



Mine Name	MineID	Operator	Activity Type	Activity Date
Moranbah North	MI00750	Anglo Coal (Moranbah North Management) Pty Ltd	Inspection	17/09/2019

Vision: Our Industries Free of Safety and Health Incidents

Mine Record Entry

This report forms part of the Mine Record under s68 of the Coal Mining Safety and Health Act 1999. It must be placed in the Mine Record and displayed on Safety Notice Boards.

Note that inspection or audit activities conducted by the Mines Inspectorate are based upon sample techniques. It remains the primary responsibility of Mine Personnel to identify hazards, and risks associated with Operations and ensure those risks are at an acceptable level.

Site Safety & Health Reps Consulted: (Acting) Damien Gehrmann

Today the 17th September 2019 Department of Natural Resources Mines and Energy inspectors Malcolm Brownnett and Keith Brennan travelled to Moranbah North underground operations to investigate the recent high number of gas exceedances and rib failures including a general inspection.

Opening Meeting:-

An opening meeting was held with SSE/General Manager Scott Dobbie, Ventilation Officer James Grebert, Development Superintendent Alan Green, Operations Administration Chantal Stone, EEM Patrick Tait, Gas and Ventilation Superintendent Owen Morgan, Technical Services Manager Wesley Noble, Geotechnical Engineer Peter Yee, SSHR Damien Gehrmann and Engineering and Maintenance Manager Brendan Kelly.

Previous Mine Record Entry:-

We briefly reviewed Mine Record Entry 17th July 2019 by Electrical Inspectors Paul Sullivan and Neville Atkinson. The introduction of Bartec IS Tablets for underground statutory reporting was discussed.

Safety Information:-

Mines safety alert no. 368 – Inrush from ventilation shaft

Mines safety bulletin no. 183 – Use of compressed air for cleaning

Mines safety bulletin no. 184 – Storm season 2019

Resources Safety and Health Newsflash – Drager PSS 5000 Self Contained Breathing Apparatus (SCABA)

Resources Safety and Health Newsflash – Structural failure – Overburden Drill Mast

High Potential Incidents - Gas Exceedances 605 Panel:-

Inspector Mal Brownnett commenced reviewing gas exceedances from 26th April 2019 to 8th September 2019. Engineering and Maintenance Manager Brendan Kelly provided an overview of Shaft 4 fans 8 and 9 outages. Over the past 10 days Moranbah North has experienced several power outages resulting in the loss of ventilation at shaft 4 fans. This in turn provided an outcome of methane greater than 2.5% in MG605.

Mr Kelly explained the proximity of 66000Kv power lines and insulators contaminated by exhausting ventilation streams and provided the following breakdown.

A break-down of the events:-

- Outages on the 31/08 and 1/9/2019 - Phase fault on the Sub 810 66kV feeder resulting in loss of supply to Sub 900, Shaft 4 Vent Fans and Seamgas Infrastructure. *Pollution build up on the 66kV circuit breaker at Sub 900. Outage was planned and insulators were cleaned on the 2/09/2019.*
- Outage on 4/09/2019 - Loss of 11kV supply to Sub 810 substation. Loss of 66kV to Sub 900, Shaft 4 Vent Fans and Seamgas Infrastructure. Insulation failure on 11kV B phase cable supplying Sub 810. Loss of supply to Sub 900, Shaft 4 Vent Fans and Seamgas Infrastructure was due to fault finding activities. In this situation the Shaft 4 vent fans were back up and running within 12 minutes. *Cable was taken out of service and power restored. The transformer is now running at a reduced capacity as 1 cable was removed from each phase circuit. Cables are planned to be upgraded when second 66/11kV transformer is returned to site.*
- Outage 8/09/2019 -Sub 900 66kV circuit breaker trip resulting in loss of supply to Sub 900 and Shaft 4 Vent Fans. Transformer oil temperature trip. Temperature sensor was found to be faulty. *Temperature sensor trip was disconnected from circuit. Daily monitoring of transformer oil temperature is performed. New sensor being sourced and will be installed during the planned Sub 900 outage in early October.*

Inspector Mal Brownnett enquired if a procedure was in place for de-gassing 605 roadways outbye the last open cut-throughs in the event of rapid CH₄ accumulations if ventilation was not restored within an acceptable time frame?

