

GUIDELINES



NSW DEPARTMENT OF
PRIMARY INDUSTRIES

GUIDELINE FOR BOLTING & DRILLING PLANT IN MINES

Part 2: Portable hand held bolters in underground coal mines

MDG 35.2

DRAFT July 2008

Note:

1. Comments must be received by 12 September 2008. Any comment received after this date will not be considered.
2. All comments should be forward to either
paul.drain@dpi.nsw.gov.au , or
peter.sunol@dpi.nsw.gov.au

MDG 35 Part 2 Comment DRAFT 08703.doc

First Published– Current draft July 2008

Acknowledgements

We wish to thank the Coal Safety Advisory Committee and the MDG 35 consultative committee for their most welcome support of this publication.

Disclaimer

The compilation of information contained in this document relies upon material and data derived from a number of third party sources and is intended as a guide only in devising risk and safety management systems for the working of mines and is not designed to replace or be used instead of an appropriately designed safety management plan for each individual mine. Users should rely on their own advice, skills and experience in applying risk and safety management systems in individual workplaces.

Use of this document does not relieve the user (or a person on whose behalf it is used) of any obligation or duty that might arise under any legislation (including the Occupational Health & Safety Act 2000, any other act containing requirements relating to mine safety and any regulations and rules under those acts) covering the activities to which this document has been or is to be applied.

The information in this document is provided voluntarily and for information purposes only. The New South Wales Government does not guarantee that the information is complete, current or correct and accepts no responsibility for unsuitable or inaccurate material that may be encountered.

Unless otherwise stated, the authorised version of all reports, guides, data and other information should be sourced from official printed versions of the agency directly. Neither the Department of Primary Industries, the New South Wales Government, nor any employee or agent of the Department, nor any author of or contributor to this document produced by the Department shall be responsible or liable for any loss, damage, personal injury or death howsoever caused.

Users should always verify historical material by making and relying upon their own separate inquiries prior to making any important decisions or taking any action on the basis of this information.

This publication contains information regarding occupational health, safety, injury management or workers compensation. It includes some of your obligations under the various workers compensation and occupational health and safety legislation that NSW Department of Primary Industries administers. To ensure you comply with your legal obligations you must refer to the appropriate legislation.

This publication may refer to NSW legislation that has been amended or repealed. When reading this publication you should always refer to the latest laws. Information on the latest laws can be checked at www.legislation.nsw.gov.au or contact (02) 4931 6666.

FOREWORD

Over the past several years there has been an increase in the number of injuries involving drilling and bolting plant in mines. The MDG 35 series of guidelines deals with the risks associated with the use of drilling and bolting plant in mines.

Part 1 provides guidance on bolting plant for strata support in underground coal mines.

Part 2 provides guidance on portable hand held bolters in underground coal mines.

Since the transition from timber roof supports to roof bolts, rib bolts, mesh and W-straps the use of bolting plant in underground coal mines has markedly increased. Between 1999 and 2008 incident data, from Coal Services Pty Ltd, identifies almost 800 injuries relating to the roof or rib bolting plant or process, (refer Appendix C – Incident Statistics). Injuries have ranged from strains through to severe entanglements.

This ‘*Guideline for Bolting & Drilling Plant in Mines - Part 2 Portable hand held bolters in Underground Coal Mines*’ has been compiled to assist in formulating a management system approach for the design and safe use of bolting plant for strata support in underground coal mines. It should be used when assessing the safety aspects of bolting plant.

This guideline provides a good industry benchmark for engineering standards and fit for purpose equipment. It can be considered good industry practice for mitigating the risks associated with the use of bolting equipment in underground coal mines. It provides practical guidance to prevent injury to people.

This is a ‘Published Guideline’.

The principles stated in this document are intended as information to assist industry to devise safety standards. Designers, manufacturers, owners and users of bolting plant should rely upon advice, skills and experience in applying safety standards to be observed in individual workplaces. Adherence to the guideline does not itself assure compliance with the general duty of care.

The State of New South Wales and its officers or agents including individual authors or editors will not be held liable for any loss or damage whatsoever (including liability for negligence and consequential losses) suffered by any person acting in reliance or purported reliance upon this guideline.

The constructive evaluation and input provided by mine engineers and manufacturers of bolting plant is gratefully acknowledged in the development of this guideline.

The MDG 35.2 ‘*Guideline for Bolting & Drilling Equipment in Mines, Part 2: Portable hand held bolters in underground coal mines*’ was distributed to industry for consultation and through the Coal Industry Safety Advisory Committee.

