SABS

MINING AND MINERALS

Content

1. Introduction

Since 1975, the South African Bureau of Standards' (SABS) mining and minerals department has cultivated and entrenched for itself a proud and global history of excellence in sampling and analysis as a key third-party service provider to the international mining industry.

Today, SABS provides a high-value and high-impact support for the mining industry offering across core service areas such as testing, standards, local content verification and certification. In addition, SABS provides meaningful guidance to mining companies on adherence to the provisions of the Mining Charter.

While the primary focus has been on coal and iron ore, the mining department's testing arsenal and apparatus extends to the broader mining industry offering a matching value proposition. SABS is also equally pleased with its classification as a "local content service provider" throughout Southern Africa, as promulgated by the Department of Trade and Industry.

Technology Innovation

SABS Mining and Minerals is committed to employing the latest technology in pursuit of excellent service. For this reason, the company installs a sophisticated laboratory information management system (LIMS) at all of the laboratories under its management. The advantages of utilising modern, customised solutions include the absolute traceability of samples, improved turnaround time of analysing results and minimising of human handling – all of which translate to cost savings for the customer. Mining and Minerals remains committed to being the preferred supplier of quality solutions to the mining and mineral industry. to the benefit of all its stakeholders.

Leading Quality Control

All analysis performed are executed strictly according to SANS/ISO standards. To ensure absolute accuracy of its analysis results, all tests are conducted in duplicate. In order to further benchmark its analytical processes against the best in the world, Mining and Minerals participates in proficiency testing schemes, with excellent results.

2. Expertise

We offer a unique blend of quality expertise, commitment to impartiality and a holistic range of services from exploration through to the final product, certification of commodities bound for export and for use in South Africa. Highly specialised petrographic, coal-utilisation and classification services are offered by a team of experts in support of coal and mineral exploration activities.

3. Services

3.1 Sampling

Samples are taken for analysis, from both incoming trains and stockpiles. Samples are taken manually to the most severe requirements of ISO Standards. A portion of the split sample is then crushed through a cross beater mill, to -212 micron. After further subdivision by means of a rotary divider several sample bottles are filled for analysis purposes to enable a number of tests to be carried out simultaneously, thereby reducing the turn-around time. Samples are extracted and packed for the customer as required. A sample of each sub-sample is sealed and retained for up to 4 months for any potential arbitration purposes. A sophisticated commercial laboratory information management system (LIMS) is used throughout the testing operation to manage the samples and the results obtained on them including the generation and distribution of certificates of analysis.

3.2 Analysis

For Proximate Analysis, the masses from the electronic balances are automatically transferred to LIMS, where the final results are calculated and repeat tests generated in the case of any out-of-tolerance results. Calorific (heat) Value is determined in a bomb calorimeter, with an oxygen atmosphere maintained at a pressure of 30 bars, which ensures the most accurate possible result is obtained. Results are automatically transferred to LIMS. The ultimate analysis of coal involves determining the hydrogen, nitrogen, carbon (CHN), with oxygen being calculated by difference. All these determinations are carried out according to ISO Standards.

Total Sulphur is determined using an automatic analyser which utilises an infrared detection system. The output of both this instrument and the CHN Analyser are again automatically transferred to LIMS. Metal oxides in coal ash are determined using atomic absorption spectrophotometry following fluxing and digestion of ash. Computerised instruments compares samples with the standard plot and calculates the result, which is then transferred directly to LIMS. As an internal control measure, weighted composite of each sub-sample are prepared and the analysis compared with calculated analysis is automatically validated and analysed statistically. After final validation by the Technical Liaison Officer of all the results, a Certificate of Sampling and Analysis is issued. Within minutes of the release of the certificate, the result can be in the hands of the customer, and due to the direct link to the computer this can eliminate human error.

3.3 Quality Assurance

The Management of Mining and Minerals has taken full personal ownership of a formal quality management system, based on the SABS Laboratory Services Division framework. SABS LSD provides the structure to combine all Mining and Minerals efforts to improve processes and ensure sustained excellence of service.

