

# **SIMRAC**

## **A MANUAL FOR BEST PRACTICE FOR EMERGENCY RESPONSE PROCEDURES**

### **PART 4**

#### **A CHECKLIST OF BEST PRACTICE REQUIREMENTS FOR THE PREVENTION AND MANAGEMENT OF INRUSHES, FIRES, EXPLOSIONS AND OTHER EMERGENCIES**

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# Introduction

From Parts 1 and 2 of this report all the salient points and additional detail arising from these points have been collated and put into a checklist format to enable the user on any colliery to carry out a first order audit. Once this has been carried out, the checklists can then be used to refine a monitoring protocol tailored to the requirements of an individual mine.

The checklists follow the logical sequence of Parts 1 and 2 of this report and major cross-references are given.

Flow charts are also included which have been condensed from the Department of Mineral and Energy (Witbank) audit flow charts.

# CHECKLIST FOR BEST PRACTICES

PAGE 1

## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>1</b>	Control mechanism for administration of CoPs, procedures & standards.		
<b>2</b>	<b>Introduction of hazards to the mine</b>		
	Procedure in place to carry out risk assessment on equipment, materials, chemicals etc. prior to being allowed on or into the mine.		
<b>3</b>	<b>Flammable gas explosions</b>		
	Risk assessment available.		
	Gas content & release rate tested for all coal seams.		
	Drilling / drainage programme laid out.		
	Geological plans showing flammable gas information.		
	Monitoring of sealed areas, gas levels shown		
	Seals to specification.		
	Seals numbered underground.		
	All seals and numbers indicated on plans.		
	Sealing programmes detailed, sequencing, precautions, removal of metal, earthing.		
	Monitoring programme for seals incl. written records.		
	Main fan failure alarm		
	Miner checks seals at start of shift		
	All ventilation planning and sequencing approved by ventilation officer		
<b>3.3</b>	<b>Sources of ignition</b>		
	Risk assessment completed.		
	Procedure for examination of picks and cutters.		
	Criteria for replacement.		
	Checking of water sprays.		
	Checking of water sprays.		
	Is pick path spraying installed.		
	Other potential frictional ignitions.		
	Gas testing done before metal is brought into contact with rock (i.e. barring etc.).		
	CoP for explosives in place, reviewed & current		
	Mechanism to detect and control contraband together with appropriate training and signage in place.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>3.4</b>	<b>Ventilation</b>		
3.4.1	CoP reviewed and current.		
	Formalised and systematic layouts for all working areas and new areas.		
	Detailed.		
	Sequencing given.		
	Method of ventilation (incl. appliance positions).		
	Fan(s) and column(s) specified.		
	Air volumes/velocities		
	Action plans if ventilation drops or fails.		
	Factors of safety in ventilation.		
	Specified velocities or volumes for:		
	Intakes.		
	Travelling roads.		
	Belt roads.		
	Last through road.		
	Returns.		
	Workshops.		
	Dams.		
	Pump stations.		
	Refuelling stations.		
	Shaft bottoms.		
	Other places.		
	System of reporting environmental conditions:		
	Routinely.		
	Abnormal or potentially hazardous		
	Immediately hazardous / life threatening.		
	Relevant persons receive reports.		
	Definitions:		
	Atmosphere or general atmosphere.		
	Other definitions as necessary.		
	Flammable gas action levels.		
	Withdrawal criteria.		
	Changeovers and opening new sections.		
	Sequencing and other precautions / supervision specified.		
	Production staff checking velocities / volumes and gas levels on starting a shift or entering a section / heading for 1st time.		
	Production staff knowledge of ventilation standards.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>4</b>	<b>Detection systems</b>		
<b>4.2.5</b>	<b>Lamrooms</b>		
	CoP Lamrooms reviewed and current.		
	Lamroom staff, adequate, OEM trained & certified.		
	Lamroom supervision, adequate, OEM trained & certified.		
	Official in charge of lamroom(s) OEM trained & certified.		
	Repairs on contract with OEM or approved repairer.		
	OEM / supplier regularly visits and reports on lamrooms.		
	Adequate facilities to calibrate and maintain instruments		
	All instruments for issue working & calibrated.		
	Gas cylinders certified, tested and records kept.		
	Individual history of each instrument available.		
	Personal issue of instruments.		
	Adequate spare instruments available.		
	Mechanism and records to shown daily drawing of instruments by individual users.		
	Reporting and action against failure to draw instrument.		
	Users able to carry out pre-use checks easily (lamroom design).		
	Record kept of users doing daily pre-use checks.		
	Method of reporting on users not doing pre-use checks.		
	Action against users not doing pre-use checks and follow up..		
	Fault reporting by users – records.		
	Test gases – correct concentration.		
	Test gases - not time expired.		
	Supervisors & Official i/c lamrooms do early and late shift checks of lamroom procedures.		
<b>4.3</b>	<b>Instruments on mechanical miners</b>		