R. Regan
Director
Mine Safety Operations

TABLE OF CONTENTS

SECTION 1 PURPOSE AND SCOPE.....	6
1.1 TITLE	6
1.2 PURPOSE	6
1.3 SCOPE	6
1.4 APPLICATION	6
1.5 APPLICABLE LEGISLATION	7
1.6 REFERENCES	7
1.7 ABBREVIATIONS	7
1.8 DEFINITIONS	7
SECTION 2 GENERAL REQUIREMENTS.....	9
2.1 OCCUPATIONAL HEALTH AND SAFETY	9
2.2 MANAGEMENT SYSTEMS	10
2.3 INFORMATION	13
2.4 PLANT SAFETY FILE	13
2.5 ACCIDENT REVIEW	13
2.6 ALTERATIONS & REPAIRS	13
2.7 GUIDELINE ASSESSMENT.....	14
SECTION 3 DESIGN AND MANUFACTURE.....	15
3.1 HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL	15
3.2 CONTROLS	16
3.3 DESIGN.....	16
3.4 DOCUMENTATION.....	18
SECTION 4 OPERATIONAL	19
4.1 GENERAL	19
4.2 RISK ASSESSMENT	19
4.3 STRATA SUPPORT	20
4.4 SAFE SYSTEMS OF WORK	20
4.5 OPERATOR PROTECTION SYSTEMS.....	20
SECTION 5 MAINTENANCE AND REPAIR.....	21
5.1 GENERAL	21
SECTION 6 APPENDICES.....	22
6.1 APPENDIX A – ASSOCIATED DOCUMENTS.....	22
6.2 APPENDIX B – OH&S LEGISLATIVE FRAMEWORK FOR MINING IN NSW	23

6.3 APPENDIX C – INCIDENT STATISTICS AND SAFETY ALERTS..... 24

6.4 APPENDIX D – COMMON HAZARDS..... 25

DRAFT

SECTION 1 PURPOSE AND SCOPE

1.1 TITLE

This is MDG 35.2, the guideline for *'bolting & drilling plant in mines, Part 2: Portable hand held bolters in underground coal mines'*.

1.2 PURPOSE

The purpose of this guideline is to minimise risks to health and safety of people from the use of portable hand held roof bolters in underground coal mines. Historically such risks from bolting plant have included injury from –

- a) a failure of the strata;
- b) people being struck by material from the roof and/or rib (small or large);
- c) people becoming entangled in rotating parts of the bolting rig;
- d) people becoming trapped or squashed in moving parts of the bolting rig;
- e) manual handling during the bolting process;
- f) failure of hydraulic hoses and other hydraulic components; and
- g) slips, trips and falls.

To minimise risks to health and safety, it is envisaged these hazards and other foreseeable risks associated with the use of portable hand held roof bolter be –

- (i) identified and assessed at the design/manufacture/supply stage with appropriate risk controls being implemented; and
- (ii) assessed through the risk management process by the user of bolting plant, with appropriate risk controls and a safe system of work being implemented.

1.3 SCOPE

This guideline provides guidance to assist in identifying, assessing and controlling the risks to health or safety from the use of portable hand held roof bolters in underground coal mines.

This guideline covers the design and use of portable hand held bolters in underground coal mines. Consideration should be given to the relevant parts of MDG 41, *'Guideline for fluid power system safety at mines'*;

NOTES:

1. Adherence to guidelines does not of itself assure compliance with a general duty of care.
2. MDG 35.2 typically does not duplicate recommendations MDG 41.
3. This guideline is intended to assist in the evaluation of risk but may not comprehensively cover all safety related aspects of bolting plant as designs and operating environments may give rise to other hazards and risks.
4. This guideline does not generally give quantitative information as it is not the intent to restrict innovative design.

1.4 APPLICATION

This guideline applies to the design and use of portable hand held bolters in underground coal mines.

This guideline should be used by designers, manufacturers, suppliers, hirers, contractors, owners, users and coal operators when –

- a) undertaking risk assessments to fulfil occupational health and safety obligations;
- b) reviewing the adequacy of risk controls following an incident;
- c) assessing/ auditing current standards and practices;
- d) designing, manufacturing, altering and/or supplying portable hand held bolting plant;
- e) operating or using portable hand held bolting plant;

1.5 APPLICABLE LEGISLATION

Principal legislation for coal mine safety includes –

- a) The *Occupational Health and Safety Act 2000* (The *OHS Act 2000*);
- b) The *Occupational Health and Safety Regulation 2001* (The *OHS Regulation 2001*);
- c) The *Coal Mine Health and Safety Act 2002* (The *CMHS Act 2002*); and
- d) The *Coal Mine Health and Safety Regulation 2006* (The *CMHS Regulation 2006*).

Note: Details of the legislation can be found at www.legislation.nsw.gov.au, or <http://www.dpi.nsw.gov.au/minerals/safety>

1.6 REFERENCES

A partial list of associated documents is included in Appendix A for reference.

1.7 ABBREVIATIONS

AS/NZS	Australian / New Zealand Standard
DPI	Department of Primary Industries (NSW)
HSMS	Health and safety management system
ISO	International Organisation for Standardisation
MDG	Mechanical Design Guideline
PPE	Personal Protection Equipment
SMS	Safety Management System
SWP	Safe Work Procedure
TRS	Temporary Roof Support

1.8 DEFINITIONS

For the purpose of this document the definitions below apply.

(drafting note: check list)

1.8.1 Alter

In relation to plant, means change the design of, add to or take away from the plant if the change may affect health or safety, but does not include routine maintenance, repair or replacement.

1.8.2 Bolting Function

Includes the drilling process and installing strata support bolts.

1.8.3 Coal Operator

Has the same meaning as ‘operator’ in the *Coal Mines Health and Safety Act 2002*.

1.8.4 Competent Person

A person who has, through a combination of training, education and experience, acquired knowledge and skills enabling that person to perform correctly a specified task.

1.8.5 Emergency Stop Device

A manually actuated control device used to initiate an emergency stop function.

1.8.6 Ergonomics

Is the design of plant, process and environment so that tasks and activities required of humans are within their limitations but also make the best use of their capabilities.