To ensure that Mining and Minerals continues to grow, benchmarks are done continuously against the best in the country and world through:

Accreditation to ISO 17025:2017/ SANS17025:2018
Sampling,Preparation and Analysis of coal

Certification to ISO 17021:2015
Environmental Management system certification

Certification to ISO 17021:2015
Occupational Health and Management systems

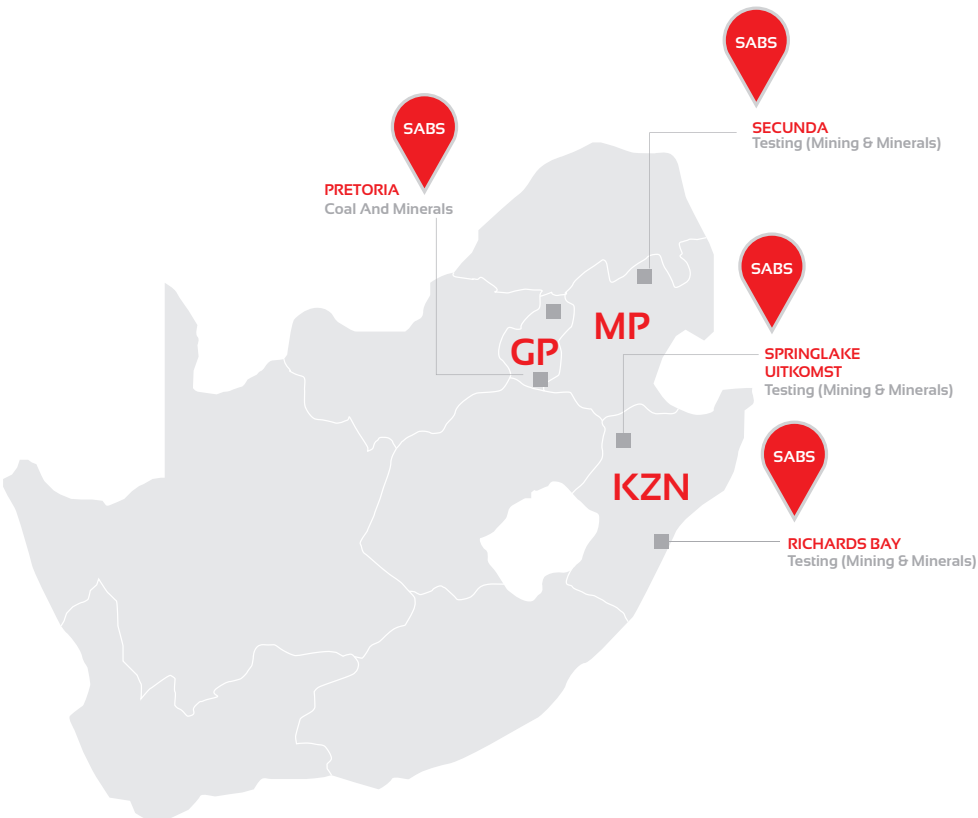
Certification to ISO 17021:2015
Quality Management system certification

We follow a holistic quality approach – the management system is documented in an LSD Manual that is applicable to all staff members and functions within SABS.

Technical signatories

Each of the laboratories have technical signatories evaluating lab results.

4. Footprint in the Country



5. Laboratory Capabilities

The Mining and Minerals coal testing laboratories offer these expert services:

Coal and Minerals T0605 has 3 technical signatories with test and equipment capability of up to
17 - ISO/ASTM
methods.

Richards Bay – T0246 has 3 technical signatories with test and equipment capability of up to
30 - ISO/ASTM
methods.

Springlake – T0204 has 4 technical signatories with test and equipment capability of up to
15 - ISO/ASTM
methods.

Secunda – T0230 has 8 technical signatories with test and equipment capability of up to
33 - ISO/ASTM
methods.

Uitkomst – Unaccredited lab aligned to ISO 17025:2017 requirements with test and equipment capability of up to
11 - ISO/ASTM
methods.

6. Testing menu includes:

- Sampling: Manual sampling of truck top, conveyor, stockpile
- Sampling: Automated mechanical systems
- Sampling: Auger
- Preparation of coal
- Ash Content - Quick Ash
- Ash Content (ISO Ash)
- Calorific Value (CV)
- Moisture in analysis sample
- Moisture, Total
- Volatile Matter
- Total Sulphur
- Size Analysis / Dry screening
- Carbon, Hydrogen and Nitrogen (Ultimate Analysis)
- Fixed carbon
- Oxygen calculated for ultimate analysis
- Float & Sink analyses

- Apparent Relative Density
- Bulk Density
- Fusibility of Ash Oxidizing
- Fusibility of Ash Reducing
- P2O5 in Coal and Ash
- SO3 Content of Ash
- Ash Constituents
- Manganese
- Boron
- Mercury
- Chlorine
- Fluorine
- Free Silica
- Fischer Analysis
- Crucible swelling number
- Hardgrove Grindability Index
- Specific Gravity
- Abrasive Index
- Roga Index
- Tumbling
- Plant efficiency
- Bias Testing
- Stockpile Control
- Plant Control

