted from the bottom of the return slope was put into operation on Sunday, November 4th. This engine provided single tram transportation to the 4200 foot level by Sunday evening. The ventilation split through the explosion doors was then increased from 8,400 c.f.m. to 15,800 c.f.m. which established the ventilation down the east fanway to the 4400 overcast.

The floor of the 4400 overcast had been blown off. Air was coming through the overcast from below and inside from the east 4400 level and together with the air coming down the east fanway was returning out the 4400 level to the main auxiliary slope. The air coming out from the 4400 east level was heavy in CO and the air coming up from below was carrying about 0.04 CO. The air coming down from the 3200 mine bord was still carrying a percentage of CO and tightening of the uphill stoppings to limit leakage to the fire area was continued.

The floor of 4400 overcast was repaired with brattice and the ventilation split through the explosion doors was further increased from 15,800 c.f.m. to 20,100 c.f.m. Meanwhile a rescue team was sent down from the 4400 level to inform the entrapped men at the 5400 foot level that help was on the way. The second rescue team went to the 4400 foot level to the auxiliary slope and reported 7 bodies there.

On completion of the floor in the 4400 overcast the fresh air was followed down the east fanway to the 4400 crosscut. A brattice stopping was erected in this crosscut and ventilation established to the 5400 foot level. The men, approximately 50, were then started up from the 5400 foot level to the surface. Another rescue team was sent to the 5700 foot level where two more men were rescued. The main slope was travelled from the 4800 to the 5700 foot levels and the bodies found there, together with the rescued men, accounted for all the men who were in the mine when the explosion occurred.

Experienced officials meanwhile were keeping a close watch on the stoppings which sealed off the fire area. They reported that the fire smell was changing and indicated coal being on fire. Their report, and the air analysis, indicated that conditions in the fire area were deteriorating rapidly and there was danger of a second explosion.

Monday, Nov. 5th 1956.

The ventilation split through the explosion doors were reduced to 12,500 c.f.m. and the 3200 mine bord doors opened. By

5:50 a.m. on Monday, November 5th, 1956 all live men, rescued and rescuers, had been removed from the mine. At 7:00 a.m. on Monday, November 5th 1956, the explosion doors leading from No. 2 mine to No. 4 mine were closed.

A meeting of all senior company officials was held on Monday morning, November 5th 1956, and in view of the danger of a second explosion it was decided to seal the mine, leaving the bodies of the dead underground. This decision was concurred in by officials of the Department of Mines and officers of District No. 26 United Mine Workers of America.

Wednesday, Nov. 7th 1956

By 3:45 p.m. on Wednesday, November 7th, 1956, a sand stopping 2 feet thick had been placed across the main slope to No. 4 mine 40 feet from the surface. The fan stack, and inspection doors in the fan casing had been sealed. The explosion doors between No. 2 and No. 4 mines had been plastered and the space between the doors filled with sawdust. The mine remained sealed until January 18th 1957.

VII. RECOVERY OF BODIES FROM No. 4 MINE

Friday, Jan. 18th 1957

On January 18th 1957, No. 4 mine was opened to recover the bodies of 26 miners. From November 7th 1956 to January 17th 1957 daily samples, barometer permitting, were taken at the main slope stopping and the fan casing. On January 17 the samples ran as follows:

Location	CO_2	O_2	CO	CH_4
Main slope	4,1	1.3	trace (tube)	60.44
Fan casing	4.9	0.8	trace (tube)	61.21

At 5:00 a.m. January 18th 1957, all men were removed from No. 2 mine and the electricity cut off. The stonedust between the explosion doors between No. 2 and No. 4 mine was removed and the top 2" taken off the sand stopping seal which was across the upper end of the No. 4 mine main slope. Two rescue teams were taken to the explosion doors in No. 2 mine. At 7:40 a.m. January 18th 1957, one team went through the explosion doors closing the doors behind them. This team went into No. 4 waiting head crosscut and took an air sample with a CO tester which showed clear. The doors were then opened.

Upon the return of this team the explosion doors were opened 1-1/2" to pass 4,000 c.f.m. After waiting 15 minutes bare-faced men followed the air through the explosion doors in to the waiting head crosscut. The ventilation was allowed to short-circuit up the waiting head crosscut. However, a slight pull of air followed the lower transfer tunnel. Barefaced men with a flame safety lamp reached the inside end of the lower transfer tunnel at 8:40 a.m.

The waiting head crosscut doors were closed at 8.45 a.m. and the fresh air followed in the back haulage tunnel. The methane concentration was slower in clearing. It was not until 10.35 a.m. that the originial fresh air base at the 3200 mine bord was reached.