More simply put - Ergonomics is designed for people in the work place. The application of ergonomics enhances people's ability to work safely and efficiently.

Note: Guidance for ergonomics in the workplace can be found in AS 4024 and "Practical Ergonomics" by Barbara McPhee, available through the Coal Services Health and Safety Trust, www.coalservices.com.au

1.8.7 Guard

Part of a machine specifically used to provide protection by means of a physical barrier.

1.8.8 Operator(s)

The person(s) who has control over the bolting rig and includes any assistant as required for the drilling and bolting process.

1.8.9 Safe guarding system

A system of safety measures consisting of the use of a combination of guards and other protective devices (safeguards) to protect persons from hazards which cannot be reasonable eliminated or sufficiently limited by design.

1.8.10 Shall

Indicates a statement that is 'strongly recommended'.

1.8.11 Should

Indicates a statement that is 'recommended'.

1.8.12 Strata Failure Management Plan

A management plan which identifies assesses and controls hazards arising from strata failure.

Note: This is a mandatory requirement under the *CMHS Regulation 2006*.

1.8.13 Supported Rib

Any portion of the roadway outbye the last line of permanently installed rib support, where rib support is required as part of the strata failure management plan for the mine or otherwise as determined and documented by a geotechnical engineer.

1.8.14 Supported Roof

Any portion of the roadway outbye of the centre line of the last line of permanently installed roof support or as otherwise determined and documented by a geotechnical engineer.

1.8.15 Use of Bolting Plant

Means work from, operate, maintain, inspect or clean bolting plant.

1.8.16 Users of Bolting Plant

Means any company that owns or has control of bolting plant where the bolting plant is used by the companies employees or employees of another company. It includes, coal operators, hire companies, contracting companies and the like.

SECTION 2 GENERAL REQUIREMENTS

2.1 OCCUPATIONAL HEALTH AND SAFETY

2.1.1 Legislative Framework

The Occupational Health and Safety legislative framework for mechanical engineering safety on mine sites is represented by the diagram in Appendix B – OH&S Legislative Framework for Mining in NSW.

This diagram highlights the hierarchy of legislation and the legislative considerations when managing mechanical engineering safety on a mine.

2.1.2 OHS Act 2000 and OHS Regulation 2001

The *OHS Act 2000* and the *OHS Regulation 2001* requires:

Designers, manufacturers and suppliers of plant must:

- ⇒ ensure plant is safe and without risk to health or safety when properly used, and
- ⇒ provide adequate information about the plant to persons to which the plant was supplied to ensure its safe use.
- ⇒ identify any foreseeable hazards that have potential to harm health or safety, assess the risks and take action to eliminate or control the risks.

Employers must ensure the health, safety and welfare of its employees and others at the employer's place of work through a process of risk management and consultation. That duty extends to:

- ⇒ ensuring that plant provided for use is safe and without risk to health when properly used,
- ⇒ ensuring that systems of work and the working environment are safe and without risk to health,
- ⇒ providing information, instruction, training and supervision as necessary to ensure health and safety is provided,

Note:

1. This guideline provides guidance on how these requirements can be met.
2. Designers, manufacturers and suppliers of plant and employers are advised to consult the *OHS Act 2000* and the *OHS Regulation 2001*, particularly Chapter 5 'Plant', for details of these requirements.
3. To effectively implement this guideline, designers, manufacturers, suppliers of plant and employers need to be aware of these requirements and have systems and procedures in place to apply them.

2.1.3 Control of Risk

The OHS regulation requires risks (that cannot be reasonably eliminated) to be controlled in the following order:

- a) Substitute the hazard to a hazard giving risk to a lesser risk.
- b) Isolate the hazard from people at risk
- c) Minimise the risk by the use of engineering means
- d) Minimise the risk by the administrative means, (e.g. safe work procedures, training, instruction, information)
- e) Use of personal protective equipment (PPE)

Notes:

1. A combination of methods may be required to minimise the risk to the lowest level reasonably practicable
2. In controlling the risk the use of bolting plant should be considered in lieu of portable and held bolters, refer MDG 35.1.

2.1.4 Consultation

Employers are required by the *OHS Act 2000* and *OHS regulation 2001* to consult with employees when taking steps to assess and control workplace risks.

Note:

1. The *CMHS Act* has additional requirements for consultation.
2. Further guidance can be obtained in the '*OHS Consultation*' Code of Practice 2001 by WorkCover NSW

2.2 MANAGEMENT SYSTEMS

The management of bolting and drilling plant should be an integral part of the mines Health and Safety Management System (HSMS) which should be consistent with AS 4801.

NOTE: Further guidance can be found in AS 4804 and HB 205. Refer also clause 14 of the *CMHS Regulation 2006*.

Designers, manufacturers, suppliers, users and coal operators' should be able to demonstrate that the each of the following has been addressed:

- a) Hazard identification
- b) Risk assessment
- c) Risk management procedures
- d) Consultation with all stakeholders
- e) Provision of adequate information
- f) Provision of adequate instruction and training
- g) Provision of adequate supervision
- h) Monitoring
- i) Review
- j) Revision

2.2.1 Hazard Identification

All hazards must be identified and dealt with so that they are eliminated or controls established to minimise the risk. This should be carried out for every stage of the plants in its lifecycle.

NOTE: See AS 4360 and MDG 1010 for further information.