The Mining and Minerals Petrographic laboratory offers a wide range of analytical techniques and services for routine and specialised investigations, including:

- Sample preparation
- Maceral analysis
- Reflectance analysis
- Microlithotype analysis
- Carbominerite analysis
- Mineral group analysis
- Weathering analysis
- Coke textural analysis
- Char morphological analysis Iron Ore chemistry analysis by XRF
- Cement; Ash constituents; Limestone chemistry analysis by XRF
- Specific Gravity by gas pycnometer

The Mining and Minerals laboratory offers a professional suite of add value services such as a Coal Proficiency scheme COALSPEC and sale of Certified Reference materials and quality control samples to laboratories in coal industry nationally and internationally:

- International Coal Proficiency Testing Scheme
- Coal Reference material certification and Sales
- Benzoic acid tablets production and sales for calibration of Bomb calorimeter

Value Add

The Mining and Minerals laboratories keep abreast of changes within industry by improving efficiencies and turnaround time.

7. Complimentary Services

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CHN Analyser

Three labs at the SABS Mining & Minerals cluster, commissioned brand new analysers for testing Carbon, Hydrogen and Nitrogen in coal. This allows the SABS to provide the fastest and most accurate tests for these important coal quality parameters.

Petrographic

The SABS laboratory at the CSIR campus in Pretoria provides a high-quality petrology service, headed by a specialist (accredited by the International Committee for Coal and Organic Petrology – ICCP). Petrographic analysis include:

- Maceral analysis (determination of organic coal composition)
- Random reflectance analysis (determination of coal rank)
- Mineral matter (inorganic part of coal)
- Microlithotypes plus carbominerite analysis
- Coke/char organic composition
- Mineral group analysis
- Condition/weathering analysis
- Detailed petrographic report (on request)

XRF ANALYSER

The SABS Coal-and Minerals Laboratory in Pretoria recently upgraded their XRF analyser to the latest available technology. This laboratory provides testing to the mining industry for coal, iron ore, limestone, and base metals analyses.

PT Scheme

The SABS laboratory at the CSIR campus in Pretoria provides a high-quality PT Scheme COALSPEC service to the coal mining industry as well as to other laboratories.

CRMs

The SABS laboratory at the CSIR campus in Pretoria provides a high-quality reference materials service to the coal mining industry.

AAS/VGA

The SABS Richards Bay Laboratory recently upgraded the Wet Chemistry offering for elemental analysis using Vapour Generation on the Atomic absorption Spectrophotometer to conduct trace elemental analyses such as Mercury, Boron and Selenium.

SULPHUR

SABS Mining and Minerals cluster, commissioned brand new analysers for testing Sulphur and Sulphur Trioxide in coal.

Equipment maintenance

The laboratory equipment used within SABS laboratories are maintained by highly skilled and trained SABS Engineering and Maintenance technicians.

This ensures that laboratory equipment are periodically verified and calibrated as scheduled to ensure optimum performance of equipment.

8. SABS Testing Services that add value and enhance Mining and Minerals

Electro Technical Expertise

We help you ensure that your mine and underground equipment complies with the Mine and Safety Act.

The Explosion Prevention Technology (EPT) laboratory, in line with the respective laws and regulations, addresses the following pertinent issues:

- The classification of hazardous locations
- Constructional and performance standards for explosion protected equipment.
- Certification of explosion protected equipment.
- Installation of explosion protected equipment.
- Maintenance and repair of explosion protected equipment.

The Rotating Machines (RM) Laboratory is the only one of its kind in South Africa and is operated by specialists with a proven track record of reliable and accurate test results.

We offer the following testing services:

- motors up to 400 KW
- alternators and transformers up to 45 kVA
- variable speed drives up to 400 kW
- comprehensive testing of transportable motor operated power tools (bench tools) up to 2,5 kW (single phase) and 4 kW (three phase)
- hand held motor-operated power tools
- lawnmowers and trimmers (petrol and electric), and
- welding power sources.

Most developed countries have legislation to ensure the safe use of apparatus in hazardous areas. In South Africa, the Explosion Prevention Technology (EPT) laboratory tests explosion protected surface equipment used on surfaces in line with the requirements of the Occupational Health and Safety Act, while mine and underground equipment are subject to the Mine and Safety Act under the ambit of the Department of Mines and Resources.

