POLYURETHANE PROGRAMME - LONGWALL 7

Statement by Paul Harrington

During the initial driveage for the development of Longwall 7, the line of a dyke was established in 477 Panel and development showed the dyke would pass through the tail gate side of the longwall block.

During development of 4 Area and of Longwall 7, the dyke was penetrated with a continuous miner on approximately fourteen occasions. The dyke was known to be soft and while roof conditions in the immediate vicinity were poor, they were definitely not unmanageable.

During the development, the roof in the area of the dyke has fallen on two occasions. Both of these however, were considered to be due to insufficient initial support and were therefore not of major concern.

When longwall 7 commenced operations, the location of the dyke was about 30 metres from the tail gate end of the 150 metre wide face. Initially no problems were experienced in cutting, however after the wall had advanced approximately 40 metres a fall occurred at the face. The fall extended for approximately 5 metres along the face with the dyke on the main gate end. The material from the fall buried the face conveyor to the point where it could no longer be operated and consequently a loader was used to remove the fall material into the tail gate.

A large volume of broken goaf material was then held above chocks Nos. 84 to 89 and any attempt to advance any of these chocks caused an immediate slippage of the broken material onto the face conveyor. Concurrently, both the seam and the overlying strata in front of these chocks fretted to the point where the face was approximately $3^{1}/2$ metres from the extension bar of the chock.

Diagram 1 shows a cross section of the locations of the chocks in relation to the fall. No support could be undertaken of the face area due to the danger to employees brought about by the possibility of falling material overriding the chocks.

It was recognised that in order to allow the face to be advanced, firstly an artificial roof would have to be constructed between the chocks and the face, and secondly, both the seam and the strata above the seam in the immediate vicinity of the face would have to be consolidated prior to cutting commencing.

The original thoughts were to establish a roof as shown in Diagram 2. This would be erected by constructing a beam between the extension bars of the chocks and the face. The artificial roof formed in this fashion would have to be strong enough to withstand the impact of stone falling from the top of the fall area which, by this time, exceeded 20 metres high. This method of constructing an artificial roof was abandoned because it was impossible to carry out the construction without committing employees to working close to the face in an extremely dangerous location.

Consideration was also given to shortening the longwall face by driving a heading using a continuous miner on the main gate side of the dyke, as shown in Figure 3. An analysis of this alternative revealed that the face conveyor could be shortened and the drivage could be achieved, however the chocks could not be removed with safety and it would be likely that one or more chocks would need to be abandoned.

It was necessary to obtain an artificial roof which could be established from an area of safety at either end of the fall or from within the cover of the chock canopies. For this to be achieved the artificial roof had to be substantial enough to withstand a fall from the top of the goaf but at the same time, light enough to enable erection from a point of safety.

A polyurethane material had been used for strata binding by in-seam injection. This material is very light, however once set, becomes very strong. It was therefore proposed to form a plug of polyurethane material as the artificial roof. The material is pumped as a liquid and consequently had to be constrained to some extent so stonedust bags on pallets were loaded onto the face to form a solid barrier between the face and the chocks. Brattice was then draped over the stonedust bags and sealed at each end of the fall.

Figure 4 shows the position of the stonedust bags and brattice on the face prior to the application of the polyurethane bonding material. Initially pumping of polyurethane commenced and 1300 litres was pumped into the cavity on L/W 7 face in front of 85 - 91 chocks. Pumping started at approx. 3.30 a.m. on Thursday 11th December 1986 and was completed at 10.00 a.m. The material filled the void in between the stonedust and the face and there was a thin layer across the extension bars of the chocks.

I received a telex from Ron Aiken, Technical Manager, Chemfix, at approx. 11.00 a.m. on Thursday 11/12/86 (see copy attached). The main point of the telex was that pumping should cease after 1000 litres of material was pumped or alternatively each one metre of depth of foam was reached. The telex stated pumping should cease for 16 hours to allow for cooling. On receiving this telex, a phone call was made by Chemfix and Mr. John Schott was told we had in fact pumped 1300 litres before stopping. After consulting Mr. Aiken, Mr. Schott informed us there would be no problem, provided we waited the full 16 hour cooling down period.