Specific hazards associated with strata support (bolting) and drilling activities which may lead to personal injury may include (but be not limited to) –

- a) the failure of the strata above the operator;
- b) rotating and percussion machinery;
- c) stability of the machine/plant;
- d) mechanical energy;
- e) electrical energy;
- f) hydraulic energy;
- g) potential hazards due to the environment [strata fall, noise, dust, water, strata gases];
- h) bio mechanical energies (poor ergonomics and repetitive work);

- i) thermal energy;
- j) excessive noise;
- k) excessive dust; and
- l) excessive vibration.

This is not an exhaustive list and there may be other hazards present.

2.2.2 Factors Commonly not Considered

Factors commonly not considered which may increase the risk include (but not limited to) –

- a) human error factors;
- b) inadvertent contact with controls;
- c) inconsistent control layout such as differences between machines and handing from the operators position;
- d) fatigue;
- e) poor work practices;
- f) change in procedures or the environment;
- g) repetitive strain injury (RSI);
- h) working at heights;
- i) high pressure fluids and fluid injections;
- j) poor visibility and poor illumination;
- k) congested work area;
- l) slippery and wet environment;
- m) strata failure; and
- n) inrush.

2.2.3 Consultation

All stakeholders, including designers, manufacturers, owners and employees should be consulted when –

- a) identifying portable roof bolter hazards and assessing or reviewing their risks;
- b) decisions are made about measures to control those risks;
- c) introducing or altering the procedures for monitoring those risks;
- d) changes, defects or incidents occur;
- e) in the development, implementation and review of the mine SMS; and
- f) after an audit has been carried out

2.2.4 Risk Assessment

Designers and manufacturers of portable hand held roof bolters must carry out a risk assessment(s) to identify all hazards, assess the risks arising from those hazards and implement appropriate risk controls. In controlling the risks the designer must have regards to ergonomic principles. The designers risk assessment must cover the lifecycle risks.

The designers risk assessments' must be reviewed whenever –

- there is evidence the original risk assessment is no longer valid; or
- they are provided with information regarding a design fault that may affect health or safety.

Note: refer *OHS Regulation 2001* Chapter 5.

The **Coal operator** or other **users** of portable hand held bolters must carry out a risk assessment(s) to identify all hazards, assess the risks arising from those hazards and implement appropriate risk controls from the use of bolting plant. This operational risk assessment shall be carried out prior to the use of any portable hand held bolters in the mine. This risk assessment should be reviewed and a new operational risk assessment carried out whenever variations in design, use, conditions or environment could change the risk.

These risk assessment shall be documented

All risk assessments shall be consistent with recognised risk standards such as - MDG 1010, AS 4024:1301, AS4024:1302 and the '*National Minerals Industry Safety and Health Risk Assessment Guideline*', refer <http://www.mishc.uq.edu.au/>.

Risk assessments shall address the following, (as a minimum):

- a) Risk to health and safety of people in the vicinity that may be affected by the use of portable hand held bolting plant.
- b) Control risk to the lowest level reasonable practicable, refer 2.1.3.
- c) Consider the use of bolting plant as per MDG 35.1 in lieu of portable hand held bolting plant.
- d) Determine if the recommendations in this guideline be adopted or rejected.
- e) Determine any additional criteria that may be required for specific circumstances.
- f) Develop safe systems of work.
- g) Ensure the portable hand held bolters are fit for the specified purpose.
- h) Maintenance requirement to ensure the safe to use of portable hand held bolters.
- i) The instruction and training requirements

2.2.5 Safe Systems of Work

Safe systems of work should be supplied by the designer/manufacturer. These systems of work should be reviewed and new systems developed/maintained by the owner of the portable hand held bolters relevant to site specific conditions.

2.2.6 Instruction, Training and Competencies

All persons involved with bolting activities including designers, supervisors, operators and maintenance should be trained and assessed for their competencies.

The minimum acceptable competencies for particular types of works should be nominated.

Records of competency should be maintained and available for audit. The training and assessment of competencies extends to all levels including management and contractors.

Persons with appropriate knowledge, skills and experience should carry out training.

2.2.7 Supervision

All people involved with bolting activities should be reasonably supervised according to their competencies, experience and age and the task at hand.

2.2.8 Audit, Monitor & Review

Bolting plant and bolting management systems should be audited, monitored and reviewed at appropriate periodic intervals.

2.2.9 Revision

Bolting plant should be revised, where applicable, after an audit or review has taken place.

2.3 INFORMATION

Designers, manufactures, suppliers and hirers must supply sufficient information to users of portable hand held bolters to enable them to fulfil their obligations with respect to occupational health and safety (identifying hazards, assessing risks arising from those hazards, controlling those risks, providing information.

This information should be provided before supply of the portable hand held bolter.

The **Coal operator** and **other users** of portable hand held bolters must provide all persons involved in the use of portable hand held bolters all available information concerning health and safety about the plant.

Note: refer *OHS Regulation 2001* Chapter 5.

2.4 PLANT SAFETY FILE

Safety related aspects of bolting plant should be fully documented. These records should be maintained in a plant safety file which covers the lifecycle of the system, as appropriate. The plant safety file should contain the following information:

- a) Design specifications, performance and other design conditions for safe use.
- b) Hazard identification, risk assessment and risk control methods for the use of portable hand held bolters.
- c) Consultation records*.
- d) Maintenance records, safety inspections and test reports.
- e) Change of procedures, monitoring, audit and review reports.
- f) Reports of accidents and safety statistics*.
- g) Training and competency records*.
- h) Plant alterations.

