

Risk Based Safety Management in the Longwall Training Gallery



**Department of Mining Engineering
IIT(ISM) Dhanbad**



Longwall Training Gallery

Department of Mining Engineering, IIT(ISM) Dhanbad

1 General Hazards in the Longwall Training Gallery

The purpose of this document is to implement the risk based safety management system in the Longwall Training Gallery of the Department of Mining Engineering. The first step is to identify the potential hazards associated with the available infrastructure of the Gallery. Once the potential hazards are identified, the existing controls and protection measures are reviewed. In the process of review of the existing controls, if the existing controls are found to be inadequate, additional controls are suggested. This enables the students and visitors in the Gallery to take due care of safety and avert any untoward incident that may lead to serious accident.

Accordingly this manual first deliberates on the general hazards associated with the Gallery, then further sections of the document explains the safety management in the use of machineries available in the Gallery. The standard operating procedures (SOPs) have been developed for running the Gallery based on the risk based safety management system.

1.1 Hazard related to electrical installations

S. No.	Existing / Potential hazards (General Electrical)	Existing controls / protection	Additional Controls	Remarks
1	Fire from high voltage electrical machineries.	-	<ul style="list-style-type: none">• Suitable Fire extinguishers shall be provided near Gate end box and other side of the Gallery. .• All technical staffs to be trained in use of fire fighting apparatus (FFA)• Procedure to be prepared for checking of FFA• FFA to be periodically checked• Expiry of FFA to be checked• Buckets of sand to be kept at suitable locations	
2	Electrical shock due to damaged cable	<ul style="list-style-type: none">• Checking of cable for any damage• Proper maintenance of electrical cable	<ul style="list-style-type: none">• Record of checking of cable to be maintained	
3	Electrical shock due to non-functioning of gate end box protection	<ul style="list-style-type: none">• Checking of gate end boxes	<ul style="list-style-type: none">• Competent person to be engaged for checking gate end boxes at regular intervals	

1.2 General / common Hazards

S. No.	Existing / Potential hazards (General Injury)	Existing controls / protection	Additional Controls	Remarks
1	Slip, trip and low height of the roof	<ul style="list-style-type: none">• Use of Helmet• Hard shoes or Mining shoes	<ul style="list-style-type: none">• Inspection by competent person regarding obstacles lying on floor• Route for visitors / students to be kept clear of obstacles and marked• Cable lying on floor to be covered	

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	Existing / Potential hazards (General Injury)	Existing controls / protection	Additional Controls	Remarks
		<ul style="list-style-type: none">• Proper housekeeping• Proper illumination	<ul style="list-style-type: none">• Caution board regarding low height danger to be provided• First-aid box to be maintained• Visitor without proper shoes shall not be allowed	

1.3 Standard operating procedure (SOP) for general hazards

- 1 Safety talks before allowing students / visitors entering into gallery
- 2 Ensuring all persons with appropriate PPE
- 3 Suitable Fire extinguishers shall be provided near Gate end box and other side of the Gallery.
- 4 All technical staffs to be trained in use of fire fighting apparatus (FFA)
- 5 Procedure to be prepared for checking of FFA
- 6 FFA to be periodically checked
- 7 Expiry of FFA to be checked
- 8 Buckets of sand to be kept at suitable locations
- 9 Inspection by competent person regarding obstacles lying on floor
- 10 Route for visitors / students to be kept clear of obstacles and marked
- 11 Cable lying on floor to be covered
- 12 Caution board regarding low height danger to be provided
- 13 First-aid box to be maintained
- 14 Visitor without proper shoes shall not be allowed
- 15 Proper guard or barricade should be placed in the appropriate place while running the machine.
- 16 Checking of cable for any damage
- 17 Proper maintenance of electrical cable
- 18 Checking of gate end boxes
- 19 Record of checking of cable and gate end boxes to be maintained