	Correctly mounted and functioning		
	Second or further detector head(s) on machine.		
	Contract with OEM / approved repairer.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Checked by qualified and certified persons at the start of each shift.		
	Maintenance by qualified staff on mine. (OEM trained)		
	Machine operator trained to understand information given by on board system.		
	Appropriate action by machine operator. on receipt of alarm.		
	Interlocked with cutting drum.		
<b>4.4</b>	<b>Telemetry</b>		
	Head positions decided on by qualified persons.		
	Monitored 24 hours per day.		
	Heads plotted on plans.		
	Correctly calibrated.		
	Contract with OEM / approved repairer.		
	Maintenance by qualified staff on mine.		
	Persons monitoring system trained and certified.		
	Persons interpreting information from system trained and certified.		
	Graphs showing "historical data" or "normal" conditions available for comparison purposes.		
<b>4.5</b>	<b>Training of users</b>		
	Formal training course designed in conjunction with OEM.		
	Practical and theoretical training given in the theory and reasons for gas testing.		
	Clear understanding of the difference between carbon monoxide and flammable gas.		
	Action required by user on detecting gas.		
	Trained, practised and examined on pre-use checks.		
	Practical gas testing in workplace or simulated workplace.		
	Is competency assessed both theoretically and practically, before any user is passed out of training centre as competent.		
	Record keeping of all users trained and their exam results.		
	Users - initial training and refresher training annually, or as required.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Is the user examined and certified as competent before he is allowed to use an instrument underground.		
	Is there follow-up by training / safety staff to monitor the competency of users on the job.		
	Independent auditing of user competence		
	All abandoned areas to be reflected on the mine plans.		
<b>5</b>	<b>Barometric pressure changes</b>		
	Equipment in place		
	CoP in place, reviewed and current		
	Influence of BP changes established		
<b>6</b>	<b>Coal dust explosions</b>		
	CoP in place, reviewed and current		
	Stone dusting requirements to standard		
	Stone dust barriers to standard and in place		
	Abandoned areas sealed off		
	General inertisation of coal dust satisfactory		
<b>7</b>	<b>Fires</b>		
<b>7.2</b>	<b>Spontaneous Combustion</b>		
	Testing of coal seams for propensity for spontaneous combustion.		
	Risk assessment in place for spontaneous combustion on mine underground and surface.		
	Monitoring of areas prone to spontaneous combustion.		
	CoP for fire prevention includes spontaneous combustion.		
<b>7.3</b>	<b>Electrical ignitions</b>		
<b>7.3.2</b>	<b>Substations -</b>		
	Adequately ventilated.		
	Substations vented to RAW - check ducting is not damaged or blocked.		
	Substations not vented to RAW - means of sealing off available.		
	Means of warning if ventilation fails or means to isolate equipment if the ventilation fails or high temperatures are present.		
	Routine cleaning of air-cooled switchgear and transformers to prevent coal dust build up.		
<b>7.3.3.1</b>	<b>All protection relay settings verified and recorded.</b>		
	Check settings have not been altered without approval		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of inrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Oil filled transformers - collection system / bund capacity + 20 %.		
	Ensure collection system / bund area is clean.		
	Cables to be fire retardant and/or painted with intumescent paint.		
	Routinely test for hot connections and overheating equipment.		
	Routinely check fire warning system.		
	Fire extinguishers - correct and sufficient.		
	Can overload & overcurrent relays on switches feeding transformers can detect a fault at the transformer secondary switches.		
	Avoid feeding more than one device from a switch.		
	Cables not covered with coal or other material.		
	Shuttle cars do not have excess cable on cable drum.		
	Mobile Flameproof Substations-		
	Backtripping in order.		
	Overload relays adequately set for gate end box feeder cables and busbar ratings.		
	Adequately ventilated and not covered in dust > 1 mm thick.		
	Routine check insulation of 6,6 and 11 kV cables within substation for signs of corona damage.		
	Regular cleaning of the inside of air-cooled transformers & switchgear.		
	Routine test for overheating or hot connections.		
	Overcurrent back tripping is in order.		
	Overload relays adequate for cables and equipment.		
<b>7.4.1</b>	<b>Flameproofed Equipment</b>		
	Regular check that equipment is in satisfactory condition, incl. flame paths and presence of bolts in flameproof joints.		
	Check isolation procedures are understood if flammable gas is detected.		
	Check that un-isolation monitoring devices are certified for use in the continuous presence of flammable gas, or that exemption has been obtained.		
	Battery operated machines-		
	Routine check of terminal connections for tightness.		



# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Ensure that terminal post welding is not carried out in hazardous locations.		
	Ensure batteries are kept clean.		
	Ensure that battery charging stations are well ventilated.		
<b>7.5</b>	<b>Mechanical</b>		
<b>7.5.1</b>	<b>Mobile mining machinery</b>		
	CoP for the use of mechanical equipment including mobile machines, in place, reviewed and current.		
	Training of attendants, operators and drivers of mechanical equipment to recognise hazards that could pose a fire risk (i.e. accumulations of grease, coal dust, binding or slippage, overheating etc.)		
	Automatic fire fighting equipment fitted.		
	Monitoring the provision and condition of fire fighting equipment.		
	Can all areas where any rubber tyred mobile machinery operates or travels be reached with a hose and adequate water supply.		
<b>7.5.2</b>	<b>Conveyors</b>		
	Maintenance and inspection programme in place		
	Training of attendants and operators of conveyors to recognise hazards that could pose a fire risk (i.e. accumulations of grease, coal dust, binding or slippage, overheating etc.)		
	Accumulations of coal around conveyors.		
	Belt slip interlocks fitted.		
	Belt tracking devices fitted.		
<b>7.5.4</b>	<b>Diesel machinery (non flameproofed)</b>		
	Ensure mechanism is in place to prevent non-flameproofed vehicles entering a hazardous area, particularly in an emergency situation.		
<b>7.6</b>	<b>Miscellaneous causes of fire</b>		
<b>7.6.1</b>	<b>Welding and Flamecutting</b>		
	CoP for "Hot Work" in place, reviewed and current.		
	Mechanism to monitor compliance with legislation and requirements of the CoP including all fire fighting equipment.		
	Record keeping mechanism for equipment.		
<b>7.6.2</b>	<b>Blasting</b>		
	Procedure in place, reviewed and current.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Monitor compliance with regulations with respect to procedures, mudblasts, tamping, quantities of explosives per hole and blasting techniques.		
<b>7.6.3</b>	<b>Refuelling stations and flammable material stores</b>		
	Commissioning of facility by Engineer and Ventilation Dept.		
	Monitoring condition and fire appliances.		
	Ventilated to return airway.		
<b>7.6.4</b>	<b>Rubber tyre store</b>		
	Minimum tyres stored.		
	Safe storage facilities i.e. under water or sprays.		
	Ventilated to return airway.		
	No old tyres left lying around underground.		
<b>7.6.5</b>	<b>Compressors</b>		
	High temperature trip out switches operational.		
	Maintenance programme.		
<b>7.6.6</b>	<b>Plastics</b>		
	Risk assessment for all plastic materials on mine		
	Identification of all potential fire hazards.		
	Recording and marking on plans sites of fire hazards.		
	Action to minimise or remove hazard documented and followed up.		
<b>7.6.7</b>	<b>Surface Fires</b>		
	Identification of areas that could be the source of a veld fire that could damage mine property or be carried underground.		
	Clearing away of fire hazards and follow up checks and records kept.		
<b>7.7</b>	<b>General Fire Prevention</b>		
	CoP for Fire Prevention Fire Fighting and Fire Drill in place, reviewed and current.		
	Legal appointments i.t.o. Reg 11.1.2.(c) to cover all the fire fighting equipment on the mine.		
	Fire audits carried out on a regular basis.		
	Fire extinguishers serviced annually by approved agent.		
	Ventilation Dept. has copy of SIMRAC Report COL 031 for reference purposes.		
<b>7.7.2</b>	<b>Fire Detection</b>		
	Fire Patrol, trained, experienced.		
	Routes review regularly.		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Fire monitoring system in place.		
	Monitoring staff trained.		
	Training of personnel in fire detection.		
<b>7.7.3</b>	<b>Action in case of a Fire</b>		
	Initial and refresher training for all persons.		
	Communications adequate and fully operational.		
	Regular liaison with Mines Rescue Service.		
	"Proto Teams" on mine to strength.		
	Availability of or access to graphical Fire Indicators and other technical resources by Vent. Dept. to enable them to fight and monitor fires.		
	Ventilation personnel adequately trained in fire fighting/monitoring techniques.		
<b>8</b>	<b>Lightning</b>		
	CoP in place, reviewed and current.		
	Adequate bonding & earthing of metalwork and power supplies.		
	Metal removed or bonded & earthed from areas to be sealed.		
	Sealing operations in non lightning season.		
	Borehole casings removed and holes sealed.		
8.3	Electrical storm warning system in place.		
	SABS 03-1985 consulted.		
	Explosive atmospheres in sealed areas.		
	Trained persons monitoring and interpreting data.		
	Trained persons monitoring and interpreting data.		
	"Stat-Safe" detonators used.		
<b>9</b>	<b>Inrushes of water, mud, noxious gas or flammable gas</b>		
<b>9.2.1</b>	<b>New areas.</b>		
	Inform Surveyor, Ventilation Officer of new areas or deviations to existing plans.		
	Layout plans available with appropriate approvals		
<b>9.2.2</b>	<b>Mining towards water, mud etc position known</b>		
	Safety boundary determined.		
	Risk assessment & mining strategy in place and done in conjunction with Surveyor Vent. & others.		
	Strategy available to relevant parties.		
	Employees aware of risk.		