Pumping on the second stage was due to start at 2.00 a.m. Friday 12/12/86. Due to problems with the pump, the second stage didn't in fact start until 4.00 a.m. The same volume, i.e. 1300 litres, was pumped in approx. 3 - $3\frac{1}{2}$ hours. The job was completed and the pump cleaned up for 7.30 a.m 12/12/86. The Arnall's people (Mr. Ron McKenzie being in charge), came out with night shift people. Mr. McKenzie reported no problems other than trouble with the pump at the start of the shift.

At approx. 10.30 a.m. on Friday 12/12/86, Warwick Anderson rang and was noticeably distressed. He reported yellowish/brownish fumes to be coming off the polyurethane. He stated he had looked up through the man-hole at the maingate end of the cavity and saw fumes rising off what appeared to be a boiling mass of the material. This "boiling" material was about half way across the cavity and closer to the face. Warwick was told to stand by the phone whilst a phone call was made to John Schott of Chemfix. Before getting on to Mr. Schott, Warwick had rung back again and was anxious about the situation. He was instructed to break the stonedusting hose along the back of the spill trays and to push stonedust up over the material in question.

John Schott was then contacted and informed of the situation. He agreed that covering the material with stonedust was the correct way to go. He was, at this stage, asked for a data sheet on the fumes being released and about what effects they would have on men working in the contaminated area. Mr. Schott advised us to stay on the fresh air side of the fumes. He then left Chemfix, Nowra to bring the data with him and to go down to observe what was happening.

Prior to the second pump, John Schott had asked if we minded him using A.C.I.R.L. to monitor temperatures in the material. This was agreed to, as there was no other way of monitoring the temperatures and we would also get an idea of the depth of cover. The person from A.C.I.R.L. didn't arrive until late afternoon on Friday 12/12/86. A.C.I.R.L. had had a lot of difficulty procuring the materials required for the heat sensing probe.

On arrival at the pit, just after afternoon shift had gone down, Mr. Schott went underground with myself to the trouble area on L/W 7. Also in our company was Mr. M. Loy (District Check Inspector) who, in the company of Mr. T. Carr (Local Check Inspector), had made an earlier inspection of the site on day shift. M. Loy and T. Carr had been advised by myself to inspect the site after the problem had been reported to me earlier on day shift.

On arriving at the site, M. Loy reported to us there had been a definite colour change in the issuing fumes and that the fumes were less dense than on his previous inspection on day shift. Mr. John Schott told us the problem of the issuing fumes had been caused by the fact that the second 1300 litre pour of that morning, was pumped too fast. The pumping cycle should have been spread across a time period of 6 - 8 hours. He went on to say that the change in colour and density of the issuing fumes was a clear indicator that the material was cooling down. Mr. Schott took several temperature readings (see attached) at various points to ensure this was in fact the case. With that, both M.Loy and myself were satisfied that the process taking place in the ploYurethane was slowing down and, given time, would in due course cease. We left the scene, leaving afternoon shift people to observe the site.

Whilst travelling outbye to pit bottom a couple of stops were made to check district and main return airways. It was found that the fumes had contaminated all these roadways back as far as the No.1 upcast shaft. On arriving at pit bottom it was decided to isolate the 4 Area of the pit due to the contamination of the atmosphere in the second egress. Evening shift only worked 3 Area of the mine with the exception of two men in 4 Area based at L/W 7. These two men were experienced, one a deputy and one a rescue trained miner (i.e. P. Forbes and W. Morris respectively). These two men were told to stay on the fresh air side of the problem area, with Siehe Gorman gear at the ready, continually monitoring the situation.

After lengthy discussions with M. Loy (see copy of District Check Inspector's Report dated 12/12/86) and both being satisfied the situation was under control and that everything that could be done was being done, I left the mine at approx. 11.05 p.m. on the night of 12/12/86.

Finally, without going into the details of the fire in this report, I was rung at home by Mr. B. Hadley, the Evening Shift Undermanager, to tell me there had been a fire at the site of the injected polyurethane, the fire was now out, but there were still hot areas. This phone call would have been around 1.00 - 1.30 a.m. Saturday 13/12/86. I instructed Mr. Hadley to invoke the Emergency Procedure and immediately proceeded to the mine.

P. HARRINGTON