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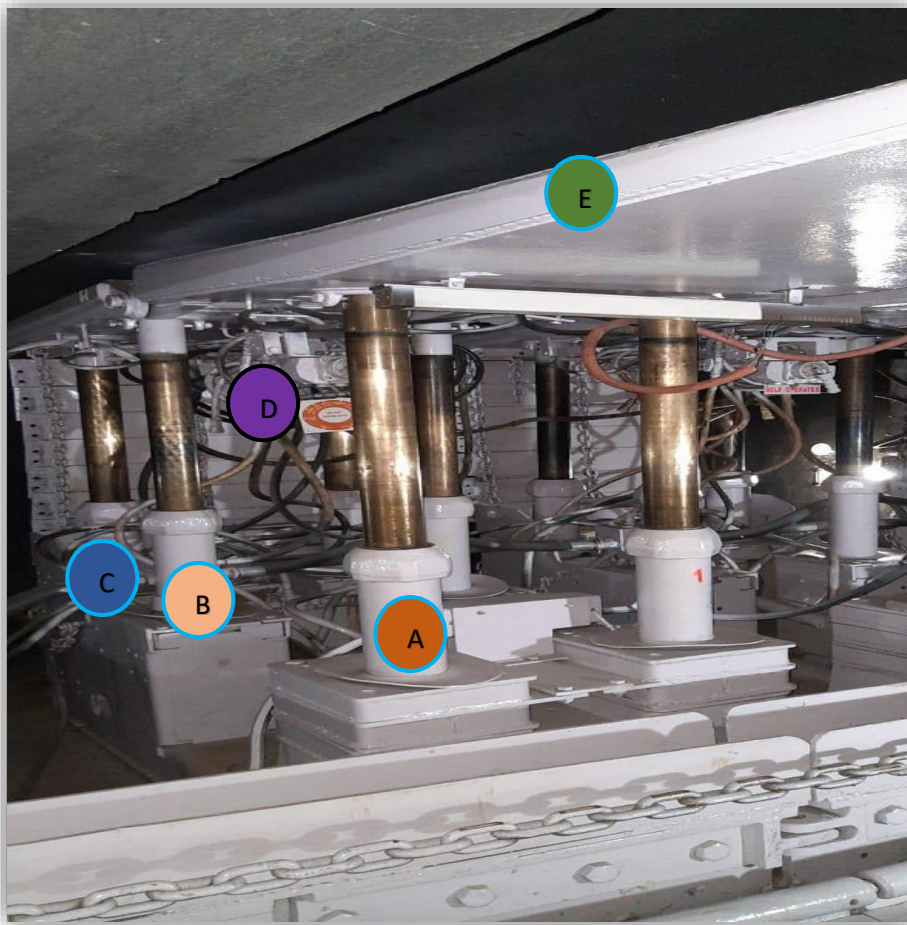


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2 Hazard identification and SOP for operation of Powered Support

2.1 Brief description of the Powered Support and the associated hazards

Self-advancing hydraulic powered supports are provided in longwall faces in coal mines to provide adequate support resistance against the rock load of overlying strata. There are various types of powered supports having varying load bearing capacities and configuration with varying number of legs, size of legs, design of base, canopy, rear shield etc. However, the existing powered supports in the Longwall Training Gallery are 6X240 Te chocks and 20 numbers of such chocks are installed in the gallery. Powered support is mainly used in coal mines together with a shearer for cutting and loading coal, face conveyor for transporting coal from face, stage loader to transfer coal from face to outbye conveyor.



- A. Front Leg
- B. Middle Leg
- C. Rear Leg
- D. Control Valve
- E. Canopy

Powered Supports

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The hazards associated with the use of Powered supports are given in the table below.

S. No.	Existing / Potential hazards associated with demonstration / testing / maintenance	Existing controls / protection	Additional Controls	Remarks
1	Sudden fall / closure of legs due to damaged oil seals of the legs causing injury	1. Checking of Oil seal of the legs by the operator before starting the machine	1. Periodic checking by competent person to assess the oil leakages. 2. Rectification of leakages, if any.	
2	Bursting of Hydraulic hoses causing serious injury	1. Checking of hydraulic hoses at regular interval by competent persons	1 Only competent persons to operate supports 2 Persons must be cautioned before starting power pack or activating supports 3 Maintaining records of inspection, maintenance and history of failure	

2.2 Standard operating procedure (SOP) for Powered support

Based on the hazards identified and existing as well as additional controls as discussed in Section 2.1, the SOP for operation of the Powered support is given as under.