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Services being offered by the EPT lab:

- Testing of Explosion Protected (Ex) apparatus, components and systems
  The EPT issue test reports and IA certificates against national standards (SANS), IEC, ATEX, European, North American and Australian standards.

- Inspection of mobile underground machines and fixed installations for Hazardous Areas Witness testing of these new and repaired machines is conducted by specialized test officers with vast expertise and knowledge on Ex equipment.

- Inspection of equipment in petro-chemical industries
  Witness tests are conducted on site at organizations and industries involved in the manufacturing and repair of fuel dispensers e.g. petrol filling stations.

- Certification of overseas Ex equipment to be in hazardous locations in the RSA
  All equipment to be used underground or on surface in the Republic of South Africa (RSA) should be certified and issued with IA (Inspection Authority) certificates. The EPT laboratory ensures that this regulatory requirement is being complied with for all overseas imports.

EPT & RM offers the following courses for Ex inspectors and personnel:

- Flameproof Equipment
- Non-Sparking equipment
- Dust Ignition Proof equipment
- Intrinsic Safety
- Flameproof Diesel Engines
- Fuel/Petrol Dispensers.

Other Performance and Safety Testing

- Lifting equipment
- Chain blocks and chains
- Steel hooks
- Lever hoists
- Conveyor belt idlers
- Hoisting equipment
- Welding mesh
- PPE against falls from heights (harnesses and safety ropes)
- Conveyor belts for general purpose textile-reinforced construction; Textile reinforced solid woven carcass construction and Steel cord reinforced construction
- Testing of fire retardant properties of all conveyor belt construction

Laboratory Services in summary:

Inspection and Sampling Services

- Sampling and sample preparation protocols and management
- On-site sample preparation
- Consignment management and route inspection
- Vessels & Cargo Inspection
- Equipment Inspection
- Tallying and stockpile control
- Environmental Monitoring & Analytical Services
- Local Content Verification

Laboratory Services

- Mechanical and Manual sampling
- Sample Preparation
- Physical & Chemical Testing
- Mineral Assay & Testing
- Management and operation of mobile & on-site laboratories
- Solid fuels Testing
- Proficiency Testing Program (Coal-spec)
- Certified Reference Material
- Certification & training
- Standard Sales
- Mass & Heat Metrology (Calibration Services)

Metallurgical services (also in support to engineering services companies)

- Sampling and analysis for plant and product control (In-plant Sampling)
- Plant Audits & Plant Efficiency Testing
- Bias Testing for sampling systems
- Bench scale Testing
- Rheological Tests

Microbiological testing

Our water laboratory has extensive experience in chemical and microbiological analysis of water from a variety of sources. Our comprehensive service includes testing in the following areas:

- Water (tap, bottled and packaged water)
- Surface water (ponds, dams, rivers and sea)
- Industrial water (industrial effluents, sewage and irrigation water)
- Ground water (boreholes)
- Inter laboratory proficiency testing

9. Certification

9.1 ISO 9001, Quality Management Systems

Do you want to improve your internal management and operational processes? Are you striving to improve shareholder value?

Then the SABS ISO 9001 certification suits your requirements. The ISO 9001 series of standards improves the effectiveness and efficacy of operations. A quality management system, ISO 9001 certification guarantees the quality of a product/ service offering of companies throughout the world.

This certification helps your company improve shareholder value as well as exceeding customer and market expectations.

What ISO 9001 does for your company

- Enhances customer satisfaction and improved customer loyalty leading to repeat business
- Increases revenue and market share obtained through flexible and fast responses to market opportunities
- Integrates and aligns internal processes which will lead to increased productivity and results
- Enhances business performance and better cost management
- Provides confidence to interested parties as to the consistency, effectiveness and efficiency of the organisation
- Increases credibility and competitiveness in the market
- Provides consistency in the delivery of your product or service
- Lowers costs and shortens cycle times through effective use of resources
- Improves communication, planning and administration processes
- Demonstrates a commitment to quality.

9.2 ISO 14001, Environmental Management Systems

Does your business have an impact on the environment? Are you looking for a system which balances environmental protection with socio-economic needs?

The SABS ISO 14001 certification is suitable for all types and company sizes. It offers elements of a sound environmental management system (EMS) which assures stakeholders that international industry specific environmental standards have been met. ISO 14001 places the emphasis on prevention and continuous improvement, while aiming at balancing environmental protection and prevention of pollution with socio-economic needs.