Ventilation Officer James Grebert provided a copy of Anglo American Moranbah North Standard Work Guideline - Procedure for Panel Degassing. The SWG requires the use of machine doors to be open in a controlled manner to de-gas roadways after ventilation is restored in the event of ERZ Controllers detecting CH₄ contaminated roadways during panel re-entry.

High Potential Incidents - Rib/Strata Failure:-

Inspector Brennan produced six High Potential Incident 1A forms reporting rib failures in 604 Maingate panel. A seventh HPI rib failure was reported by UMM Michael Lerch on Monday 16th September 2019. Discussion identified the majority of rib failures were inbye the current longwall face one fall occurred on the belt road on the 15th April 2019.

Technical Services Manager Wesley Noble and Geotechnical Engineer Peter Yee provided advice as to the rib failures, an increased rib support pattern has been introduced. Abutment loading following longwall 604 retreat has been a major contributing factor, increased rib bolting density/pattern in maingate 605 has reduced rib spoil.

Technical Services Manager Wesley Noble advised a trial using Silcrete to reduce rib spoil has been discontinued the inspectorate were advised the exothermic chemical reaction of Silcrete reaches 105°C. Geotechnical Engineer Peter Yee provided copies of BASF (Chemical Company) MasterRoc - TSL - 865 (Formerly known as Meyco TSL - 865) a one-component polymer based powder/spray application on rock and coal surfaces for surface support and MasterRoc - TML 5 used for surface sealing of coal surface.

Inspector Brennan advised the appropriate diligence is required i.e. licensing, procedural and health monitoring shall be in place before any trails can take place.

Geotechnical Engineer Peter Yee responded Moranbah North have identified the following contributing factors regarding rib failures:-

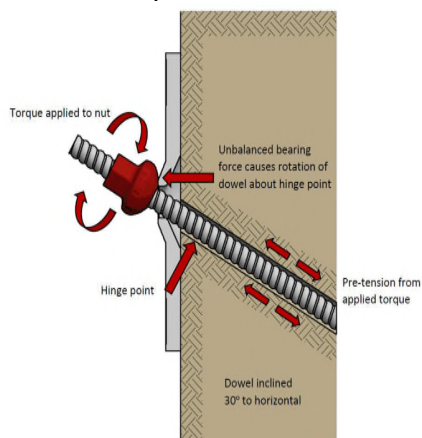
- MG604 installed 3 x 1.8m 22mm High Torsion (HT) fibreglass rib bolts/1.0m on the blockside and has seen a number of rib failures occur with this density of support. The HT fibreglass bolt has a shear capacity of >50 kN which is the failure mode experienced in rib failures.
- Less than anticipated encapsulation was observed in a number of failures where 1000mm x 24mm spin to hold resin was used.
- Adverse cleat direction on the blockside, causing large sheets to form along the face cleat.
- Over tensioning of HT fibreglass bolts which have a shank torque strength of >130N.m. causing damage at the collar of the bolt and shear failure of the fibres and failure at the collar (immediate 50mm-80mm) when minor bulging of the rib is experienced.

- Angle and height of the lower rib bolt promoting fracture propagation around the Tonstein band.
- Abutment loads from the retreating longwall, causing ribs to buckle, bulge and deteriorate.
- Machinery interaction with the rib causing a loss of confinement and damaged installed support (bolts and mesh). During roadway management grader blade interaction with installed rib support and below sprayed shotcrete has undercut and destabilised the condition of the rib. An increase in load on the undamaged installed fibreglass rib bolts has been experienced causing increased load and shear failure to occur in places.
- Water bodies deteriorating the condition of the floor and lower rib condition.

Improvements to rib support and response:-

Moranbah North have made a number of changes to the support of the blockside ribs, where fibreglass rib bolts are utilised. The changes made are as per the following:

- Trial and implementation of an Extra High Torque (XHT) fibreglass dowel with shank torque strength of >290 N.m. provided to resist over tensioning during installation and a rod shear strength of >60 kN. XHT bolts are grey to differentiate between the HT (white) fibreglass bolts.
- 1200mm spin to stall resins were trialled and implemented to improve encapsulation, in addition to this larger limestone grit particles were added to assist in shredding the capsule and improvement in bond strength of the resin to bolt/coal.
- An amendment to the provided plastic steel combination plate increased the hole aperture to 42mm (from 36mm) to allow bending of bolt at collar upon installation at various angles. The 42mm aperture retained the desired 5t pull-through load.