Standard Operating Procedure and Controls:

- 1 Only competent, authorised and experienced operators must operate the machine.
- 2 Before demonstration, an initial briefing regarding the potential hazards shall be explained to the students or visitors
- 3 Operator must assess the oil leakages of the machine, hoses before starting the machine.
- 4 Periodic checking by competent person to assess the oil leakages.
- 5 Rectification of leakages shall be done as early as possible.
- 6 Checking of hydraulic hoses at regular interval by competent persons
- 7 Only competent persons to operate supports
- 8 Persons must be cautioned before starting power pack or activating supports
- 9 Maintaining records of inspection, maintenance and history of failure
- 10 In case any support not functioning properly, the same should be locked.
- 11 The operator and the instructor must ensure maintaining a safe distance for the students / visitors

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3 Hazard identification and SOP for operation of Stage loader

3.1 Brief Description of the Stage loader and the associated hazards



Stage loader

When the coal has been carried by AFC from the face, it has to be transferred to the gate belt conveyor at right angle to the face and there must be some overlapping bridge in between to accommodate face advance. This function is carried out by the **Stage Loader, which** is another chain conveyor, transferring coal from AFC to gate belt conveyor. In this case with steel plates on both sides and runs from the main gate drive to the main gate conveyor (belt).

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The hazards associated with the use of Stage loader are given in the table below

S. No.	Existing / Potential hazards associated with demonstration / testing / maintenance	Existing controls / protection	Additional Controls	Remarks
1	Injury due to flying pieces of broken of chain link, flights etc. while running	Briefing of hazards from Stage Loader	<ul style="list-style-type: none">• Caution board to display hazards• Maintaining safe distance• Checking stage loader chain links for any damage• Prestart warning	
2	Persons may get injured, while crossing stage loader due to sudden start of Stage loader	Briefing of hazards from Stage Loader	<ul style="list-style-type: none">• Caution board to display hazards• Prestart warning• No person shall be allowed to cross stage loader• Clear marking of walking routes• Placing caution cones / chains• Maintaining safe distance• Checking stage loader chain links for any damage	
3	Electrical shock due to leakage current flowing through stage loader steel structure	Checking of electrical circuits at regular interval		
4	Stage loader advancing ram hitting persons	No body shall be allowed to stand or work near stage loader advancing ram	<ul style="list-style-type: none">• Caution Board to be displayed• Prestart warning	

3.2 Standard operating procedures of the Stage Loader

1. Only competent, authorised and experienced operators must operate the machine.
2. Before demonstration, an initial briefing regarding the potential hazards shall be explained to the students or visitors
3. Operator and demonstrator must ensure nobody is standing near or on the Stage loader
4. The operator and the instructor must ensure maintaining a safe distance for the students / visitors
5. Caution board to display hazards to be provided and maintained
6. Prestart warning to be maintained and implemented
7. No person shall be allowed to cross stage loader
8. Clear marking of walking routes
9. Placing caution cones / chains around the caution zone

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10. Checking stage loader chain links for any damage
11. Checking of electrical circuits at regular interval

4 Hazard identification and SOP for operation of Armoured Face Conveyor (AFC)

4.1 Brief Description of the Armoured Face Conveyor (AFC) and the associated hazards



Armoured Face Conveyor (AFC)

Once the coal is cut, it has to be removed from the face to the main gate, so some form of coal haulage system is required. Coal is loaded on to face conveyor to transfer the coal from face to stage loader. AFC is also used to mount the Shearer main body frame and the shearer moves along the face. AFC is also provided with spill guards and cable handling trays for accommodating the shearer power cable, hoses.

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The hazards associated with the use of AFC are given in the table below

S. No.	Existing / Potential hazards associated with demonstration / testing / maintenance	Existing controls / protection	Additional Controls	Remarks
1	<p>Injury due to flying pieces of broken of chain link, flights etc. while running</p> <p>Persons may get injured, while crossing AFC due to sudden start of AFC</p> <p>AFC advancing ram hitting persons</p> <p>Injury due to flying pieces of broken of chain link, flights etc. while running</p>	<p>Briefing of hazards from AFC</p> <p>Briefing of hazards from Stage Loader</p> <p>No body shall be allowed to stand or work near advancing ram</p> <p>Briefing of hazards from Stage Loader</p>	<ul style="list-style-type: none"> • Caution board to display hazards • Maintaining safe distance • Checking stage loader chain links for any damage • Prestart warning • Caution board to display hazards • Prestart warning • No person shall be allowed to cross AFC • Persons to walk along walkway inside powered supports • Placing caution cones / chains • Maintaining safe distance • Checking stage loader chain links for any damage • Caution Board to be displayed • Prestart warning • Caution board to display hazards • Maintaining safe distance • Checking stage loader chain links for any damage • Prestart warning 	

