

CAPABILITY STATEMENT

RAISE BORE DIVISION

05

CAPABILITIES

07

FLEET

20

SPECIALIST EXPERIENCE

LEADERS IN UNDERGROUND MINING

PYBAR is a nationwide provider of mining services with core competencies in underground hard rock mining.

RAISING THE BAR

PYBAR's Raise Bore Division sets the standard in fleet availability, rig capability and expertise. Backed by industry-leading management systems and a strong safety ethos, it offers fit for purpose solutions to projects both nationally and internationally.

SPECIALISED EXPERIENCE. FIT FOR PURPOSE RIGS. OPTIMISED PROJECTS.

CONTENTS

02

COMPANY
PROFILE

03

THE WAY
WE WORK

04

SAFETY AND
PRODUCTIVITY

05

CAPABILITIES

06

SERVICES

07

FLEET

14

RIG
SELECTION

16

ADDITIONAL
SERVICES

20

SPECIALIST
EXPERIENCE

ABOUT PYBAR

PYBAR IS A LEADER IN UNDERGROUND MINING IN AUSTRALIA DELIVERING ON PROJECTS FROM LARGE ESTABLISHED MINING OPERATIONS TO GREENFIELD DEVELOPMENTS.

PYBAR's success is based on safe, rapid underground infrastructure development and consistent reliable production.

An integrated service offering to the mining sector

The PYBAR Group provides a comprehensive service offering to the mining industry through a number of service units including **PYBAR Mining Services** as underground mining contractors.

The Raise Bore Division

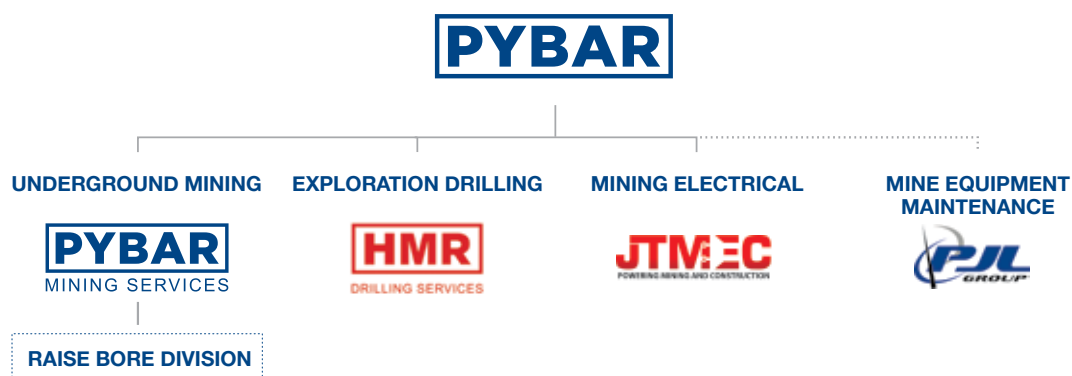
PYBAR's Raise Bore Division is headquartered in Orange NSW, with Group offices in Sydney, Perth, Darwin, Cobar, Townsville and Kalgoorlie.

Overall, PYBAR has a fleet of more than 300 drills and ancillary equipment and has the second largest raise bore rig in Australia.

PYBAR has the agility and responsiveness of a private company, with the resources and capabilities to provide a scalable, market-leading service internationally.



THE PYBAR GROUP OF COMPANIES



SPECIALISED EXPERIENCE. FIT FOR PURPOSE RIGS. OPTIMISED PROJECTS.

QUALITY BACKED BY INFRASTRUCTURE AND SYSTEMS

03

THE WAY WE WORK

PYBAR'S CULTURE FROM THE TOP DOWN IS TO STRIVE TO EXCEED EXPECTATIONS.

We understand that our role is to deliver value and provide a service that results in more profitable projects for our clients.

Safety

We have a 'zero harm' mandate. The principles of risk management and continuous improvement are fundamental to PYBAR's overall business strategy.

Core to our values is safety which is supported by a number of strategies and policies.

A BUSINESS BUILT ON OUR VALUES.

SAFETY

- Zero Harm. Zero Compromise.

SERVICE

- We are responsive and deliver solutions
- We do what we say

Quality management

PYBAR's quality management strategy is backed by highly trained personnel, policies and systems that ensure consistency and ensure conformance.

PYBAR's quality management plan is conducted to AS/NZS ISO 9001.