The records should be stored and maintained in such a way that they are readily retrievable and protected against damage, deterioration or loss.

Note: A plant safety file may not necessarily be one complete document, but may refer to where the information can be obtained see *

2.5 ACCIDENT REVIEW

A co-operative approach between designers, manufacturers, statutory authorities and coal operators is required to eliminate further bolting plant incidents.

The owners and operators of bolting plant should provide to the plant designer/manufacturer details of relevant incidents.

The designer/ manufacturer should notify all owners and operators of any safety related incidents that they become aware of and their recommendation to rectify such defect. (e.g. Safety Alerts, Technical Bulletins, etc.), refer <http://www.dpi.nsw.gov.au/minerals/safety/publications/statistical-publications>

2.6 ALTERATIONS & REPAIRS

Alterations to bolting plant must not be carried out unless the person undertaking the alterations fulfils the duties of a designer under the *OHS Regulation 2001*. A risk assessment shall identify the alterations is safe and is able to be done without reduction to safety.

Alterations to plant shall be designed and implemented under the direction of a competent engineer.

Repairs to plant are to be at least as functionally efficient and strong as they were before the failure or damage.

The end user should conduct an operational risk assessment on the modified plant before putting the

machine into operation. This risk assessment should ensure that no new hazards are introduced unless appropriate controls are implemented.

For any alteration and in conjunction with a change management process all standards and documentation should be reviewed.

2.7 GUIDELINE ASSESSMENT

An assessment against this guideline should be carried by designers and users of portable hand held bolters.

DRAFT

SECTION 3 DESIGN AND MANUFACTURE

Note: This section is an extract from MDG 5:1994.

3.1 HAZARD IDENTIFICATION, RISK ASSESSMENT AND CONTROL

3.1.1 General

All foreseeable hazards associated with the use of bolting plant must be identified by the designer.

Note: Clause 2.2.1 provides guidance on specific hazards with bolting plant.

The designer must evaluate/assess all risks of harm to safety of any person arising from the identified hazards. The designer must identify the design requirements and any other actions as required to control the risk to a level as low as reasonably practicable. In designing risk controls the designer must make sure that the design has regards to ergonomic principles.

The designer must review the design risk assessment whenever there is evidence it is no longer valid or a person has provided information about a design fault that has potential to harm the safety of any person.

The design risk assessment should consider reasonably foreseeable misuse and should review previous accidents, incidents relating to similar plant, where practicable.

3.1.2 Information by designer/manufacture

The designer/manufacture must provide information on risk controls necessary for the safe use of the portable hand held bolters. This information must include the following, but be not limited to –

- a) information on identifying hazards, assessing risks arising from the hazards and controlling risks from the use of the bolting plant;
- b) the purpose of the portable hand held roof bolters;
- c) testing or inspections requirements;
- d) installation, commissioning, operation, maintenance, inspection, cleaning requirements;
- e) systems of work for the safe use of the bolting plant; and
- f) emergency procedures.

3.1.3 Human Plant Interactions

The design risk assessments shall consider the following factors for safe human-plant interaction:

- a) Limitations of human capabilities.
- b) Human actions critical to safety and the consequences to safety of human error in these actions.
- c) Integration of human performance into systems and their operation.

Note: Guidance is given in ISO 13407, AS 4024:1401, and AS 4024:2601.

3.1.4 Ergonomics

The designer shall consider safety related aspects of ergonomic issues for persons carrying bolting and drilling activities using portable hand held roof bolters.

Note: Guidance for ergonomics in the workplace can be found in AS 4024:1401, the 1900 series of parts to AS 4024 and “*Practical Ergonomics*” by Barbara McPhee, available through the Coal Services Health and Safety Trust, www.coalservices.com.au

3.2 CONTROLS

3.2.1 General

The operating controls shall be clearly marked to show their function. The marking shall be durable so that it will not be easily obliterated.

Controls should be positioned for ease of operation by both right and left handed persons wearing protective gloves.

Controls should be protected against inadvertent or accidental operation.

Guards around controls shall be so designed that they do not create nip-points for the operator's hands or gloves.

The chuck rotation valve shall shut off each time the operator releases the control trigger. Its operation shall not be affected by ingress of fines or by minor damage to the machine. The flow of air through this valve shall be in favour of the closed position. Centrifugal force created by a machine spinning out of control shall not act against the closure of this valve.

NOTE: Spool valves are not considered to be suitable for this application.

The trigger which controls the chuck rotation shall be spring loaded to the "OFF" position. In case of valve failure a second means should be available for the operator to shut off chuck rotation.

Should the handle be released from a stalled position at full air pressure the machine shall not rotate through an arc greater than 180° before coming to rest.

3.2.2 Direction of Movement

The direction of movement for controls should be as follows:

FUNCTION	DIRECTION
ON	Down, right, forward, clockwise, pull (push/pull type switch)
OFF	Up, left, backward, anti-clockwise, push
RIGHT	Clockwise, right
LEFT	Anti-clockwise, left
FORWARD	Forward, down
REVERSE	Backward, up
RAISE	Up, back
LOWER	Down, Forward
RETRACT	Up, backward, pull
EXTEND	Down, forward, push
INCREASE	Forward, away, right, clockwise
DECREASE	Backward, toward, left, anti-clockwise
OPEN VALVE	Anti-clockwise
CLOSE VALVE	Clockwise

3.3 DESIGN

3.3.1 General

Safe guarding systems shall be provided to prevent injury from moving parts, rotating parts, nip/shear points and contact with hot surfaces.

