



Hazard Identification and Controls in Mine Ventilation and Environment Laboratory



DEPARTMENT OF MINING ENGINEERING

Hazard Identification and Controls in Mine Ventilation and Environment Laboratory

Sl. No.	Name of the laboratory / Equipment	Existing / Potential hazards associated with demonstration / testing / maintenance	Existing controls / protection	Additional Controls	Remarks
1	Sound level meter	During noise level monitoring, exposure of staffs/employees to high noise levels may cause hearing loss.	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Using personal protective equipment like earmuffs, earplugs, etc. during monitoring high level noise. 	Awareness/brief knowledge about noise level standards and adverse effects of high noise levels.	
2	Hygrometer/psychrometer	During measurement of DBT and WBT of air, the whirling hygrometer may hit nearby persons.	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Maintaining a safe distance from hygrometer during the measurement. 	1. Demonstrate proper for use of whirling hygrometer.	
3	Methanometer	<ul style="list-style-type: none"> • Chances of leakage of inflammable and toxic gases such as CH₄, CO, H₂S, SO₂, CO₂, etc. from the gas cylinders/ sample holders during measurement and analysis of different gases. • Exposure of staff/students to these gases may cause health problems. • During assembly and maintenance of safety lamps, the glass of safety lamp may break and hit somebody. • The fuel of flame safety lamp may spill and get ignited. 	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Proper supervision of possible leakage paths. 3. Replacing the damaged aspirators and gas tubes. 4. Maintaining proper ventilation in the laboratory using adequate number of exhaust fans to prevent accumulation of gases. 	<ol style="list-style-type: none"> 1. Brief knowledge about effects of different gases on human healths and their safe limits. 2. Maintaining the safe distance from the sources of gases during measurements. 3. Checking the cylinder valves/regulators periodically whether they are fitted properly. 4. Keeping suitable fire extinguishers in laboratory. 	
4	CO detector				
5	Multi-gas detector				
6	Gas Chromatograph				
7	Flame safety lamp and Gas testing chamber				

			5. Proper handling and maintenance of equipment.		
8	Godbert-Greenwald Furnace	<ul style="list-style-type: none"> • Operator/students may get burnt by coming in contact with high temperature furnace wall. • High explosion flame may be produced during experiment and hit the persons nearby. • Leakage of oxygen/compressed air from cylinders may occur and exposure of staffs/students to high concentration of oxygen may cause oxygen toxicity. • Over pressurising of the air vessel may lead to its bursting. • Overheating of power transformer and electrical short circuiting. 	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Proper handling, maintenance and supervision of equipment. 3. Charging and purging of air using remote controlled trigger switch. 4. Pressurising the air vessel at the recommended air pressure. 5. Conducting experiments following the procedure and safety guidelines laid down in user manual. 6. Maintaining safety distance from the furnace during experiment. 7. Maintaining proper ventilation in the laboratory using adequate number of exhaust fans to prevent accumulation of fumes, gases and dust. 	<ol style="list-style-type: none"> 1. Wearing personal protective equipment like shoes, gloves, goggles, etc. during experiment. 2. Checking the oxygen cylinder valve/regulator, air tubes, pressure gauge, etc. whether they are fitted properly. 3. Keeping suitable fire extinguishers in laboratory. 	The equipment is required to be kept inside a fume hood with sash glass

9	Crossing Point Temperature (CPT) Apparatus	<ul style="list-style-type: none"> Leakage of oxygen from the cylinders may occur and exposure of staffs/students to high concentration of oxygen may cause oxygen toxicity. Over heating of glycerin bath may create lots of fumes and event catch fire. Over heating of coal sample in the apparatus may catch fire. Electrical short circuiting may occur leading to fire. 	<ol style="list-style-type: none"> Using equipment by skilled & competent technical staff. Proper handling, maintenance and supervision of equipment. Maintaining safety distance from the equipment during experiment. Maintaining proper ventilation in the laboratory using adequate number of exhaust fans to prevent accumulation of fumes. 	<ol style="list-style-type: none"> Wearing personal protective equipment like shoes, gloves, goggles, etc. during experiment. Checking the oxygen cylinder valve/regulator, air tubes, pressure gauge, etc. whether they are fitted properly. Not leaving the apparatus unattended during experiment. Keeping suitable fire extinguishers in laboratory. 	
10	Wet-oxidation potential setup	During determination of susceptibility of coal to spontaneous combustion by electro-chemical method, fire due to electrical short circuiting may occur.	<ol style="list-style-type: none"> Using equipment by skilled & competent technical staff. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> Wearing personal protective equipment like shoes, gloves, goggles, etc. during experiment. Keeping suitable fire extinguishers in laboratory. 	
11	Self-contained closed circuit breathing apparatus (BG-174)	While wearing the breathing apparatus, self-rescuers and pulmotor, the wearer may sometimes feel uneasy and breathlessness.	<ol style="list-style-type: none"> Using equipment by skilled & competent technical staff. Tightening of valves, fittings and checking for any leakage in the apparatus. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> Filling the cylinders in breathing apparatus with adequate amount of oxygen. Ensuring sufficient amount of oxygen being supplied to the wearer during the use of apparatus. 	
12	Chemical oxygen self-rescuer				
13	Filter self-rescuer/gas mask				
14	Reviving apparatus (Pulmotor)				