Industry-leading, information technology infrastructure

PYBAR's Raise Bore Division is backed by industry leading, information technology and infrastructure.

We ensure the infrastructure is in place to ensure successful operation of your mine. Central to this are our communications and control processes that provide efficient and safe operations.

RESPECT

- We look after our people and communities
- We listen and act with honesty and integrity
- We build and maintain relationships

RESULTS

- We exceed expectations by doing more with less
- We set the standards for industry best practice

WHY USE RAISE BORING AS THE PREFERRED DRILLING TECHNIQUE?

Safety

Raise boring is possibly the safest method you can use to create a tunnel. It is a non-entry method and therefore reduces the risk of injury from rock falls and eliminates the need for explosives.

Increased productivity

Tunnels are created quickly, reducing delays.

Minimal rock disturbance

Drilling doesn't shake the surrounding rock with the same intensity as a blast. Therefore, adjacent mining operations are essentially left undisturbed.

Profit driver

With less time and resources spent excavating shafts and reduced rehabilitation of neighbouring excavations, raise boring can enhance the profitability of a mining operation.



SAFER. MORE EFFICIENT. BETTER RESULTS.

A COMPLETE RAISE BORING SERVICE

FROM STANDARD RAISE DRILLS TO ONE OF THE MOST POWERFUL RIGS IN AUSTRALIA, PYBAR PROVIDES OPTIMUM SOLUTIONS FOR ANY SIZE OF PROJECT, GLOBALLY.

THE RAISE BORING PROCESS

Pilot Drilling

The pilot drilling process allows for both the directional integrity and attachment of the reamer. The cuttings from the pilot hole are flushed by the use of water or compressed air up through the annulus of the drilled hole.

Conventional Reaming

In the conventional raise boring process, the pilot hole is drilled down to a lower level in the mine or civil project. Following the pilot hole drilling the reamer is attached and back reamed.

Boxhole/Up-hole Reaming

In this method of raise boring, the pilot hole is drilled upwards to the upper level or stope area. Once the targeted length has been achieved the drill string is retrieved, reamer attached and then reamed upwards. The cuttings will be collected in a designed chute which is attached to the raise boring machine for discharge.

Down-hole Reaming

The pilot hole is drilled down to a lower level; the drill string is then retrieved, reamer attached, and reamed down towards the lower level of elevation below. The cuttings are flushed through the annulus of the pre-drilled pilot hole.

AREAS OF EXPERTISE

Metalliferous Hard-Rock

PYBAR's raise bore drilling services have been an integral part of PYBAR's mining operations and some of Australia's largest expansion projects and production projects. Our fleet of raise boring machines, combined with experienced drill crews, provide PYBAR with the dynamic ability to ream raises in metalliferous hard-rock from 0.7 metres up to 7.0 metres in diameter.

Coal

PYBAR's raise bore management team has deep hands-on experience in coal having completed multiple raise bore projects. PYBAR's flame-proof equipment is used to ensure that we offer a complete range of equipment to ream shafts in coal.

Civil Construction

PYBAR has a significant fleet of raise boring machines which provide the dynamic ability to ream raise for civil works from 0.6 metres up to 6.0 metres in diameter. This raise boring technique may be utilised for a broad range of civil construction applications including shafts for hydro-electric projects, underground gas storage facilities, egress and underground elevator shafts, and exhausts for subway or motorway tunnels.



A FULL TURN-KEY RAISE BORING CONTRACTING SERVICE PACKAGE



TAILORED RAISE BORING CAPABILITIES

PYBAR'S RAISE BORING CAPABILITIES OFFER FLEXIBILITY AND FIT-FOR-PROJECT SOLUTIONS

Our raise boring capabilities include:

- ventilation shafts;
- ore passes;
- slot holes;
- service holes;
- paste fill holes and pipes;
- drain holes;
- escape ways;
- shaft steel liners;
- shaft sealing units; and
- shaft blast canopies.

Our civil engineering capabilities include:

- penstocks for hydro plants;
- tunnel ventilation;
- tunnel drainage;
- pressure reducers from train tunnels; and
- deep and large diameter pile holes.

ATLAS COPCO EASER L

07

FLEET

1000V HYDRAULIC DRIVE MACHINE

The Atlas Copco Easer L is a compact, dual-purpose rig specifically designed to drill both conventional rises and boxhole slot rises while maintaining a low profile.