A rescue team completed a brattice stopping across the east corner of the 3200 mine bord at 11.40 a.m. to deflect the ventilation through the 3200 mine bord doors to the main auxiliary slope. The split through the explosion doors was increaseed from 4,000 c.f.m. to 8,500 c.f.m.

At 11.55 a second rescue team passed through the 3200 mine bord to the main auxiliary slope and built a barricade across the slope below the 3200 mine bord. This team started to raise ladders up the main auxiliary slope from the 3200 mine bord to the 3200 main level. A third rescue team completed the ladder-way at 3:05 p.m. This team also travelled in the 3200 east main level after removing the brattice door. They reported a heavy fall just inbye the door.

Friday, Jan. 18th 1957

At 3:25 p.m. a fourth rescue team left the fresh air base to go up the main auxiliary slope above the 3200 main level. This team returned reporting trouble with their machines. This team shut the compressed air valve at the top of the east fanway.

A fifth rescue team left the fresh air base at 4:10 p.m. travelled up the main auxiliary slope to 10 feet above the 3200 main level and reported one boom down there with a large stone on the boom.

Another rescue team left the fresh air base at 8:35 p.m. and travelled to the same point on the main auxiliary slope above the 3200 level. This team secured a hand rope from the fall on the slope to the 3200 mine bord. Samples were taken on the haulage tunnel just below the 3200 level. At 10:10 p.m. another rescue team left the fresh air base to secure the hand rope on the auxiliary slope and to stay the stone on the slope. The crew was too exhausted after taking up material to secure the fall. All rescue teams were sent to the surface at 10:55 p.m.

Saturday, Jan. 19th 1957

At 9:20 a.m. on Saturday, January 19th, 1957, a rescue team left the fresh air base to take out the canvas stopping on the auxiliary slope above the 3200 level. When this was done, the 3200 mine bord doors were closed and the brattice stopping east of the back tunnel on the 3200 mine bord was taken down. At 10:40 a.m. the split through the explosion doors was increased to 21,100 c.f.m. An attempt was made to travel the 3200 mine bord east to the east fanway but the methane concentration was too heavy. At 11:25 a.m. the explosion door split was further increased to 30,700 c.f.m. by opening both doors 20 inches. The two doors across the east fanway to the high side of the 3200 mine bord were opened by a rescue team. However, the fresh air continued to drag down the east fanway. At 1:15 p.m. canvas stoppings had been built below the 3200 mine bord across the east and west fanways.

Bare-faced men then went up the east fanway to the 3200 main level, out west to the auxiliary slope back head and up this head 300 feet. They had to retreat due to lack of oxygen. Bare-faced men also travelled out to the 3200 level door and proceeded to rebuild the brattice stopping using boards salvaged from the main auxiliary slope.

(1) OBSERVATIONS:

It was observed that the plaster overcast on the 3200 main level at the west fanway was destroyed. The explosion had travelled inbye on this level as pieces of stone could be found embedded on the west side of the wood props. The hatch on No. 1 head off the 3200 level was found intact, open up the hill and fastened open by wire, this was the normal position. The arches on the auxiliary slope between the stairway and the 3200 main level were pitched uphill at the crown of the arch. An empty box was standing on its wheels, off the road to the west side of the track, hanging on the rope at the points. One boom was down on the box with a piece of stone resting on this boom. The points were shifted for the straight road to the deep. On the 3200 west level, the chain-runner's telephone receiver was off its hook and hanging straight down by the cord. Coking was observed on the west side of props on the 3200 west level.

Upon completion of the stopping across the 3200 main level, the explosion doors were fully opened to pass 37,900 c.f.m. into No. 4 mine. A second attempt was made to travel up the back auxiliary slope above the 3200 level. The 2900 level was reached and the hatch stopping in this level found intact. The level was travelled across to the main auxiliary slope where a fall of stone

prevented further exploration. The back head above the 2900 level was travelled to the 2600 level where another fall of stone prevented further progress. This exploring crew returned to the 3200 mine bord at 6:30 p.m., the 2900 level hatch was left open and the stopping across the east fanway to the low side of the 3200 mine bord opened. The two uphill doors on the east fanway were closed thus turning the ventilation down the east fanway.