15	Artificial Lung Machine	<ul style="list-style-type: none"> • During evaluation of performance of rescue equipment, leakage of CO₂ may occur and exposure of staffs/students to high CO₂ concentration may cause health problems. • Fire due to electrical short circuiting. • Fire due to overheating of the machine and apparatus being tested. 	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Continuous monitoring of the machine and apparatus being tested for intense heating. 3. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> 1. Maintaining safety distance from the machine and apparatus being tested. 2. Checking the valve/regulator of gas cylinder whether it is fitted properly. 3. Keeping suitable fire extinguishers near the machine. 	
16	Gravimetric dust sampler	Exposure to high concentrations of dust during experiment may cause health hazard, like pneumoconiosis.	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> 1. Brief knowledge about adverse health effects of dust on human health and safe limits of dust concentration. 2. Wearing the personal protective equipment such as dust respirators, gloves, goggles. 	
17	Real-time Aerosol Monitor				
18	Personal Dust Sampler (CIP-10)				
19	Ventilation fan-duct system	<ul style="list-style-type: none"> • Electrical short circuiting may cause fire. • Persons may be hurt by accidentally coming in contact with the rotating fan blades. 	<ol style="list-style-type: none"> 1. Using equipment by skilled & competent technical staff. 2. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> 1. Wearing personal protective equipment such as shoes and safety helmets. 2. Giving proper instruction to students not to touch the fan blades during running of the fans. 3. Maintaining safety distance. 4. Keeping suitable fire extinguishers in laboratory. 	
20	Laboratory Wind Tunnel				

21	Thermal Conductivity Meter	<ul style="list-style-type: none"> Electrical short circuiting. 	<ol style="list-style-type: none"> Using equipment by skilled & competent technical staff. Proper handling, maintenance and supervision of equipment. 	<ol style="list-style-type: none"> Wearing the shoes and gloves. Keeping suitable fire extinguishers in laboratory. 	
22	Radon measurement system	<p>While carrying out radiation monitoring studies, exposure of Instructor / Technician / Students / Visitors to beta and gamma radiations, and radon and its short-lived decay products may cause radiation hazards.</p>	<ol style="list-style-type: none"> Using equipment by skilled & competent technical staff. Proper handling, maintenance and supervision of equipment. Keeping the sources of radiation in isolated places. Shielding the radiation sources to reduce gamma radiation. Maintaining proper ventilation in the laboratory using adequate number of exhaust fans to prevent accumulation of fumes. 	<ol style="list-style-type: none"> Awareness/brief knowledge about the hazards due to gamma radiations, radon and its daughters and their safe limits in the atmosphere. Wearing personal protective equipment such as shoes, aprons, gloves and goggles. 	
23	Radiation survey meter				
24	NaI(Tl) gamma spectrometry				

Standad Operating Procedure (SOP) and Safety Guidelines in Mine Ventilation and Environment Laboratory

Name of the equipment	SOP and Safety Guidelines
Sound level meter	<ol style="list-style-type: none"> 1. Before determination of noise level meter, brief description about the effect of noise on human health should be explained to the students or visitors. 2. Only skilled, competent and authorised technical staff should operate the equipment. 3. Technical staff/stuents/visitors should wear personal protective equipment such as earmuffs and earplugs during monitoring of high noise level.
Hygrometer/psychrometer	<ol style="list-style-type: none"> 1. Use of hygrometer should be demonstrated by the technical staff to students/visitors before taking DBT/WBT measurements. 2. Safety distance from the hygrometer should be maintained during the measuerement of DBT/WBT using whirling hygrometer.
Methanometer, CO detector, multi-gas detector, gas chromatograph, flame safety lamp and gas testing chamber	<ol style="list-style-type: none"> 1. Before demonstration, an initial briefing regarding the potential hazards should be made to the students or visitors. 2. Effect of different types of gases on human health and their safe limits should be explained to the students/visitors befoe measurement of gases. 3. Safety dittance from the sources of gases during measurement should be maintained. 4. Gas cylinders should be vertically kept in cylinder cages and valves/regulators should be periodically checked. 5. Adequate number of exhaust fans should be fitted to remove gases from the laboratory.
Godbert-Greenwald furnace	<ol style="list-style-type: none"> 1. Before demonstration, an initial briefing regarding the potential hazards should be made to the students or visitors. 2. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 3. Staffs/students/visitors should wear the personal protective equipment like shoes, gloves, goggles during determination of explosibility index of coal. 4. Safety distance from the furnace should be maintained during experiment. 5. Switch boards must be provided with suitable MCBs and other safety features. 6. Gas cylinders should be vertically kept in cylinder cages and valves/regulators should be periodically checked. 7. Suitable fire extinguishers should be kept near the apparatus. 8. The apparatus should be switched off after completion of the experiment. 9. Exhaust fans should be fitted to remove the fumes and dust produced during experiment.