The rig is capable of drilling production slot rises in block cave, sub-level caving and sub-level stoping mines in addition to precondition holes, paste fill holes, drain holes and escape ways.

The Easer L is capable of reaming 750mm up-hole slots, 750mm down-hole slots and 1.1m conventional rises for escape ways with deviation less than 1%.

No site preparation or concrete foundation is required.

The Easer L is a wheel-bound unit making it exceptionally easy to move between drill sites. Designed to keep a high level of safety, there is no manual labour required with the installation of drill pipes, stabilisers or the reamers. All moving and lifting is done with the crane within a 4m radius.



Operational Data	Up-hole Slot Diameter	Diameter Length	750mm 60m
	Conventional Ream Diameter	Diameter Length	750mm to 1.1m 60m
	Down-hole Ream Diameter	Diameter Length	750mm 60m
	Raise Angle	All Modes	60 degrees to vertical
	Pilot Hole Diameter	Normal	9" (228mm)





REDBORE 40-SDR

1000V HYDRAULIC DRIVE MACHINE

The Redbore 40-SDR is a small, compact rig designed primarily for production slot rises and escape ways rises.

The rig can be configured from conventional reaming mode to down-hole reaming mode for stope recovery down slots, eliminating the need for bottom hole access.

A simple and straight-forward hydraulic drive machine, the Redbore 40-SDR is an ideal rig for delivering value and productivity.

It is capable of reaming 1.1m to 1.5m diameter rises up to 152m in length.

Operational Data	Conventional Ream Diameter	Diameter Length	1.1m to 1.5m 152m
	Down-hole Ream Diameter	Diameter Length	725mm 60m
	Raise Angle	Ream Mode Down-hole Mode	45 degrees to vertical 45 degrees to vertical
	Pilot Hole Diameter	Normal	9" (228mm)

REDBORE 50-MDUR

1000V ELECTRIC DRIVE MACHINE

The Redbore 50-MDUR is a compact, dual-purpose rig specifically designed for conventional rises and boxhole slot rises while maintaining a low profile.

The rig features a retractable wrenching arm system, lay-down rod handler and electric PLC drive system which greatly improves the transfer of energy while reducing power consumption.

The Redbore 50-MDUR is capable of reaming 1.1m to 1.5m diameter up-hole slots up to 60m in length, and conventional rises up to 2.1m in diameter and up to 183m in length.



Operational Data	Up-hole Slot Diameter	Diameter Length	1.1m to 1.5m 60m
	Conventional Ream Diameter	Diameter Length	1.1m to 2.1m 183m
	Raise Angle	Up-hole Slot Mode Ream Mode	45 degrees to vertical 45 degrees to vertical
	Pilot Hole Diameter	Normal Maximum	11" (297mm) 12-1/4" (312mm)

SBM 450

1000V HYDRAULIC DRIVE MACHINE

The SBM 450 is a compact, dual-purpose rig specifically designed for conventional rises and boxhole slots rises while maintaining a low profile.

The rig features a mechanised wrenching system, lay-down rod handler and hydraulic drive system which greatly improves the transfer of energy while reducing power consumption during operations.

The SBM 450 is capable of reaming 700mm to 1.1m diameter up-hole slots up to 60m in length, and conventional rises up to 2.4m in diameter and up to 350m in length.

Operational Data	Up-hole Slot Diameter	Diameter Length	700mm to 1.1m 60m
	Conventional Ream Diameter	Diameter Length	1.1m to 2.4m 350m
	Raise Angle	Up-hole Slot Mode Ream Mode	45 degrees to vertical 45 degrees to vertical
	Pilot Hole Diameter	Normal Maximum	11" (297mm) 12-1/4" (312mm)

ATLAS COPCO 61-RH

1000V HYDRAULIC DRIVE MACHINE

The Atlas Copco 61-RH is a powerful, compact and lightweight raise bore designed to fit in smaller underground excavations, it is the ideal solution for mid-size ventilation raises, ore passages and escape way rises of all kinds.

The 61-RH is capable of reaming 1.4m to 3.0m diameter rises up to 350m in length.



Operational Data	Conventional Ream Diameter	Diameter Length	1.4mm to 3.0m 350m
	Raise Angle	Ream Mode	45 degrees to vertical
	Pilot Hole Diameter	Normal Maximum	11" (297mm) 12-1/4" (312mm)



SBM 800

1000V HYDRAULIC DRIVE MACHINE

The SBM 800 is a large diameter raise bore ideally suited to surface and underground ventilation raises, shafts and ore passes.