Saturday, Jan. 19th 1957

At 8:20 p.m. on Saturday the 19th of January 1957, bare-faced men proceeded down the east fanway where heavy methane was encountered at the 4100 east level. A brattice box stopping was erected on the slope at the 4100 level but this failed to hold back the gas and it was necessary to use a rescue team to brattice the door on the east 4100 level. This was completed at 5:15 a.m. January 19th, and bare-faced men proceeded to the 4400 overcast where two samples were taken. The 5400 overcast was reached at 6:00 a.m. and the men proceeded out the 5400 level to the main auxiliary slope down to the 5700 level where a heavy concentration of methane was encountered.

By 10:05 a.m. on the 19th of January 1957, an investigating team of bare-faced men together with representatives of the medical profession, U.M.W. of A. and Mines Department had reached the 5400 bottom for the identification and removal of the bodies.

(2) LOCATION OF BODIES

The aforementioned party travelled from the 5400 level on the main auxiliary slope up to a fall at the 4800 level, through this fall to the 4400 level. They identified the bodies of 3 men on the way. The team then travelled back down the slope to the 5400 bottom. They identified 2 bodies which were lying just below the bottom on the slope. The team then proceeded to the 5700 level and identified 3 bodies on the 5700 east waiting head. They then travelled the 5700 west bottom inbye to the tunnel, and in the tunnel to No. 1 head on the 5700 east level, No. 6 seam. They identified 5 bodies on the 5700 west bottom, No. 7 seam; 1 body at the outside tunnel turn; 1 body at No. 1 head on the 5700 east level, No. 6 seam. A heavy concentration of methane was encountered in the 5700 east level and below this point on the slope. The party returned to the main auxiliary slope and travelled 150 feet down the slope below the 5700 bottom where 3 bodies lying on the west side of the slope were identified. Meanwhile, a rescue team had recovered one body from the inside end of the haulage tunnel. Following identification the removal of the bodies was immediately started. The location of the bodies are shown on the map attached as Appendix "D".

(3) INSPECTION OF AUXILIARY SLOPE 5400 to 4400 LEVELS.

There was a heavy fall at the 4800 level with 5 empty boxes under this fall. See Appendix "D" and Figures (7) and (9). The 4/0 armour cable on the east rib was pulled from the upper end of the junction box. The end of the cable could not be seen. The gland on the junction box was broken. The compound had melted and run out of the junction box, down a piece of sleeper which was at a 45° angle. The compound formed a pool on the pavement. On the high side of the fall, considerable silt had been washed down the slope by water from a broken water line situated somewhere above. There was one piece of timber on the high side of the fall on the east rib, partially buried, the surface of which had been burned to charcoal.

The explosion appeared to have originated at the fall at the 4800 foot level. On the upper side of the fall it was seen that the side of the props had some fine dust adhering; while on the lower side of the props dust had been compacted. On the lower side of the fall, the fine dust on the upper side of the props had been cleanly swept away.

Between the 4400 and 4800 levels two more empty boxes were found.

There was a fall on the slope at the 4400 level. The 4/0 armour cable on the east rib below the 4400 level had received two partial cuts or squeezes. It appears that this was mechanical damage as there was no sign of a burned cable; i.e. globules of copper, lead or charring of the insulating paper.

On the 4400 level east off the auxiliary slope, both doors on the outside end of the level were blown to the east. The overcast over the east fanway was blown out from the underside.

Sunday, Jan. 20th 1957

At 7:00 p.m. on Sunday, January 20th, 1957, the bodies from below the 4400 foot level had been taken above the 4400 foot level with the exception of 3 bodies which were being brought up from the 5400 level. At 10:00 p.m. on Sunday all bodies from below the 4400 level had been taken above such level. A brattice stopping was built across the east fanway below the 4400 level. The floor was taken out of the 4400 overcast and a brattice curtain erected on the 4400 east level just inbye the overcast. This permitted the inspection team, consisting of representatives from the medical profession, the U.M.W. of A. and Mines Department, to travel out west on the 4400 level to identify and

recover the bodies of 7 men. These bodies were found on the low road between the overcast and the inside door at the outside end of the 4400 bottom.

The 7 bodies were recovered, along with an 8th body which had been taken up the main auxiliary slope and placed on the outbye end of the level on the previous shift. This was completed at 2:20 a.m. on Monday, January 21st 1957. The floor was replaced in the 4400 overcast at 4:15 a.m. Three crews of men were sent below the 4400 level to bring up the spare equipment. They returned at 4:45 a.m.

Monday, Jan. 21st 1957

All men and bodies had reached the 3200 mine bord at 6:10 a.m. A rescue team started to erect a brattice stopping across the east fanway just below the 3200 mine bord. This stopping was completed at 6:50 a.m. The two doors on the east fanway above the 3200 mine bord were opened and the ventilation turned uphill to the 3200 main level.