The position of the lower rib bolt has been restricted between 1.4m - 1.6m height i.e. above Tonstein band – to reduce the bolt angle and provide a better quality of installation.

- A 4 x 1.8m fibreglass rib bolt pattern was implemented from MG604 34ct inbye and has continued to be installed at this density in MG605 with great success. The formation of installed rib bolts has recently been assessed and changed to provide improved distribution and confinement of the rib.

I, inspector Brennan advised due to the significant rib/strata failures I will be issuing a Directive to increase rib re-support activities in maingate 604.

Bartec IS Statutory Reports:-

Prior to travelling underground the inspectorate requested to view the electronic ERZ Controller reports. ERZ Controller Damien Gehrman was requested to demonstrate how coal mine workers access the information on the viewing screen connected to Technical Services printer 17. ERZ Controller Gehrman was able to display night shift 17th September 2019 explaining in detail gases recorded, ventilation quantities. A Strata Defect was recorded for 604 Maingate panel.

The report dated 15th September 2019 - Strata Defect Report. The report recorded rib failure on the 14th September 2019 Maingate 604, the report aligns with a reported High Potential Incident reported to inspector of mines Theo Kahl. *Geologist is required to inspect is an action from the report.* I enquired as to the time period and was advised by Technical Services Manager Wesley Noble and Geotechnical Engineer Peter Yee a geologist is required to inspect within 7 days (paper

system) the electronic system *shall* also illustrate the requirement for a 7 day inspection by a geologist.

Geotechnical Engineer Peter Yee displayed a 32mm rib dowel soon to be trialled, the rib support had a torques tension plate attached, chemical length for the trial rib bolt x 1500mm x 36mm medium set chemical the nut breakaway tension requires ~140N.m.

Control Room:-

The CRO was able to display recent gas levels in 605 maingate at 8:11am a spike of 2.35% CH₄ was recorded. (During the inspection of 605 we established the spike was due to calibration by Bull Gang electricians). Shaft 4 fans 8 and 9 were running with a total pressure of 3955 Pascals.

Inspection:-

In the company of SSE/General Manager Scott Dobbie, EEM Patrick Tait, Ventilation Superintendent Owen Morgan, Technical Services Manager Wesley Noble, Geotechnical Engineer Peter Yee, SSHR Damien Gehrmann and Shift Coordinator Joe Wills we travelled to 605 maingate, travel roads are maintained to a high standard we did not observe any unsafe conditions during travel.

605 Panel Crib Room:-

Inspector Mal Brownnett had a conversation with the Bull Gang ERZ Controller regarding the degassing procedure for 605 panel and if he had been trained in the degassing of the panel. The ERZ Controller had an understanding of the procedure but was not trained in degassing of 605 panel. Inspector Brownnett discussed training of ERZ controllers with SSE General Manager Mr Scott Dobbie that all ERZC should be trained in degassing procedure for 605 panel. SSE General Manager Mr Scott Dobbie agreed and a training plan will be developed by the VO to train all ERZC in the degassing procedure for 605 panel starting from the night shift 17-09-2019. The ERZ Controller discussed the activities being conducted in 605 panel. Drill rods were currently being recovered from A 35c/t flanking hole targeting out to 39 c/t.

605 Panel:-

Inspector Brownnett had a discussion with day shift ERZ Controller for 605 Maingate panel. The discussion of the 605 panel de-gassing and had he been trained in the procedure for 605 panel/face area. The ERZ Controller had been trained in the degassing procedure and had degassed the 605 panel/face area twice.

The ERZ Controller explained the de-gassing process for the panel/face areas and was very confident in this process including de-gassing using the auxiliary fans, the ERZ Controller was confident and had a good understanding how to de-gas safely including the use of brattice in the event of the unavailability of the auxiliary fans. The ERZ Controller explained the dropping down of brattice that is hung on the roof in A & B headings to ventilate and de-gas both headings, his knowledge of the different ways to safely de-gas 605 face area was clear and precise.

Inspector Brennan discussed the Alternative Mining Method as distinct from Remote Mining with a miner driver. The coal mine worker had a sound knowledge of alternative mining being carried out in A and B headings, B heading CM008 was stood during drivage of 36ct. The Bull Gang crew consisting of trades (who confirmed the calibration CH₄ spike) all understood the requirements and controls for Alternative Mining.