4.2 Standard operating procedure (SOP) for Armoured Face Conveyor (AFC)

1. Only competent, authorised and experienced operators must operate the machine.
2. Before demonstration, an initial briefing regarding the potential hazards shall be explained to the students or visitors
3. Operator and demonstrator must ensure nobody is standing near or on the AFC
4. The operator and the instructor must ensure maintaining a safe distance for the students / visitors
5. Caution board to display hazards to be provided and maintained
6. Prestart warning to be maintained and implemented
7. No person shall be allowed to cross AFC
8. Placing caution cones / chains around the caution zone
9. Checking AFC chain links for any damage

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5 Hazard identification and SOP for operation of Shearer

5.1 Brief Description of the Shearer and the associated hazards



Shearer

Shearer is a most powerful coal cutting machine for cutting and loading coal .A shearer consists of a machine body containing cutting drums, gear train, ranging arm, electric motors, traction unit, hydraulic equipment and controls which is mounted over the AFC. Usually the shearer is provided with two cutting drums at two ends of the shearer body for cutting and loading coal from two ends. However, the shearer in the training gallery is single ended ranging drum shear with one drum at one end. Horizontal cutting drums are mounted on the face side of the machine, laced with cutting picks and rotating in a plane parallel to the face. If the AFC is pushed towards the face as the cutting drums are rotated and the shearer travels along the face, it

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is able to cut into the face for the full web width, moving along a snake in the AFC. This is known as "sumping in". Once fully into the web, the shearer can advance the full length of the face cutting out the web. The snake can also be reversed to cut the wedge shaped portion of coal left while sumping in.

The hazards associated with the use of Shearer are given in the table below

S. No.	Existing / Potential hazards associated with demonstration / testing / maintenance	Existing controls / protection	Additional Controls	Remarks
1	Persons may get seriously injured due to hit by moving picks	Safety instruction	<ul style="list-style-type: none">No person shall be allowed to stand near by moving shearerPrestart warning to be ensured for cautioning everybodyNo body shall be allowed to walk in front of AFC	
2	Persons may get seriously injured due to hit by flying picks while shearer drum in motion	Checking of shearer picks	<ul style="list-style-type: none">The shearer picks shall be checked thoroughly before starting machineProper records of checking to be maintainedNo person shall be allowed to stand near by moving shearerPrestart warning to be ensured for cautioning everybodyNo body shall be allowed to walk in front of AFC	
3	Snapping traction chain may hit persons causing serious injury	Tension of traction chain checked Condition of traction chain checked	<ul style="list-style-type: none">Anchor bolts of traction chain to be checked before startPrestart logbook shall include checking of traction chainNo body shall be allowed to walk or stand near the shearerThe operator shall stand or walk along the walkway.	
4	Fire in shearer due to oil leakage	Leakage of oil checked	<ul style="list-style-type: none">Suitable fire fighting apparatus for oil fire to be provided	

1.2 Standard operating procedure (SOP) for Shearer

- 1 Only competent, authorised and experienced operators must operate the machine.
- 2 Before demonstration, an initial briefing regarding the potential hazards shall be explained to the students or visitors
- 3 No person shall be allowed to stand near by moving shearer
- 4 Prestart warning to be ensured for cautioning everybody
- 5 No body shall be allowed to walk in front of AFC

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- 6 The shearer picks shall be checked thoroughly before starting machine
- 7 Proper records of checking to be maintained
- 8 No person shall be allowed to stand near by moving shearer
- 9 Prestart warning to be ensured for cautioning everybody
- 10 No body shall be allowed to walk in front of AFC
- 11 Anchor bolts of traction chain to be checked before start
- 12 Prestart logbook shall include checking of traction chain
- 13 No body shall be allowed to walk or stand near the shearer
- 14 The operator shall stand or walk along the walkway.
- 15 Suitable fire fighting apparatus for oil fire to be provided
- 16 Operator and demonstrator must ensure nobody is standing near the Shearer
- 17 Operator and the instructor must ensure maintaining a safe distance for the students / visitors