

REPORT ON THE ABERFOYLE - LUTWYCHE SURVEY

Summary :

The original surface and underground survey bearings in and around the Aberfoyle Mine, Rossarden were initially transferred from the original Lease Boundary Survey, which are directly related to Magnetic North.

REPORT

ON

On July 5th - 6th, 1968 the Mean Azimuth Bearing was established by Messrs. G. B. STANDARDISATION OF MINE SURVEY BEARINGS on the Staff of the University of N. S. W. This survey also included Observations for Latitude and Longitude Observations (see Report No. 6, Department of Surveying, University of N. S. W.).

IN THE

The determination of ABERFOYLE - LUTWYCHE AREA indicated a variation of  $10^{\circ} 14' 32''$  between the adopted Mine North and Mean Grid North. This variation has now been adopted as the standard deviation between Mine Bearings and Mean Azimuth Bearings for all past, present and future surveys in the Aberfoyle - Lutwyche Mines, both surface and underground.

FROM

GYRO-THEODOLITE SURVEY

Summary of Results of Gyro-Theodolite Surveys :

AUGUST, 1968

Astronomical Observations for Latitude and Longitude - 5 - 6th July, 1968

Mean Azimuth of Line 2/100	$304^{\circ} 16' 21''$
by Gyro-Theodolite	
Mine Bearing of Line 2/100	$294^{\circ} 01' 49''$
by transfer from original survey	

Standard deviation between Mean Azimuth Bearings and Mine Bearings A. J. MURPHY  
MINES SUPERINTENDENT.

Standard Co-ordinates accepted for Surface	
Station 3/100	5569.797N
	1642.119E

Standard Co-ordinates accepted for	
Underground Station 1/100	5569.595N
	1642.450E



The following report is a complete summary of all survey data connected with the tying-in of the Lutwyche surface to underground via Spiers Shaft.

Phase 1 - Initially, the bearing and datum co-ordinates of the 13 Level crosscut were adopted from a Shaft Plumb carried out on the 7th January, 1967 by Mine Surveyor, Mr. L. Jeffery, from 8 Level to 13 Level. This survey was primarily carried out to establish a working survey for the M.O.P. system between 7 and 12 levels and was only continued to 13 Level to provide a commencement bearing for the crosscut (see sheets 1 & 2). It was intended that a second shaft plumb be done from the surface to 13 Level to establish the final bearing and co-ordinates for the crosscut.

As no reliable surface bearings were available to tie in both the shaft plumbing to 13 Level and the surface traverse to the Lutwyche site, it was decided to transfer the bearing and co-ordinates from 8 Level to the surface to re-establish a main base line.

This survey was carried out on 25th April, 1968 by R. Wood and L. Jeffery (sheet 3). The results of both surveys are shown on the attached survey sheets.

Phase 2 - Following negotiations with the Department of Surveying, University of N. S. W., Messrs. G. Bennett and J. Freislich, Senior Lecturers at the University, carried out a Gyro-Theodolite Survey to establish Mean Azimuth Bearings, both surface and underground. They also obtained Astronomical Observations for Latitude and Longitude in addition to Azimuth -

Latitude  $S41^{\circ} 39' 40''$   
Longitude  $E 9^{\text{h}} 51^{\text{m}} 00^{\text{s}}.0$

Summary of results from Gyro-Theodolite Survey by Messrs. Bennett and Freislich :-

<u>Line</u>	<u>Mean Azimuth from Gyro</u>	<u>Mine Value</u>	<u>Gyro-Mine</u>
S/100-S/099	$304^{\circ} 16' 21''$	$294^{\circ} 01' 49''$	$+10^{\circ} 14' 32''$
13/004-13/L1	$38^{\circ} 24' 14''$	$28^{\circ} 09' 56''$ (see amended bearing )	$+10^{\circ} 14' 18''$

The Surface Line S100 - S099 was established by Shaft Plumbing from 8 Level to be the Main Base Line for the Gyro-Theodolite Survey and thence the surface traverse to the Lutwyche Shaft Site.

The Station S100 was also used by Messrs. Bennett and Freislich to obtain Latitude and Longitude.

Both S100 and S099 are to be permanently protected by steel casing and concrete to provide maximum stability for future surveying around the surface areas of both Aberfoyle and Lutwyche.