An inspection of the production faces followed commencing in B heading. The brattice wing from 35ct was providing adequate ventilation to reduce gas levels at the miner to 0.55% roof and 0.42% CH₄ general body on the intake side of the brattice wing. In A heading Bull Gang workers were pumping 8 metre mega bolts, The inspectors discussed the use of a collective/team SLAM as each coal mine worker relied on actions of other workers.

'A' heading overdrive was ventilated, 0.62% CH₄ was detected above head height in the general body, it was suggested to the ERZ Controller to carry a probe due to the high levels of CH₄, a hurdle screen had been erected outbye the face tube, it was observed faulting existed in the centre of the face.

At CM011 readings of 0.72% roof and 0.62% CH4 general body, the roof and face areas gave no indications of structures. Outbye the face an environmental Trolex monitor was reading 0.41% CH4 general body. The inspectorate requested to inspect the belt roadway, fan installation, the boot end was free of spillage. Inspector Brownnett raised the standard of dusting in the return roadway. It was understood due to Alternative Mining method advancement was slow as a result the trickle duster pod required refilling. The bulk trickle duster pod on the return side of the segregation stopping at 34ct is required to be re-located to the intake side to allow change out. The ERZ Controllers were directed to re-dust B heading from the cribb room inbye to 35ct and A heading face zones before recommencing cutting.

Maingate 604:-

We travelled to 24ct Maingate 604 during travel to 24ct rib coal had been shotcreted to 21ct with no obvious signs of rib failure. We inspected the location of 24ct mid-pillar shaft, a series of rated stoppings had been constructed to facilitate the future filling of the shaft. We walked inbye 24ct it was observed areas of re-supporting had taken place. The abutment pressure was causing blockside rib failures, the support causing the rib coal to slide rather than fall into the travel roadway.

During the inspection the inspectorate observed 26ct active gas stub rib coal had failed above an drainage pipe, we discussed the recovery of the rib and potential impact of a rib fall on the drainage pipe CH4 contaminating intaking ventilation. SSE/General Manager Scott Dobbie prioritised remedial actions. Water management at 27ct pod pump was failing due to pump starter trips.

Close Out Meeting:-

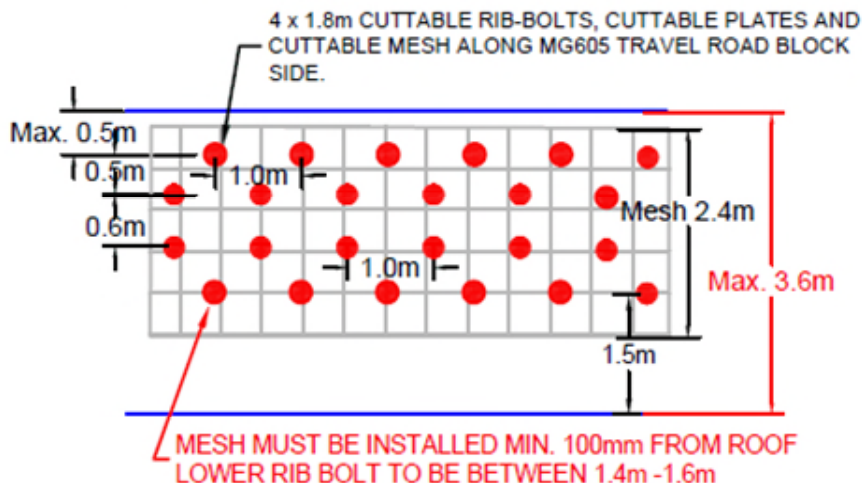
The close out meeting was attended by SSE/General Manager Scott Dobbie, Ventilation Officer James Grebert, Development Superintendent Alan Green, Operations Administration Chantal Stone, EEM Patrick Tait, Gas and Ventilation Superintendent Owen Morgan, Technical Services Manager Wesley Noble, Geotechnical Engineer Peter Yee, SSHR Damien Gehrman and Engineering and Maintenance Manager Brendan Kelly.

Inspector Brownnett discussed the training of all ERZ Controllers on site regarding de-gassing of 605 panel, Ventilation Officer James Grebert is to facilitate the development of the training in SWG - Procedure for Panel De-gassing.