At 8:05 a.m. an inspection party entered the mine, travelled to the 3200 mine bord, in to the east fanway and up to the 3200 main level. At 10:00 a.m. this party proceeded up the back head of the auxiliary slope to the 2900 level. The hatch in the 2900 crosscut was closed thereby sending the ventiliation up to the 2600 level. The party followed the fresh air to the 2600 level. Several falls were encountered in this level. The props and booms were still standing. However, small stone had fallen from between the booms. The level was travelled to the top of the auxiliary slope where a fall barred further progress. There was some evidence of an oily, black deposit having condensed on the roof. The high side coal rib along a distance of 25-30′ appeared to have been slightly charred.

The party travelled back down the back head to the 2900 crosscut and passed through the ventilation hatch which was left partly open to provide a small split. A fall was encountered at the outside end of the crosscut, running booms on the east side of the slope having fallen. A way was made throught the fall and the party proceeded through the fall to the slope, travelling up the slope to the auxiliary slope hoist. The body of one man was found 20-30 feet above the 2900 crosscut on the slope.

(4) OBSERVATIONS MAIN AUXILIARY SLOPE 2900 TO AUXILIARY SLOPE ENGINE HOUSE

The vault on the east rib above the 2900 crosscut was intact and appeared normal. There was a fall opposite the 2900 crosscut. The east collar boom was down. The small tram for the

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(4) OBSERVATIONS MAIN AUXILIARY SLOPE 2900 TO AUXILIARY SLOPE ENGINE HOUSE

The vault on the east rib above the 2900 crosscut was intact and appeared normal. There was a fall opposite the 2900 crosscut. The east collar boom was down. The small tram for the

2900 engine was found coped on the east rib in its normal position. However, several coils of loose rope were to be seen between the tram and the sheave wheel.

The engine house, engine motor and cables were found to be intact. A strongback, which was resting on two angles fastened to the inner sides of the engine house columns, was found moved upwards. Several pieces of stone and coal were embedded between the rope coils on the low side of the drum. The hoist driver's telephone receiver was off its hook, and downwards by its cord. The hoist driver's wooden chair was partially burned as was a coat hanging on its hanger to the right side of the operator's chair. There was a fall behind the engine house and stone had run down from above. Several pieces of wood which had been on fire were seen behind the hoist room.

The throttle and reversing switch on the hoist were in the neutral position with both the clutch and brake levers in the forward position. The engine operator was found 20-30 feet above the 2900 crosscut. His glasses were intact.

The one body from above the 2900 level on the auxiliary slope was taken out of the mine and the 2900 level crosscut hatch left open. The uphill doors on the east fanway above the 3200 mine bord were closed. The brattice across the east fanway below the 3200 mine bord was taken down. The brattice across the bottom of the main fanway was removed. The waiting head crosscut doors on the 3200 lower tunnel were tied open.

The explosion doors at the 3300 level in No. 2 mine were closed at 3:00 p.m. on Monday the 21st of January 1957, and everyone had checked out of the mine at 3:31 p.m.

(5) GENERAL

Throughout the recovery operations samples were taken at the top of the main slope, No. 4 mine and also from the various sections underground as ventilation was restored. The samples were run for CO, CO_2, CH_4, O_2 determinations. A further check on the CO was obtained using M.S.A. carbon monoxide tube testers and also the pyrotannic method for the quantitative detection of CO. The blood method checked fairly closely with the CO tube test when the oxygen content of the sample was known.

Small amount of CO were detected in the analysis from samples taken at the top of No. 4 main slope. At the times CO was found at the top of the main slope. This could be correlated with the ventilation recovery of various sections underground, apparently being residual CO.

VIII. COMMISSION HEARING

On February 15th 1957, the Commission hearings adjourned until the 25th of March 1957, in order that all interested parties might travel the mine to determine whether or not a further physical examination of the mine would enable additional evidence to be given which might bear on the subject matter of the Inquiry.

It was not until June 17th 1957, that the Inquiry reconvened, at which time the mine had been officially inspected by Company officials, Department of Mines officials and Union officials. In addition, Mr. F. E. Griffith, a Commissioner, and Mr. T. A. Giles, Commission Counsel, in company with Company, Union and Department of Mines officials, also travelled the various workings of the mine.

At the time of the reconvening of the commission the main slope had been cleared to the 3200 foot level and the hoisting apparatus put back in operation to that point.

Company officials who gave evidence during the initial sittings of the commission were recalled to determine whether or not anything could be added to their evidence, based on their re-examination of the mine. It would appear that no change could be made in the observations which had originally been made by the witnesses who had taken part in the rescue operations and the recovery of the bodies, and who gave evidence at the initial sittings of the Inquiry.