Sharp edges on the plant which could injure people should be avoided.

A system for the safe handling and loading of consumable materials (such as; drills, bolts, chemicals, plates, etc) should be specified. The handling system should minimise reach distance and exposure to hazards where practicable.

The total weight of the roof bolter should be less than 20 kg, unless provision is provided for two people to carry it.

The handle shall be 100 mm shorter than the leg to keep controls clear of the floor.

The handle should be designed to reduce severity of impact which could result from a machine spinning out of control.

The horizontal load at the handle shall not exceed 200N for normal operation of the bolter.

There should be a clamp to retain the drill steel in the chuck to ensure the steel follows the machine when it is lowered. The clamp should be within the chuck. External clamps are not desirable.

Compressed air hoses shall comply with the FRAS requirements of AS 2660.

3.3.2 Working Pressure

Roof bolters shall be designed to withstand a safe working pressure of 700 kPa for air and 1700 kPa for water and comply with a minimum factor of safety of 3:1. There shall be provision in the air and water supply to ensure that these pressures cannot be exceeded. This provision need not be incorporated within the roof bolter. The allowable safe working pressures shall be clearly marked on the roof bolter in a durable manner so that it will not be easily obliterated.

Hydraulically operated hand held bolters shall comply with MDG 41.

3.3.3 Air Filtration

The roof bolter main air supply shall be fitted with an air filter which is capable of filtering out all particles likely to cause any valve malfunction.

3.3.4 Exhaust

The air exhaust system shall be designed not to exhaust onto the operator or raise coal dust into the atmosphere.

3.3.5 Air Lubrication

The density of oil mist emitted by the bolter in the vicinity of the operator shall not exceed the Threshold Limit of 5 milligrams/cubic metre (exposure standards for Atmospheric Contaminants in the Occupational Environment).

3.3.6 Noise

Appropriate control measures must be taken if exposure to noise at the operators station – exceeds an 8 hour noise level equivalent of 85 dB(A); or peak of more than 140 dB(C).

A comprehensive noise survey of the drilling or bolting plant should be conducted and be incorporated in the design documentation.

Notes:

1. Exposure to noise is to be taken to be measured at the position of the ears of operator.
2. The noise measurement is to be made on the assumption that the operator is not wearing any noise protection such as ear muffs.
3. When measured in accordance with AS 1269.1.
4. It is preferable for this noise survey to be carried out in the intended operating environment.

A muffler shall be fitted to the air exhaust outlet to attenuate the noise generated from that source.

A label indicating that personal hearing protection should be worn shall be displayed on all bolters where the noise level for that type of bolter exceeds this limit.

3.3.7 Non-metallic Materials

Non metallic materials (e.g. plastics) used in the construction of roof bolters should be fire resistant and anti-static (FRAS) in accordance with MDG 3006 MRT 8.

3.4 DOCUMENTATION

The designer, manufacturer, supplier shall provide a comprehensive manual for the purpose of training personnel in the operation, inspection and maintenance of their equipment.

The documentation supplied with each machine shall include:

- a) A warning notice, “machine not to be used without filters in place”
- b) Feed rate for lubricant to be set so that the limits for oil mist are not exceeded
- c) The fittings used to connect the air/water hoses to the roof bolter should provide an attachment comparable with the hose burst pressure rating

DRAFT

SECTION 4 OPERATIONAL

4.1 GENERAL

The coal operator and other of bolting plant must ensure that –

- a) portable hand held bolters are not operated unless the operator is supervised and receives adequate information and training; and
- b) portable hand held bolters are only used for the purpose which it was designed, unless a competent persons assesses that the change does not present an increase in risk to safety; and
- c) safety features are used as intended by the designer of portable hand held bolters; and
- d) the risk of entanglement is controlled by safe guarding systems or otherwise safe systems of work; and
- e) portable hand held bolters are subject to appropriate checks, tests and inspections necessary for safety; and

Note: refer *OHS Regulation 2001* Chapter 5.

4.2 RISK ASSESSMENT

All portable hand held bolters should be operated in accordance with its intended operational envelope and the designers, manufacturers and suppliers recommendations.

An operational site specific risk assessment shall be carried out prior to the bolting and drill rig being used on the mine site.

The risk assessment shall include:

- a) each location where portable hand held bolters are indented to be used.
- b) specific site requirements in the strata failure management plan
- c) site specific hazards including hazards associated with the fluid power energy supply arrangements.
- d) operator protective systems.
- e) site competencies.
- f) develop safe systems of work before normal operation.
- g) proximity to unstable roof and rib.
- h) the use of bolting plant in accordance with MDG 35.1.

4.2.1 Training

Training and assessment of competencies for personnel who use bolting plant should as a minimum include the following:

- a) Knowledge and understanding of the hazards and required controls.
- b) Safe operation, inspection and testing of the plant.
- c) Operator safety inspections and operational maintenance activities.
- d) Reporting of faults and defects.
- e) Use of safe guarding systems.
- f) Bolting drilling process, standards and systems.

Note: Training may vary depending on the hazard levels associated with the tasks being undertaken.