The rig is a compact lightweight design which fits into smaller underground excavations. The drilling operation is fully compatible with directional drilling technology, allowing the drill to deliver vertical excavation when needed.

The SBM 800 is capable of reaming 4.0m to 6.0m diameter rises up to 600m in length.



Operational Data	Conventional Ream Diameter	Diameter Length	3.5m to 6.0m 600m
	Raise Angle	Ream Mode	45 degrees to vertical
	Pilot Hole Diameter	Normal Maximum	13-3/4" (349mm) 15" (381mm)



RBR 600-VF

1000V ELECTRIC (VF) DRIVE MACHINE

The RBR 600-VF is a large diameter raise bore ideally suited for surface and underground ventilation raises, shafts and ore passages.

The compact design provides a cost-effective method to drill large diameter raises while minimising costly underground excavations.

The RBR 600-VF features a PLC controls system, allowing unprecedented control over the drilling process. It is fully compatible with directional drilling technology, allowing the drill to deliver vertical excavation when needed.

The rig is capable of reaming 4.0m to 7.0m diameter rises up to 1,000m in length.



Operational Data	Conventional Ream Diameter	Diameter Length	4.0m to 7.0m 1,000m
	Raise Angle	Ream Mode	45 degrees to vertical
	Pilot Hole Diameter	Normal Maximum	13-3/4" (349mm) 15" (381mm)