IX. RECOMMENDATIONS SUBMMITTED TO THE COMMISSION

Recommendations were submitted to the commission by District No. 26 United Mine Workers of America, Inspectors of the Department of Mines of the Province of Nova Scotia, H.M.C. Gordon, General Manager, Dominion Steel and Coal Company, and Overman Conrad Embree. These recommendations are:

United Mine Workers of America, as follows:

1. That research be carried on by representatives of Department and Mines and Officials of the Company in the designing of an improved type of coupling.
2. The changing of intake airway from main haulage slope.
3. Removal of cable from haulage slopes.
4. A more complete and positive method of stonedusting.
5. Water spray at loading heads and on pan lines to be kept in operation.

6. Water spray over cutting bar on longwall machine to be kept in constant use when the machine is cutting coal.
7. Erection of emergency air locks throughout the mine as recommended by Mr. Embree.
8. Auxiliary telephone line Department of Mines—that inspectors be allowed to carry on investigations as provided for under the Coal Mines Regulation Act without restriction.
9. Closer inspections be made on dust and gas conditions and inspection of dust be carried on both underground and on the bankhead.
10. The Department of Mines cause the appointment of an Inspector of Rescue equipment.
11. Laboratories be set up by the Department of Mines to make necessary analysis of dust, gas, air or water samples.
12. That the Department of Mines set up in Nova Scotia a Safety Council comprised of representatives of the Coal Operators, of the Department of Mines, and representatives of the Union.

Inspectors of the Department of Mines, as follows:

Having heard the evidence that has been brought before you during the sessions of this inqquiry, and having examined those sections of the number four mine affected by the explosion of November 1, 1956, and having noted from physical evidence the cause and results of the explosion, respectfully submit the following recommendations:

(1) That a safety catch be devised to work in conjuction with the three link couplings used on the coal boxes of number four and number two mines. These safety catches to be devised so as to prevent the boxes from uncoupling except when manually operated.

(2) That the power cable be taken into number four mine via number two fan slope, through the explosion doors to the 3200 foot bottom, to the back slope hoist via the transfer level and haulage tunnel.

The power cable to be taken from 3200 foot bottom via the auxiliary deep (return airway) to the different points of utilization.

(3) That junction boxes, twenty-four hours after being filled with compound, be checked for proper setting and voids.

(4) That all loading points be equipped with water sprays to be used continuously, while loading.

(5) That all cutting machines be equipped with water sprays to be used continuously while cutting.

(6) That landings where coal rakes are being made up be equipped with water sprays to lay the dust before rakes are hoisted up the slopes.

(7) That the tipple be equipped with adequate water sprays, and that the bankhead be kept free of coal dust accumulations.

H. M. C. Gordon, General Manager, Dominion Steel & Coal Company, made recommendations as follows:

BY MR. GORDON—As far as recommendations are concerned, I would like to concur in the recommendation that has been made that an adequate water spray be set up to spray the coal in boxes on landing end before it goes to a main hoist. There are sprays on the market today and those sprays will do an excellent job. Most of our landings are equipped with sprays now.

Secondly, I would like to concur in the recommendation made by Mr. Embree that safety shelters be established and adequately equipped in every section of every level.

Thirdly, I would like to concur in Mr. Frost's recommendation that junction boxes be well recessed where a power cable is laid in a coal hoist inclined slope.

I would like to concur also in a recommendation that has been made that safety ropes be used with any trip on an inclined slope where a power cable is laid.

I would like to make this recommendation: That where a power cable is laid in any hoisting slope, that it be adequately protected by strong steel rubbing rail continuous throughout set up just below the cable itself, so that any box will strike the rubbing rail and not the cable, so that the cable cannot be got at by anything flying down the slope.

I would like to make this recommendation: All our colliery officials are compelled by law to carry a flame safety lamp. The light given by that lamp is absolutely inadequate to permit these men to carry out their duties. I would recommend therefore that colliery managers, colliery underground managers, production supevisors and maintenance supervisors be authorized to carry an electric safety lamp, and that

provision be made to see that there are sufficient examiners, and shot firers in every section of the colliery carry a lock flame safety lamp, to see that everything can be properly carried out. But so many other things dealing with safety requires a visual inspection that it is necessary that those men be given an electric lamp or they cannot carry out their duties.