4.2.2 Supervision

All portable hand held bolter activities shall be carried out under the direction of a competent supervisor.

This person must have sufficient control to ensure that before portable hand held bolters activity are commenced the following items have been taken into consideration:

- a) The hazards of the location have been identified and the risks assessed.
- b) Controls are in place to eliminate or reduce risk.
- c) The plant being used has been inspected, is fit for purpose and safe to operate.
- d) The operator is aware of potential hazards.
- e) The portable hand held bolters are operated in accordance with the mine specific standards and procedures.

4.3 STRATA SUPPORT

No person shall proceed beyond the last line of permanently supported roof¹ unless temporary roof support has been erected / set to protect the operator.

No person shall proceed beyond the last line of permanently supported rib² unless temporary rib support or protection has been erected / set to protect the operator, or in accordance with the mines strata failure management plan.

Portable hand held bolter operations should be carried out in accordance with the mines strata management plan and support rules.

4.4 SAFE SYSTEMS OF WORK

Site safe systems of work for operating the bolting plant shall be developed from the designers information, the operational risk assessment and site specific conditions and standards.

4.5 OPERATOR PROTECTION SYSTEMS

An effective means to prevent injuries to operators from material falling from the either the roof or ribs shall be provided. All operators shall be protected from –

- a) the failure of the strata above the operator;
- b) a falling object hitting the operator e.g. loose smaller material, larger material or roof fall;
- c) the rib breaking away and collapsing on the operator; or
- d) mobile bolting plant overturning while travelling or being operated.

The operator shall be able to carry out the strata support process from –

- a) under permanently supported roof and supported rib³; or
- b) otherwise under an operator protection system which provides an appropriate level of protection.

Where required, operator protection systems shall comply with the relevant requirements in MDG 35.1.

¹ refer clause 1.8.14

² refer clause 1.8.13

³ The geotechnical engineer may determine supported roof or rib criterion, refer clause 1.8.14 and 1.8.13. Refer also *CHMS Regulation 2006* subclause 32(n)

SECTION 5 MAINTENANCE AND REPAIR

5.1 GENERAL

The coal operator and other users of portable hand held bolters must ensure that in relation to repair and maintenance of bolting plant –

- a) necessary facilities and systems of work are provided and maintained; and
- b) inspections, maintenance and cleaning is carried out with regards to designers, manufacturers information or otherwise developed by a competent person; and
- c) all safety features and warning devices on bolting plant are tested and maintained; and
- d) a competent persons assess any damage to bolting plant, where the risk to safety is increased; and
- e) repair, inspection and testing in carried out by a competent person; and
- f) repairs to bolting plant keep the bolting plant within its design limits.
- g) if access to the bolting plant is provided, the bolting plant is stopped and a lockout, danger tag, permit or other control measure used.

Note: refer *OHS Regulation 2001* Chapter 5.

DRAFT

SECTION 6 APPENDICES

6.1 APPENDIX A – ASSOCIATED DOCUMENTS

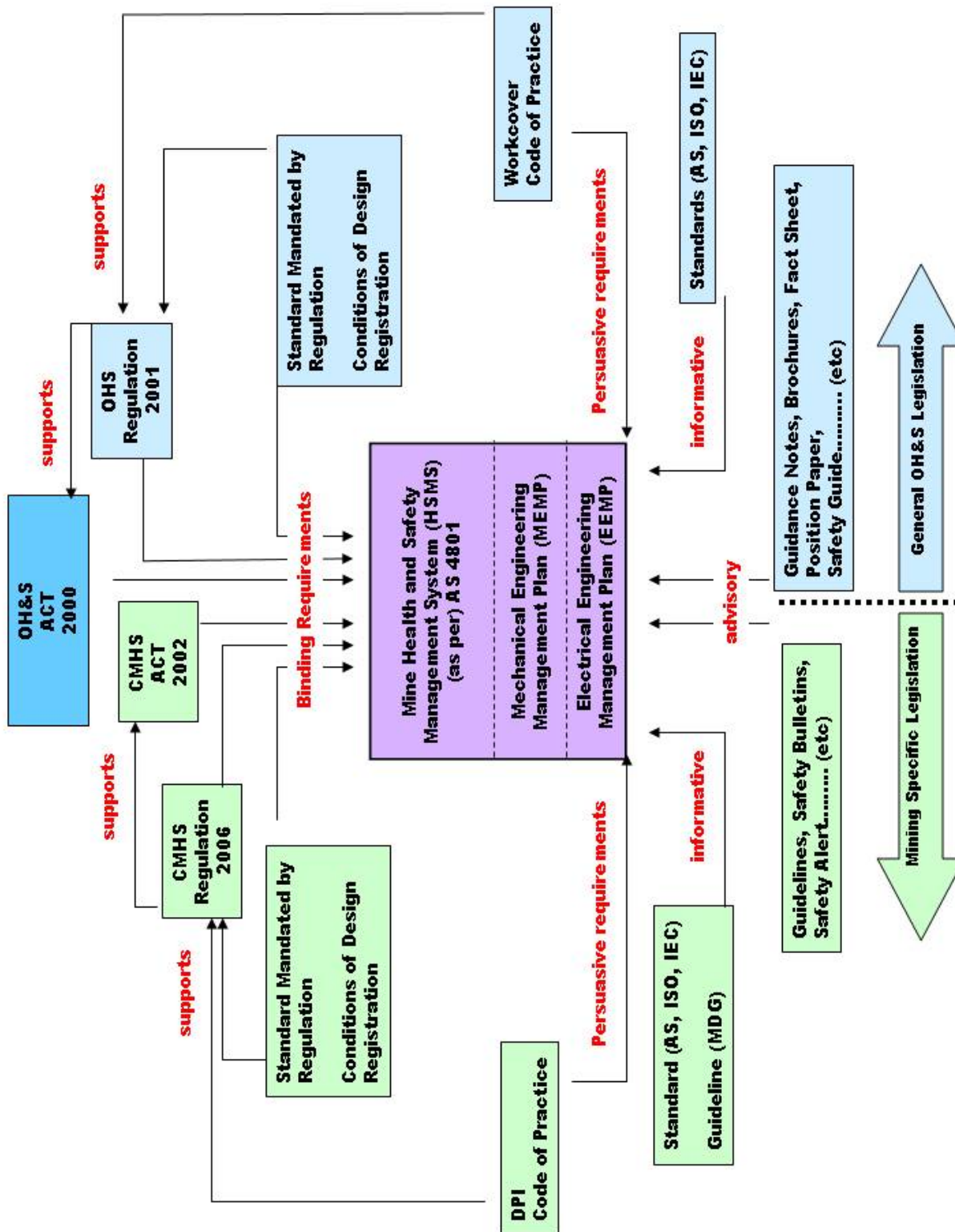
The following partial list of documents is related to fluid power system safety. This list is provided for information only and it is not a full and comprehensive list of all documents that may be applicable.