# CHECKLIST FOR BEST PRACTICES

## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>9.2.3</b>	<b>Mining towards abandoned areas that are accessible</b>		
	Reports from officials examining area in writing.		
	Area free from water, mud and gases.		
	Mining strategy in place incl. provision for:		
	Method of mining incl. precautions,		
	De-watering or de-gassing control measures and supervision.		
<b>9.2.4.</b>	<b>Mining towards abandoned area, position NOT known</b>		
	Attempts to ascertain position of abandoned workings.		
	Risk assessment carried out with relevant assistance.		
	Written, detailed strategy giving mining plan, any restrictions and limitations, equipment used & control measures.		
	Written strategy available to all relevant parties.		
	Employees aware of risks.		
<b>9.2.5</b>	<b>Mining towards surface accumulation of water or mud</b>		
	Risk assessment carried out with relevant assistance.		
	Written, detailed strategy giving mining plan and taking into account competence of overlying material bore holes and geological features.		
	Written strategy available to all relevant parties.		
	Employees aware of risks.		
<b>9.3</b>	<b>Response to an intrush of water, mud or gas</b>		
	Written procedure in place, reviewed and current		
	Part of initial and refresher training.		
<b>10</b>	<b>Flooding and abnormal weather</b>		
	Risk assessment done with Ch. Surveyor, Environmental Manager etc.		
	Precautionary steps taken to avoid damage.		
	Written procedure to respond to this type of event reviewed and current.		
<b>11</b>	<b>Major collapse or flood with persons trapped</b>		
	Written procedure in place, reviewed and current		
	Establishing a Control Room with all data needed.		
	Calling on the services of the drill and its crew.		
	Provision of services by the mine.		
	Allocation of responsibilities		