What ISO 14001 does for your company

- Improves business, reduces environmental risks and the company's impact on the environment
- Helps a company improve occupational health and safety by creating a healthy working environment
- Assures customers of a company's commitment to responsible environmental management and legal compliance
- Helps a company to maintain good public and community relations
- Enhances the image and market share of the company

- Improves cost control
- Demonstrates a responsible caring attitude
- Conserves input material and energy
- Helps in the development and sharing of environmental solutions, and
- Helps improve relations between government and industry.
- fication helps your company improve shareholder value as well as exceeding customer and market expectations.

9.3 ISO 45001 Occupational Health and Safety Management Systems

Did you know that SANS/ISO 45001 is the new international standard which replaces OHSAS 18001? Let's help you comply with the minimum standards for occupational health and safety worldwide.

SANS/ISO 45001 is a management system standard against which your company's occupational health and safety management can be assessed and certified. It aims to help your business implement an Occupational Health & Safety Management System (OHSMS) which minimises the frequency of accidents in the workplace.

What ISO 45001 does for your company

- Ensures the company's Occupational Health & Safety risks and hazards are effectively controlled
- Reassures customers
- Improves operational and financial performance
- Improves corporate image and credibility among stakeholders, regulators, customers, prospective clients and the public
- Ensures legislative awareness and compliance.

9.4 Product certification

The well-known SABS Mark Scheme is a type 5 product certification which is one of the most comprehensive schemes with regards to auditing and testing in accordance to the requirements of the relative SANS/ISO standard. The Mark Scheme is a certification process by which SABS gives assurance that a product fulfils all the requirements of the standard concerned. Our specialist team will assist our customers through the process of obtaining the SABS mark, which is achieved by full testing of their products and continuous surveillance of the manufacturing processes.

9.5 Consignment Inspection

Our Consignment Inspection Services provides inspection of commodities before consignment to the purchaser and comes into operation after tenders have been accepted. Suppliers, instructed by purchasers, notify SABS when commodities are ready for inspection. The SABS Consignment Inspection Scheme has implemented and maintains a formal Quality Management System that complies fully with SANS/ISO 17020.

9.6 Local Content Verification

What is local content?

Local content was introduced through the Preferential Procurement Framework Act in 2011 with an amendment that made provision for the Department of Trade and Industry (the dti) to designate certain sectors for local production and content, in line with national development and industrial policies for local production.

As a result, the Department of Trade and Industry (the dti) has designated the SABS to perform local content verification as mandated by the prescript mentioned above.

How does this affect my mining operation?

The Mining Charter #3 through the Department of Mineral Resources, Government Gazette No.41934, 27 September 2018, vol.639 states that “A mining right holder must procure goods in line with a standardised product identification coding system developed by the Department of Trade and industry. A mining right holder shall provide proof of local content for mining goods in the form of certification from the South African Bureau of Standards (SABS) or any other entity designated by the Minister”.

This mandate is further reinforced in the Mining Charter Guidelines of 19 December 2018, Government Gazette No.42122, Vol. 642 which states that “local content verification shall be carried out by the South African Bureau of Standards”.
The South African Technical Specification, SATS 1286:2011 has been adopted as the national instrument for measuring local content.

SANS 1286 uses the following formula to calculate local content:

(1 – x/y) * 100

Where x is the imported content and y is the tender price.

9.7 Local Content in the Mining sector

Local content is especially pertinent to the mining sector. In September 2018, the Department of Mineral Resources issued the Broad-Based Socio-Economic Empowerment Charter for the Mining Industry (Mining Charter #3). Under the new charter, mining houses are expected to spend at least 70% of their procurement on South African manufactured goods. This will result in mining houses giving preference to procure goods that meet the definition of South African manufactured goods. Suppliers whose products meet the local content requirements will see this as an opportunity to secure preferential consideration in procurement decisions.

Local content certification for mining goods will not be linked to tenders but can be secured by a supplier whenever they feel confident that their product meets the local content requirements. In preparation for local content verification, the supplier will have to assess the local content value of their manufactured products. The Mining Charter #3 provides guidelines on how to calculate local content. The following formula will be used:

A = (B- C)/B x 100%

Where A is the percentage local value add, B is the sales price in rand of the capital good, component or consumable excluding mark-up and indirect overheads, and C is the value of the imported inputs/components used in the assembly or manufacturing of the capital good, component or consumable.