Technical Services Manager Wesley Noble, Geotechnical Engineer Peter Yee provided illustrations of the updated rib support as below:-

TRAVEL ROAD BLOCK SIDE CUTTABLE RIB BOLT PLAN

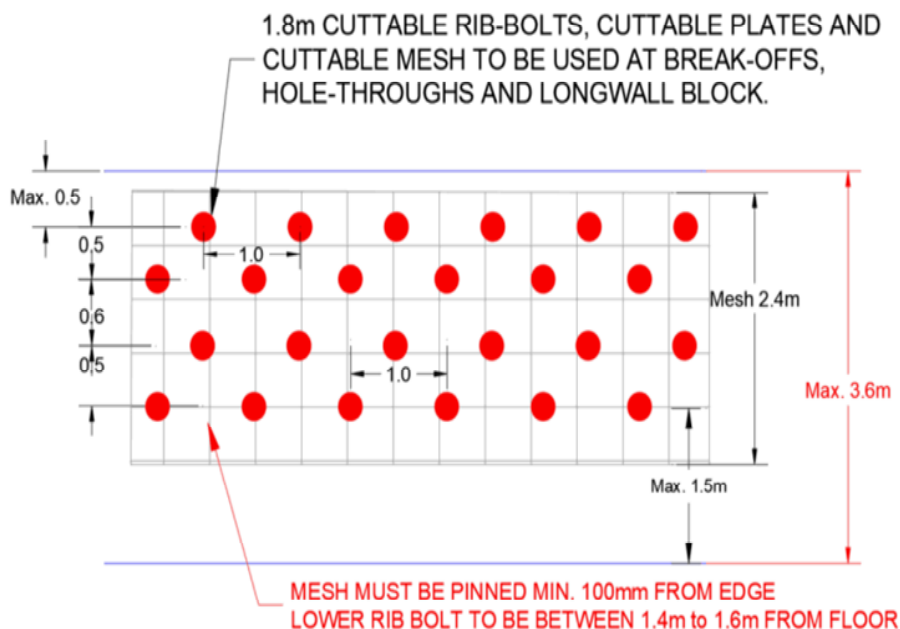
ADHERE TO SCARP SPOT BOLTING GUIDE TO CONTROL RIB DEFORMATION.



Initial 4 x 1.8m fibreglass rib bolts/1.0m pattern

CUTTABLE RIB BOLT PLAN

ADHERE TO SCARP SPOT BOLTING GUIDE TO CONTROL RIB DEFORMATION.



Revised 4 x 1.8m fibreglass rib bolts/1.0m pattern

Additional rib remedial equipment to site will include another shotcreting rig, loader and crews to man the additional rig brought to site. The additional rig will allow one shotcrete rig to focus on development block side shotcrete. The second shotcrete rig will focus on remediating strata defects located in outbye areas. Shotcrete has been proven to assist in confinement of the rib and protection of installed support from machinery interaction and abutment loads.

- Tool-box talks and training of the strata defect system to be undertaken. In addition Moranbah North are currently conducting Strata Awareness Training for all underground crews. The strata defect system is a component of the training.
- Ongoing product trials of a steel wire reinforced plastic mesh.
- Ongoing remedial support in MG604 is planned to be undertaken using additional bolting and shotcrete, this will be completed by the 9th December 2019 and weekly progress updates will be provided to the inspectorate.

Geotechnical Engineer Peter Yee advised recent trials and installation of 1.8m x 32mm torque tensionable fibreglass dowels in LW604 chute roads using a 1500mm medium set resin. The 32mm dowel is intended to be used off the miner and a pillar trial is required. The 32mm solid dowel has a shear strength of 130kN, double the shear capacity currently provided from the 22mm XHT dowel (60kN). The nut has a cap on the end which will break out a ~140N.m. this allows the bolt to be fully spun and effectively mix the resin to the back of the hole prior to breaking out and tensioning of the bolt. The current XHT dowels have a nut cap which breaks out at ~100 N.m. for reference.

We thanked Moranbah Management team for their assistance during our inspection.

<u>Number</u>	<u>Directive</u>	<u>Due Date</u>
	Pursuant to section 166 of the Coal Mining Safety and Health Act 1999	
1	Moranbah North underground operations are required to intensify the remedial rib support programme in Maingate 604 panel.	06/12/2019
	Moranbah North underground operations are required to intensify the remedial rib support programme in Maingate 604 panel.	

Please provide a written status report on each Directive together with the actions taken to address each item by their due dates

Keith Brennan
Inspector of Mines

Malcolm Brownnett
Inspector of Mines