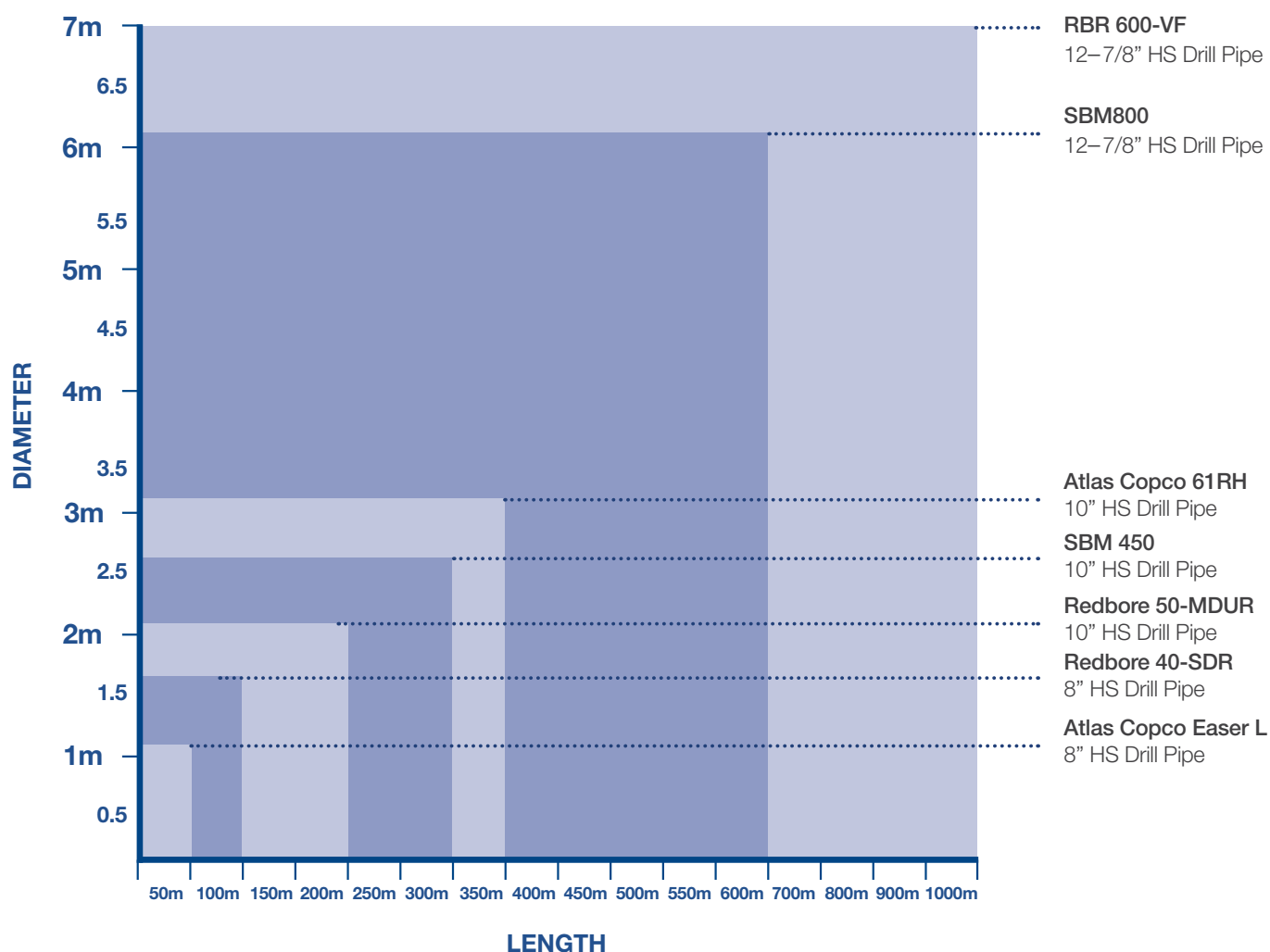
SELECTING THE RIGHT RIG

SELECTION OF THE CORRECT RIG DELIVERS EFFICIENCIES IN TIME AND BUDGET.

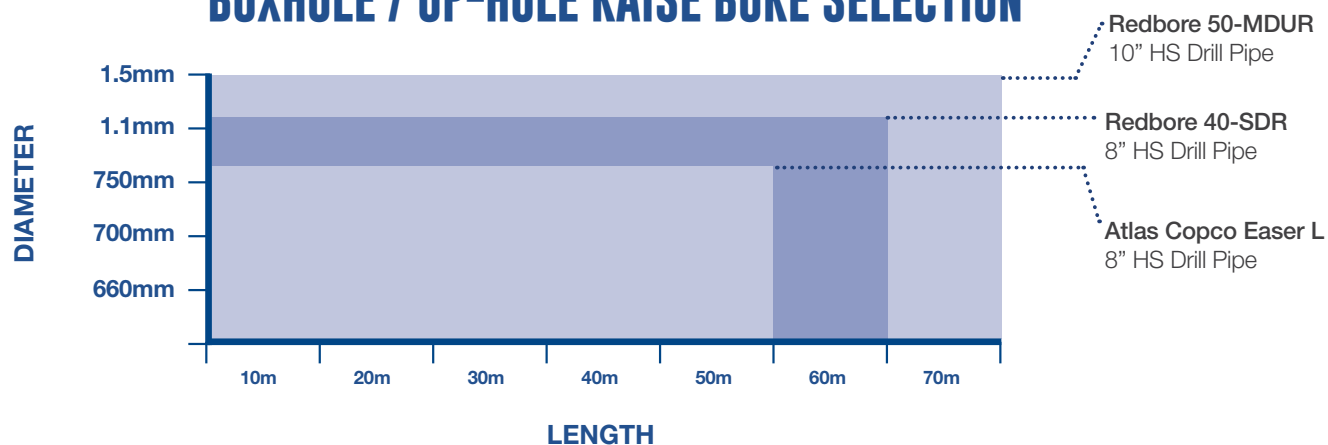
The following diagrams assist in the selection of the correct rig to suit varying project applications.



CONVENTIONAL RAISE BORE SELECTION



BOXHOLE / UP-HOLE RAISE BORE SELECTION





DIRECTIONAL DRILLING

WITH ZERO DEVIATIONS, THE ROTARY VERTICAL DRILLING SYSTEM (RVDS) IS A PRE-PROGRAMMED, SELF-STEERING DRILLING DEVICE THAT PROVIDES A DRILLING ACCURACY GUARANTEED IN VERTICAL HOLES.

PYBAR has the capability to provide directional drilling with MICON's Rotary Vertical Drilling System (RVDS).

Raise boring typically produces pilot holes with deviations between 0.5% and 1.0% over the pilot hole length. In most cases this is acceptable; however in some applications the need for a straight, controlled hole is critical (i.e. hoist shafts, elevator shafts or pipe shafts).

PYBAR offers directional drilling to guarantee zero deviations over the length of the pilot hole.

Advantages:

- Same drilling parameters as normal raise bore machines including ROP, RPM and Load
- Technical support provided
- Easy assembling and disassembling of the RVDS tool
- Drilling diameter of 12-1/4", 13-3/4" and 15"



SHAFT SUPPORT AND STEEL LINERS

SUPPORT SERVICES IN RESPONSE TO EFFICIENCY, CERTIFICATION AND SERVICE REQUIREMENTS.