Crossing Point Temperature (CPT) Apparatus	<ol style="list-style-type: none"> 1. Before demonstration, an initial briefing regarding the potential hazards should be made to the students or visitors. 2. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 3. Staff/students/visitors should wear personal protective equipment such as shoes and gloves during experiment. 4. Safety distance from the furnace of CPT apparatus should be maintained during experiment. 5. Switch boards must be provided with suitable MCBs and other safety features. 6. Gas cylinders should be vertically kept in cylinder cages and valves/regulators should be periodically checked. 7. Suitable fire extinguishers should be kept near the apparatus. 8. The apparatus should be switched off after completion of the experiment.
Wet-oxidation potential setup	<ol style="list-style-type: none"> 1. Staffs/students/visitors should wear the personal protective equipment such as shoes and gloves during experiment. 2. Suitable fire extinguishers should be provided near the apparatus. 3. The apparatus should be switched off after completion of the experiment.
Self-contained closed circuit breathing apparatus (BG-174), Chemical oxygen self-rescuer, Filter self-rescuer/gas mask, Reviving apparatus (Pulmotor)	<ol style="list-style-type: none"> 1. Adequate amount of oxygen should be filled in the cylinders fitted with the breathing apparatuses. 2. Adequate oxygen supply to the wearer during the use of apparatus must be ensured.
Artificial Lung Machine	<ol style="list-style-type: none"> 1. Before demonstration, an initial briefing regarding the potential hazards should be explained to the students or visitors. 2. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 3. Safety distance from CO₂ cylinder should be maintained. 4. Switch boards must be provided with suitable MCBs and other safety features. 5. Gas cylinders should be vertically kept in cylinder cages and valves/regulators should be periodically checked. 6. Suitable fire extinguishers should be provided near the apparatus. 7. The apparatus should be switched off after completion of the experiment.
Gravimetric dust sampler, real-time aerosol monitor and personal dust sampler (CIP-10)	<ol style="list-style-type: none"> 1. The adverse effects of dust on human health and safe limits of dust concentration should be explained to the students/visitors. 2. Only skilled, competent and authorised technical staff should operate the equipment. 3. Staffs/students/visitors should wear the personal protective equipment such as dust respirators, gloves and goggles.

Ventilation fan-duct system and Laboratory Wind Tunnel	<ol style="list-style-type: none"> 1. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 2. Before demonstration, an initial briefing regarding the potential hazards should be made to the students or visitors. 3. Staffs/students/visitors should wear the personal protective equipment such as shoes and safety helmets. 4. Switch boards must be provided with suitable MCBs and other safety features. 5. Suitable fire extinguishers should be provided near the apparatus. 6. The apparatus should be switched off after completion of the experiment.
Thermal Conductivity Meter	<ol style="list-style-type: none"> 1. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 2. Staffs/students/visitors should wear the personal protective equipment such as shoes and gloves. 3. Switch boards must be provided with suitable MCBs and other safety features 4. Suitable fire extinguishers should be provided near the apparatus. 5. The apparatus should be switched off after completion of the experiment.
Radon measurement system, Radiation survey meter and NaI(Tl) gamma spectrometry	<ol style="list-style-type: none"> 1. Before demonstration, the potential hazards due to gamma radiations, radon and its daughters and their safe limits should be explained to the students/visitors. 2. Only skilled, competent and authorised technical staff under the supervision of Technical Supdt. should operate the equipment. 3. Staffs/students/visitors should wear the personal protective equipment such as shoes, aprons, gloves and goggles. 4. Adequate number of exhaust fans should be fitted to prevent the accumulation of radon and its daughters in the laboratory. 5. The sources of radiation should be kept in the isolated places. 6. The radiation sources should be shielded to protect the staff/students/visitors from the gamma radiation.

General instructions on safety and Do's and Don'ts

- Come to the practical classes on time wearing cotton clothes.
- Keep your mobile phones in switched off mode in the laboratory.
- Listen carefully to your instructor and don't hesitate to ask question in case of any doubts.
- Do wear protective shoes, gloves and goggles while conducting the experiments to ensure proper safety.

- Don't touch or operate any laboratory instruments unless asked to do so.
- Do practice fire and electrical safety. Ensure that all electrical instruments are turned off before plugging in the sockets.
- In case any instrument is not functioning properly, bring it to the knowledge of your instructor.
- Read the laboratory manual carefully in advance, carry out the experiments as per the procedures laid down in it and record the observations in the appropriate format.
- Don't touch the hot surfaces of the equipment.
- Maintain safety distance from the instrument producing heat or flame.
- Keep the workplace clean.
- Handle the equipment with care and leave them in good condition after the experiments.
- Don't eat, drink or chew gums during the course of laboratory experiment.
- Don't leave any of your belongings in the laboratory and check before you leave.
- In case of any impending danger, evacuate the place and inform the concerned.