Conrad Embree gave evidence, as follows:

Yes, I have one recommendation. In the most of our levels we have at least one door and I think that applies probably to every mine, or at least any mine I have worked in, and it seems to me in thinking the thing over that if probably we will say where we have one door, if within a reasonable distance, say 100 or 150 feet, we had another stopping. In the most of our levels there is a 6 inch line or an air line running in, and it seems to me in case of a fire if we had some sort of air lock there with an intake coming in and with a valve on it to be controlled, and every man in the mine and every official instructed as to its use and how to operate it, that men in case of a fire could stay there almost indefinitely, and at the same time I think there should be a place made for a roll of brattice within that air lock and a few nails and a copper hammer so that in the case of a door being damaged they could create almost an air lock. I believe with a body of men who have some instruction about that and its use and what to do in the case of an emergency.

X. RECOMMENDATIONS

Pursuant to the terms of reference, and from the evidence presented at the Inquiry, a physical examination of the mine, a study of the Coal Mines Regulation Act and an examination of the various exhibits tendered in evidence, your commission is pleased to make the following specific recommendations:

(1) Mine Rescue

The mine rscue organization should be placed under the control of the Department of Mines for organization and training.

The use of safety line and telephonic communications should be examined and considered and introduced if possible. The age limit for active mine rescue personnel should be changed so as to permit no person over the age of 40 to take part in mine rescue operations. A more thorough and rigorous training schedule than presently in use should be instituted and regulation 105(5) providing for frequent medical examinations should be rigorously enforced.

Self rescuers of the type shown in Figure (22) should be available for all underground personnel and they should be required to be carried by those pesonnel at all times.

(2) Inspection of Mines by Department of Mines Inspectors

The Department of Mines should take immediate steps to ensure that all Inspectors now engaged or to be engaged pursuant to the Coal Mines Regulation Act are qualified, competent and physically able to properly inspect the mines. Furthermore, post engagement training and examinations should be carried out and the Department should be satisfied that its personnel are qualified, both physically and technically, before their appointments are made permanent.

(3) Location of Electric Cable

A suspended electric power transmission cable should be supported by an easily breakable and flexible suspension with sufficient slack so as to avoid breakages in the event of falls or haulage accidents. Connecting boxes should be recessed, as required by the Coal Mines Regulation Act. When filled, the compound should be tested before sealing.

When cables are suspended in a haulage road some type of bumper arrangement should be provided so as to protect the cable from being struck or ruptured by coal boxes or falling material.

As an alternative, the cable might be installed on the floor and protected from falling material or derailed equipment by steel conduit or other substantial guards.

A ground trip relay system should be installed on all transmission cables and properly maintained.

(4) Illumination

The requirement of the Coal Mines Regulation Act to the effect that mine officials shall not carry any other type of lamp except the locked flame safety lamp should be repealed and mine officials should be permitted to wear an electric lamp for illuminating purposes in addition to the locked flame safety lamp used for gas detection.

(5) Rock Dusting

The provisions of the Coal Mines Regulation Act relating to rock dusting should be implicitly followed.

Rock dusting in very dusty places should always be preceded by a thorough cleaning of all dust accumulations. A wash-

ing by fire hose of the roof and ribs should be done and dust applied immediately by mechanical means.

Consideration should be given to the use of gunite guns in the application of wet rock dust to the roof and ribs.

The maximum percentage of combustible material to be allowed in the dust on the floor, roof and sides of every accessable road normally limited to 35% (Coal Mines Regulation Act, Section 68, Sub-section 2) should be reduced by 10% for every 1% of methane present in the ventilating current. This is in conformity with the requirements of the United States Bureau of Mines.

(6) Underground Rescue Stations

Underground rescue stations should be established and maintained with a supply of brattice cloth, lumber, nails and emergency rations stored therein. The location of these stations should be clearly marked and all officials and miners should know of their location.

(7) Mine Car Couplings

Efforts should be made to devise a system of mine car coupling which will preclude detachment of the cars when operated together.

(8) Completion of Reports by Company Officials

Consideration should be given to a revision of the Sections of the Coal Mines Regulation Act which deals with the completion of reports by Company officials. It is recommended that efforts be made to lessen the number of reports required so as to avoid omissions and failure to complete reports adequately.

(9) Use of Water at Loading Heads, on Cutting Machines and Pan Lines

It is recommended that consideration be given to amending the Coal Mines Regulation Act to implement the recommendations made to the Commission with respect to the use of water at the loading heads and on the cutting machines and pan lines.