6.1.1 Australian Standards

DRAFT

6.2 APPENDIX B – OH&S LEGISLATIVE FRAMEWORK FOR MINING IN NSW

The following diagram outlines the Occupational Health and Safety legislative framework for coal mines in NSW.



6.3 APPENDIX C – INCIDENT STATISTICS AND SAFETY ALERTS

6.3.1 Incident Data

(Drafting note: set up link to DPI web site page for bolting plant statistics and analysis)

6.3.2 Safety Alerts

The following safety alerts have relevant to strata support in underground coal mines-

Alert No.	Title
SA 08-05	<u>Miner's arm injured using drill rig</u>
SA05-05	<u>Drill Rig Serious Injuries</u>
SA04-04	<u>High Pressure Air Hose Burst on Exploration Drill Rig</u>
SA01-13	<u>Fall of coal and stone kills miner</u>
SA01-01	<u>Coal mine fatality from fall of roof</u>
SA00-25	<u>Serious injury while roof bolting</u>
SA99-12	<u>Fatality resulting from a continuous miner crushing injury</u>
SA99-16	<u>Continuous miner drill rig fatally crushes tradesman</u>
SIR94.4	

(Insert table of titles and refer to DPI web site and hotlink where copy can be found)

6.4 APPENDIX D – COMMON HAZARDS

For a more extensive list of hazards than the following table, refer to appendix B of AS 4024.1301-2006 - Safety of machinery – Part 1301: Risk Assessment - Principles of Risk Assessment

(DRAFTING NOTE: THIS TABLE SHOULD BE REPLACED WITH A SPECIFIC TABLE FOR BOLTING PLANT BASED ON INCIDENT STATISTICS)

Energy source	Hazard	People Consequence	Plant / Other Consequences
Bio-mechanical	<ul style="list-style-type: none"> Ergonomic design failure 	<ul style="list-style-type: none"> Excessive effort Human error, human behaviour Injuries from neglected use of PPE Slips, trips, falls Sprains, strains Unhealthy posture 	
Chemical	<ul style="list-style-type: none"> Dust Explosion Fires Fluids Fumes Gases Mists 	<ul style="list-style-type: none"> Asphyxiation Burn injuries Cancer Dust Irritation Lung damage Poisoning 	<ul style="list-style-type: none"> Corrosion Explosion Fire Melting
Gravity	<ul style="list-style-type: none"> Stored potential energy - Weight in elevated machine components 	<ul style="list-style-type: none"> Crush injuries Fall injuries 	<ul style="list-style-type: none"> Plant damage
Mechanical	<ul style="list-style-type: none"> Crushing Drawing-in or trapping Entanglement Friction or abrasion Impact Shearing Stored potential energy - springs Unexpected movement 	<ul style="list-style-type: none"> Amputations Crush injuries Entanglement injuries Impact injuries 	<ul style="list-style-type: none"> Impact damage Structural failure
Noise	<ul style="list-style-type: none"> Excessive noise levels 	<ul style="list-style-type: none"> Hearing loss Make errors Miss alarms or acoustic signals Tinnitus 	
Pressure	<ul style="list-style-type: none"> Stored potential energy – liquids and gases under pressure 	<ul style="list-style-type: none"> Fluid injection injuries Struck by ejected projectiles 	
Temperature	<ul style="list-style-type: none"> Contact with extreme high or low temperature objects Explosions Flames Heat radiation Hot or cold work environments 	<ul style="list-style-type: none"> Burns, scalds Cancer Freezing Heat stress Hypothermia 	<ul style="list-style-type: none"> Explosion Fire Melting Thermal damage
Vibration	<ul style="list-style-type: none"> Hand held machine vibrations 	<ul style="list-style-type: none"> Neurological, vascular disorders Whole body vibration damage 	