All surface stations related to this base line are steel pins set in concrete and large painted posts are to be set into the ground as location and protection markers.

Phase 3 - Following the establishment of Mean Azimuth, both surface and underground, a single wire plumb was carried out by the Mine Surveyors, R. Wood and L. Jeffery, on 7th July, 1968 to establish new co-ordinates on 13 Level. The co-ordinates of S100, previously established from 8 Level, were accepted as the Mine datum and these were transferred to station 13004 as the main datum on 13 Level. These co-ordinates were altered slightly following a further series of shaft plumbings (see attached Survey Traverse sheet No.6).

Phase 4 - From the results of the Gyro-Theodolite Survey it was apparent that the difference between Mine Bearings (from Lease Boundaries) and Mean Azimuth Bearings was in excess of  $10^{\circ}$  and that the only surveys available to derive a reasonably accurate difference between the two, were the two shaft plumbings previously carried out between 8 Level to 13 Level (7.1.67) and between Surface to 8 Level (25.4.68).

Although these two surveys gave a reasonably good comparative result between Mine and Azimuth Bearings, it was decided that a further shaft plumbing direct from Surface to 13 Level would be carried out using S100 - S099 as a base line and tying-in to 13004 - 13L01.

On 21st July, 1968, R. Wood and L. Jeffery carried out a double shaft plumbing from Surface to 13 Level, leaving the suspended wires in position, they transferred bearings and co-ordinates by -

- (a) The Weisbach Triangle Method
- (b) The Equalateral Triangle Method.

The difference between the Mean Azimuth Bearings and Aberfoyle Mine Bearings became as follows:-

Mean Azimuth Bearing on S100-S099 from Gyro-Theodolite Survey	304°16'21"
Applied Mine Bearing on S100-S099 transferred from 8 Level	294°01'40"
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	10°14'81"

Phase 5 - Summary and Comparison of Results in Relationship to Shaft Plumbings with Gyro-Theodolite Surveys.

Following completion of the double shaft plumbing of 21st July, 1968 all shaft plumb surveys connected with the transfer of bearings and co-ordinates between 8 Level, 13 Level and surface were recalculated independently by both Surveyors, R. Wood and L. Jeffery. From this, a slight error in calculation of bearing and co-ordinates in the original survey from 8 Level to 13 Level was disclosed. This error did not materially affect the plotted position of the 13 Level crosscut as it was only in the order of  $00^{\circ} 07' 00''$ .

The results of these shaft plumbings as compared with the results obtained from the Gyro-Theodolite survey are tabulated as follows :-

Surface Bearing	13 Level Bearing	Bearing Difference	Difference from Gyro	Remarks
S100-S099	13004-13L01			
$304^{\circ} 16' 21''$	$38^{\circ} 24' 14''$	$265^{\circ} 52' 07''$		Gyro-Theod. Survey
$294^{\circ} 01' 49''$	$28^{\circ} 16' 41''$	$265^{\circ} 45' 08''$	$+10^{\circ} 07' 33''$	Combination of shaft plumb 8L-13L(7.1.67) 8L-Surface (25.4.68)
$294^{\circ} 01' 49''$	$28^{\circ} 22' 08''$	$265^{\circ} 39' 37''$	$+10^{\circ} 12' 30''$	Weisbach Surface-13 L.
$294^{\circ} 01' 49''$	$28^{\circ} 21' 28''$	$265^{\circ} 40' 21''$	$+10^{\circ} 11' 46''$	Equalateral triangle Surface-13 L.

As a result of the above surveys, it was decided to accept the Mean Azimuth Bearings from the Gyro-Theodolite survey giving a correct bearing difference of  $265^{\circ} 52' 07''$  between surface and underground on 13 Level.

To obtain the difference between Mean Azimuth and Mine Bearings it was decided to accept the bearing from S100-S099 as transferred from 8 Level, viz.  $294^{\circ} 01' 49''$ .

This would ensure that all previous surveys throughout the Aberfoyle Mine would be tied in to the Lutwyche Mine with a reasonable degree of accuracy.