XI. APPENDIX "A"

LIST OF MEN KILLED IN NO. 4 MINE EXPLOSION NOVEMBER 1st, 1956

Company check No.	Name	Occupation	Age
Bodies not Removed from Mine			
2011	Russell Morse	Overman	54
3032	Victor Henwood	Company Loader	22
2035	David Betts	Miner	30
2044	Kenneth Beaton	Miner	28
2054	Victor Millard	Putter	36
2057	Ralph Clarke	Miner	32
2064	Clair Styles	Trip Runner	47
2095	George T. Ward	Electric Hoist	47
2114	Daniel Winters	Miner	29
2117	Donald Tabor	Mechanic	34
2153	Thomas Brown	Miner	45
2174	Angus Hunter	Timberman	33
2188	Kenneth Clarke	Pack Builder	25
2199	Ernel Spence	Pack Builder	26
2232	Harold Lewis	Pack Drawer	40
2244	Wm. H. Tower	Trip Rider	55
2252	Gilbert Daken	Labourer	31
2288	Avard Glennie	Machine - Runner	44
2305	Henry McLeod	Miner	30
2315	Richard Ellis	Labourer	21
2336	Logan Milton	Trip Rider	59
2354	Floyd Beaton	Pack Builder	19
2282	Leonard McCormick	Labourer	27
2387	Alex Campbell	Miner	47
2460	Frank Allen	Miner	53
2461	Ernest Boutilier	Rope Splicer	49
Killed on Bankhead by Blast:			
154	David Vance	Banksman	20
26	Lester Nelson	Banksman	37
36	Pleaman Pyke	Banksman	34
152	Ben McLellan	Chain Runner (Bank)	50
40	Joseph Crummey	Banksman	55

39	**Leslie MacDonald**	Banksman	54
178	William Jones	Banksman	32

Bodies Removed from 3200 Main Bottom:

2256	Ephriam Alderson	Bottomer	50
2260	Gerald Dawson	Bottomer	44
2268	Lester Fisher	Chain Runner	43
2352	Burrel Pepperdine	Tunnel Haulage	49

Draegermen Killed Trying to Enter No. 4 Main Slope:

842	Alex Spence	Dragerman	44
892	William Ferguson	Dragerman	38

APPENDIX "B"

TABLE OF AIR ANALYSIS SHOWING METHANE CONTENT IN ATMOSPHERE OF SPRINGHILL NO. 4 MINE FOR MONTHS JANUARY TO OCTOBER INCLUSIVE

Ch 4

Location Where Samples Taken	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Return Top Main Fan Slope	1.20	1.13	1.10	1.10	1.20	0.90	1.26	0.80	0.97	
Return in Lower tunnel	1.00	1.13	1.20	1.20	1.20	0.90	1.03	0.80	0.80	
Total return No. 6 Seam, 4440 tunnel	1.20	1.07	1.33	1.36						
Return Top 5700 West Longwall	0.80	1.00	1.05	1.03	0.80	0.90	0.90	0.87	0.60	
Return Top 5700 East Longwall	0.60	0.70	0.80	0.86						
Return 4400 East Level	1.10	0.80	0.90	0.86						
Return 4400 West Level	1.33	1.20	1.40	1.66						
Return No. 7 Seam	0.50	0.50	0.43	0.45	0.60	0.50	0.53	0.50	0.56	
Return Electric Hoist	0.20	0.10	0.10	0.10	0.17	0.03	0.10	0.13	.05	
Return at 5400 Booster Fan					1.13	1.00	1.03	1.10	0.90	1.03
Return top 6100 East Longwall					0.23	0.13	0.30	.30	0.30	

VENTILIATION RECORD CUMBERLAND RAILWAY & COAL MINE NO. 4 MINE BEING JANUARY TO OCTOBER INCLUSIVE — 1956

APPENDIX "C"

Jauuary

Surface Fan Output	86,400 (exhausting)
Surface W. G.	13.8"
Fan Speed	1040 R.P.M.
Barometer	28.9 (steady)
Temperature	32° F.

Mine Quantities

Intake top Main Slope	78,700
Intake in Transfer Tunnel	73,900
Fresh Split to Electric Hoist	6,700
Split to No. 7 Seam	5,200
Return East No. 6 Seam	18,400
Return West No. 6 Seam	31,200
Return out Lower Tunnel	84,500

February

Surface Fan Output	88,100 (exhausting)
Surface W. G.	13.8"
Fan Speed	1050 R. P. M.
Barometer	29.15 (Rising)
Temperature	8° F.

Mine Quantities

Intake top Main Slope	76,100
Intake in Transfer Tunnel	74,100
Fresh Split to Electric Hoist	6,500
Split to No. 7 Seam	3,800
Return East No. 6 Seam	18,100
Return West No. 6 Seam	29,300
Return out Lower Tunnel	82,500

March

Surface Fan Output	82,600 (exhausting)
Surface W. G.	14.1"
Fan Speed	1042 R.P.M.
Barometer	29.75 (steady)
Temperature	19° F.