# CHECKLIST FOR BEST PRACTICES

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## Part 1 Prevention of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>12</b>	<b>Ground movement, Subsidence and Sinkholes</b>		
	Risk assessment completed with assistance from appropriate parties if required.		
	Written procedure in place, reviewed and current.		
	Allocation of responsibility for monitoring ground movement, subsidence and sinkholes		
<b>13</b>	<b>Collapse or subsidence of any tip or dump</b>		
	Risk assessment carried out with assistance from appropriate parties if required.		
	Engineering controls in place.		
	Written procedure in place, reviewed and current.		
<b>14</b>	<b>Incident involving pollution or other environmental issues</b>		
	Risk assessment carried out with assistance from appropriate parties if required and in conjunction with the provisions of the EMPR.		
	Engineering controls in place.		
	Quality assurance of the control measures available.		
	Written procedure in place, reviewed and current.		
<b>15</b>	<b>Outbursts</b>		
	Consider as a hazard if applicable.		
	Written procedure in place, reviewed and current.		
<b>16</b>	<b>Major goaf</b>		
	Procedure in place to warn employees of hazard		
	Induce major goaf during off shift period		

# CHECKLIST FOR BEST PRACTICES

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## Part 2 Management of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
<b>2</b>	<b>Escape and rescue</b>		
	CoP reviewed and current.		
<b>2.1</b>	<b>Pre-planing.</b>		
	Formal, detailed documentation for escape and rescue for each workplace.		
	Workplace E & R plans reviewed and updated monthly and copies distributed / posted up.		
<b>2.2</b>	<b>Awareness of emergency situation</b>		
	Training.		
	Electronic instruments.		
	Means of raising alarm.		
<b>2.3</b>	<b>Self contained self rescuers</b>		
	CoP reviewed and current.		
	SCSR - Checking, maintenance and monitoring.		
	Caches of long duration sets.		
	Monitoring and maintenance system for long duration sets.		
<b>2.4</b>	<b>Locating refuge bay / place of safety</b>		
	Designated route.		
	Life line.		
	Barricades.		
	Bridges over conveyors.		
	Review monthly.		
	Fire / escape drills monthly.		
	Accountability for life line and fire / escape drills.		
<b>2.5</b>	<b>Refuge bays</b>		
	Designated.		
	Siting with in the "tested" distances.		
	Size for workforce + 20%.		
	Formal (140 kPa construction) standards.		
	Equipment.		
	Ventilation.		
	Less formal / transportable refuge bays.		
	Siting.		
	Construction and equipment standards.		
	Accountability for maintenance.		
<b>3</b>	<b>Training</b>		
	Formal initial and refresher training for -		
3.1	Receiving adequate warning and responding to signals from CO monitor.		
3.2	SCSR (incl. breathing simulator & training sets).		
3.3	Locating place of safety under stress and blindfolded.		

# CHECKLIST FOR BEST PRACTICES

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## Part 2 Management of intrushes, fires, explosions and other emergencies

Ref.	ISSUE	Y/N/?	ACTION
	Refuge bay procedures.		
3.4	Escape drills documented "on the job".		
	Auditing of training.		
	Record keeping.		
<b>4</b>	<b>Disaster management</b>		
	Written Procedure or CoP reviewed and current,		
<b>4.1</b>	<b>Control rooms and associated facilities</b>		
	Adequate space.		
	Telephones / communication facilities.		
	Plans- ventilation, water, rescue, etc.		
	E & R plans for each workplace available.		
	Stationery.		
	Duties allocated.		
	Callout lists up to date (review regularly).		
	Availability of all emergency procedures.		
	Immediate availability of all materials and equipment for dealing with any emergency.		
	Consultation with Mines Rescue Services for information, advice and guidance.		
<b>4.2</b>	<b>Situation management &amp; rescue operations</b>		
	Duties of members of management and technical staff included in CoP.		
<b>5</b>	<b>Disaster recovery</b>		
	Formal documentation of all decisions, instructions, sequence of actions and supervision as required.		
<b>6</b>	<b>Media liaison</b>		
	Channel for all official statements defined.		
	Officials informed re policy on media.		
	Media facilities.		
<b>7</b>	<b>Quality assurance</b>		
	Formalised programme in place. covering:		
	Documentation, CoPs, standards & procedures.		
	Monitoring implementation in the workplace.		
	Independent auditing applying the benchmark of industry best practices.		