The difference between the Mean Azimuth Bearings and Aberfoyle Mine Bearings become as follows :-

Mean Azimuth Bearing on S100-S099 from Gyro-Theodolite Survey	$304^{\circ} 16' 21''$
Applied Mine Bearing on S100-S099 transferred from 8 Level	$294^{\circ} 01' 49''$
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	$+10^{\circ} 14' 32''$

Therefore as from 7.7.1968 the standard deviation between Mine Bearings and Mean Azimuth Bearings =  $+10^{\circ}14'32''$ .

The Mean Azimuth obtained by the Gyro-Theodolite between the underground stations 13004 - 13L01 was also accepted as the Main Base Line Bearing for future surveys underground. The corrected Mine bearing for this line was obtained by subtracting the Standard Deviation ( $10^{\circ}14'32''$ ) from the Mean Azimuth Bearing ( $38^{\circ}24'14''$ ) as follows :-

Therefore Mean Azimuth Bearing between 13004 - 13L01 =  $38^{\circ}24'14''$   
- Standard Deviation =  $10^{\circ}14'32''$

Therefore corrected Mine Bearing between 13004-13L01 =  $28^{\circ}09'42''$

Therefore as from 7.7.1978 the corrected Mine Bearing for the line 13004 - 13L01 on 13 Level becomes  $28^{\circ}09'42''$  for the transfer of Mine Bearing to the Lutwyche Mine.

Phase 6 - Co-ordinates -

As the line S100 - S099 was accepted as the Main Base Line for all future surveys on the Aberfoyle - Lutwyche area, so it was decided that the co-ordinates of station S100 be adopted as the Standard Mine Co-ordinates, viz. :-

S100 Latitude 5693.297 N  
Departure 1629.119 E

These co-ordinates were then transferred underground to Station 13004 by the following methods (see sheet 6) -

	Station	Latitude	Departure
(a) Single Wire Plumb (7.7.68)	13004	5569.589 <sup>N</sup>	1642.339 <sup>E</sup>
(b) South Wire - Double Plumbing (21.7.68)	13004	5569.595	1642.450 X
(c) North Wire - Double Plumbing (21.7.68)	13004	5569.618	1642.465

X The co-ordinates obtained from the calculations applied to the south wire during the plumbing operations on 21.7.68 were accepted as the true Mine Co-ordinates for Station 13004 on 13 Level and are to be continued on from that station.

Therefore as from 7.7.68, the co-ordinates to be accepted and applied for future surveys, both surface and underground, are as follows :-

Surface - S100 Latitude 5693.297N 1629.119E  
Underground - 13004(13/L) Latitude 5569.595N 1642.450E

Phase 7 - Surface Traverses - Lutwyche -

Following the acceptance of the line S100 - S099 as the Main Base Line, an accurate surface traverse between Aberfoyle - Lutwyche established by R. Wood, prior to the Gyro-Theodolite survey, was then tied into this base line and recalculated to give corrected Bearings and Co-ordinates. The main section of this traverse has been closed in itself and closed back onto the line S100 - S099 by retraversing along the line from S093 - S100 reading the angles at S100 from both directions (see accompanying sketch, sheet 9).

It is intended to close this traverse a stage further by traversing from S099 to close into the main traverse.

The section of the survey commencing from S093 and closing back to that point had an angular misclose of  $00^{\circ}00'08''$  or 1 in 37,100 (see sheet 7).

A. J. Murphy

Mines Superintendent

Acknowledgements -

I would like to acknowledge our thanks to the Staff of the Surveying Department, University of N.S.W. (especially Mr. G. Bennett and Mr. J. Freislich) and also "Unisearch" for their co-operation in accepting our request for their assistance, the manner in which their work was carried out in the field and in the splendid presentation of their completed Report.

I would also like to congratulate our two Mine Surveyors, Mr. R. Wood and Mr. L. Jeffery and their Assistants who contributed largely to the success of this operation.

Their work has been meticulous at all times and during most of the time was carried out under adverse conditions, especially when transferring the bearings from surface to underground.

Comments -

Wild T16 instruments were used throughout all surveys and found very serviceable for the job.

The chain used to measure all traverse lines over 100 ft was a 300 ft band which had been standardised a couple of years ago but has had little useage since.

Fifteen pounds pressure was applied on all measurements using a spring balance, whilst temperature, sag and slope corrections were also applied to all measurements. Vertical angles for slope corrections were measured with the theodolite.

All surface stations consist of bronzed topped steel spikes set in cement.