PYBAR has the capability to offer geotechnical appraisals of proposed ventilation shafts.

Our capabilities include:

- design and construction of surface drill pads, fan foundations and infrastructure;
- pre or post sinking in near surface lithology using a variety of methods; and
- non-entry shaft support using either sprayed fibrecrete or steel liners.

There has also been an increasing requirement for shaft support which incorporates speed of installation, structural certification and flexibility.

Innovative + Responsive

Responsive to market demands, PYBAR has adapted and improved the process for installing galvanised steel liners as a non-entry method of ground control for vertical raise bore shafts. The concept relies on modular liner segments which are lowered into the shaft immediately following the raise boring activity.

This method, which can incorporate grouting of the shaft/liner annulus, has been used on shafts of up to 6m in diameter and in excess of 400m in depth. Off-site fabrication and on-site assembly during raise boring allows installation rates of up to 40m per day.

PYBAR can also provide services to incorporate escape way ladders as a second egress or additional service lines.



ESCAPE WAYS

THE MOST VERSATILE ON THE MARKET, PYBAR'S ESCAPE WAYS ARE SPECIALLY-DESIGNED STRUCTURES CUSTOMISED TO MEET THE MOST DEMANDING OF PROJECTS, GLOBALLY.

PYBAR has the capability to supply a wide range of escape ways incorporating rising mains for dewatering, all in one single compact design.

Multiple escape way variations are available and can be custom designed to suit individual mine requirements (from a basic single pipe rising main to a more complex 4 or 5 pipe rising main system).

Compliance

All of PYBAR's designs comply with relevant codes for loading and strength. The escape ways are designed and certified to AS 3990 – 2013 Mechanical Equipment – Steelwork guidelines.

Built to meet the demands of underground mining

PYBAR's ladder ways are proudly Australian made and built to standards tough enough to handle the demanding conditions of underground mining.

Escape ways can also be custom designed to overcome specific challenges and requirements.

International service

PYBAR's escape ways are not only supplied throughout Australia, but can be exported to overseas sites.

Our extensive expertise and experience in this area means we can provide advice on the best and most cost-effective custom solutions. We can also provide efficient and seamless installation globally.

PREMIUM PASTE FILL PIPES

**PREMIUM SOLUTIONS THAT LEAD
TO REDUCED INSTALLATION
COSTS AND LEAD TIME.**

Solutions

To resolve issues, PYBAR offers a premium paste line casing and connection range (PPL range) comprising threaded pipes of increased thickness. Benefits include:

- increased paste fill pipe operating life;
- premium threaded connections that reduces wearing at joints;
- increased wall thickness that increases operating life and tensile strength;
- reduced installation cost and lead time;
- eliminates need for costly and time-consuming welding; and
- drilling and casing can be completed simultaneously with the raise bore, eliminating the need for separate mobilisation of a crane.



A FOCUS ON THE DELIVERY OF OPTIMUM SOLUTIONS

**SPECIALIST EXPERIENCE AND
ADVANCED MANAGEMENT SYSTEMS
DELIVER THE BEST SOLUTIONS FOR
OUR CLIENTS.**

A team of drilling specialists with deep mining experience leads the PYBAR Raise Bore Division.

Our service and experience includes:

Remote Shotcreting

PYBAR has entered into a joint venture with Shaft Lining Australia to provide a complete service for all stages of shaft shotcreting including in-hole HD video footage, and before and after shotcrete application.

Shaft Support

Recognised for our expertise in shaft design, PYBAR has the experience and capability to sink shafts through any type of ground.

Project Control

PYBAR offers full project management services with the capability to manage and control projects from design through to closure. Project management solutions include on-site engineering and surveying.



PRECISION.
EFFICIENT.
SPECIALISTS.

Technical Services

PYBAR's technical services include engineering, estimating, project control, document control and procurement.

Our technical staff can support engineering of shaft systems including headframes, hoists, shafts and off-shaft construction, and underground installations including ventilation and dewatering systems.

SAFETY
SERVICE
RESPECT
RESULTS





PYBAR
MINING SERVICES

HEAD OFFICE – RAISE BORE DIVISION

1668–1670 Forest Road
PO Box 2154
Orange NSW 2800

P +61 (0)2 6361 4499 **F:** +61 (0)2 6360 2783
E raisebore@pybar.com.au

PYBAR.COM.AU