Mine Quantities

Intake top Main Slope	76,200
Intake in Transfer Tunnel	74,000
Fresh Split to Electric Hoist	7,500
Split to No. 7 Seam	3,700
Return East No. 6 Seam	16,900
Return West No. 6 Seam	29,200
Return out Lower Tunnel	80,800

April

Surface Fan Output	81,400 C.F.M.
Surface W. G.	14.5"
Fan Speed	1060 R.P.M.
Barometer	29.26 (steady)
Temperature	42° F.

Mine Quantities

Intake top Main Slope	73,800
Intake in transfer tunnel	74,400
Fresh Split to Electric Hoist	6,200
Split to No. 7 Seam	5,200
Return East No. 6 Seam	21,100
Return West No. 6 Seam	28,800
Return out Lower Tunnel	80,800

May

Surface Fan Output	82,600 C.F.M. (exhausting)
Surface W. G.	15.0"
Fan Speed	1062
Barometer	29.77
Temperature	69° F.

Mine Quantities

Intake Top Main Slope	75,600
Intake in Transfer Tunnel	74,200
Fresh Split to Electric Hoist	5,500
Split to No. 7 Seam	4,400
Split to 6100 East Longwall	10,200
Split to 6100 West Longwall	13,200
Split to 5700 West Longwall	20,200
Intake to Booster Fan 5400 Level	57,800
Return out Lower Tunnel	78,200

June

Surface Fan Output	83,700 (exhausting)
Surface W. G.	14.9"
Fan Speed	1060 R.P.M.
Barometer	29.50 (steady)
Temperature	62° F.

Mine Quantities

Intake top Main Slope	75,400
Intake in Transfer tunnel	70,100
Fresh Split to Electric Hoist	5,400
Split to No. 7 Seam	3,400
Split to 6100 East Longwall	10,400
Split to 6100 West Longwall	12,100
Split to 5700 West Longwall	20,400
Intake to Booster Fan at 5400 Level	57,300
Return out Lower Tunnel	80,200

July

Surface Fan Output	82,700 C.F.M.
Surface W. G.	14.9"
Fan	1062 R.P.M.
Barometer	29.30 (rising)
Temperature	66° F.

Mine Quantities

Intake top of Main Slope	72,200
Intake in Transfer Tunnel	70,200
Fresh Split to Electric Hoist	6,100
Split to No. 7 Seam	2,700
Split to 6100 East Longwall	11,200
Split to 6100 West Longwall	12,200
Split to 5700 West Longwall	18,400
Intake to Booster Fan 5400 Level	55,100
Return out Lower Tunnel	80,500

August

Surface Fan Output	84,200 (exhausting)
Surface W. G.	15.2"
Fan Speed	1072
Barometer	29.30 (rising)
Temperature	58° F.

Mine Quantities

Intake top Main Slope	74,700
Intake in Transfer Tunnel	72,700
Fresh Split to Electric Hoist	7,600
Split to No. 7 Seam	2,600
Split to 6100 East Longwall	10,200
Split to 6100 West Longwall	13,600
Split to 5700 West Longwall	22,500
Intake to Booster Fan 5400 Level	55,100

September

Surface Fan Output	83,700 (exhausting)
Surface W. G.	15.0"
Fan Speed	1059 R.P.M.
Barometer	29.4 (Rising)
Temperature	46° F.

Mine Quantities

Intake top Main Slope	72,900
Intake in Transfer Tunnel	71,800
Fresh Split to Electric Hoist	7,500
Split to No. 7 Seam	2,400
Split to 6100 East Longwall	9,900
Split to 6100 West Longwall	10,100
Split to 5700 West Longwall	23,800
Intake to Slope Tunnel Drivage	4,100
Intake to Booster Fan 5400 Level	54,200

October

Surface Fan Output	73,900 (exhausting)
Surface W. G.	16.2"
Fan Speed	1055 R.P.M.
Barometer	—
Temperature	—

Mine Quantities

Intake top Main Slope	67,200
Intake to transfer tunnel	—
Fresh Split to Electric Hoist	6,900
Split to No. 7 Seam	—
Split to 6100 East Longwall	7,900
Split to 6100 West Longwall	6,400
Split to 5700 West Longwall	18,700
Intake to Slope Tunnel Drivage	—
Intake to Booster Fan 5400 Level	52,900