It remains the manufacturer's responsibility to know the local content contribution from any input components used in the production process. Procuring from a local supplier does not mean that components sourced are 100% local.

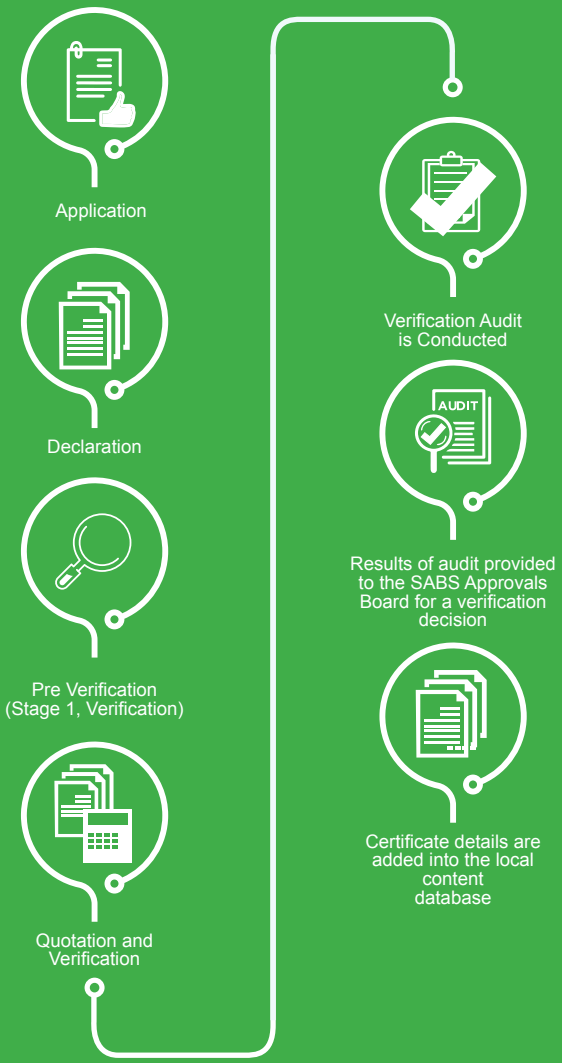
Manufacturers producing multiple products can selectively opt to attain verification and certification for products that meet local content requirements. In preparation for local content verification, the manufacturer will identify the scope of products to be verified. The supplier must be able to distinguish how materials and direct overheads are allocated for each of the products selected for verification.

Mining goods that meet the local content requirements will be certified as meeting the definition of South African manufactured goods for a period of five years. The certificate is issued on condition that the audited supply chain activities and production technology are maintained over the full five year period.

Manufacturers holding local content certificates for the purposes of Mining Charter #3 compliance are required to submit an annual declaration to confirm consistency in procurement behaviour and the manufacturing process. Annual declarations will be used to conduct annual surveillance audits where necessary.

The supplier remains responsible for informing the SABS of any changes to the production mix and/or supply chain during the period of certification. The SABS will consider the changes and assess whether they have any impact on the assertions made in the certificate. Only products or product ranges verified and found to have met local content requirements will be included in the certificate.

In summary, the local content verification process for the Mining Charter #3 consists of the following steps:



10. Standards

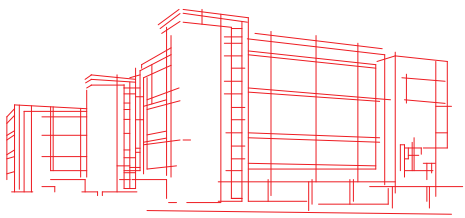
Keeping you in the know

In order to amplify its already comprehensive support tools, the SABS offers clients a subscription service which provides access to all applicable mining industry standards and related documents.

These documents cover mining operations, minerals and base metals as well as SANS 9001.

What you get

- More than 300 standards and related documents in PDF format
- A multi-site licence to store the standards on a network server with unlimited access
- A licence to print the standards
- Quarterly updates
- Updates on amended and revised standards
- Hyperlinks to the standards



Head office:
1 Dr Lategan Road
Groenkloof
Pretoria
0001

Postal address:
Private Bag X191
Pretoria
0001

Telephone number:
+ 27 12 428 7911 or
0861 277 227

Fax number:
+ 27 12 344 1568

E-mail address:
info@sabs.co.za

Website:
www.sabs.co.za

@SABSapproved @SABSapproved SABS Approved South African Bureau of Standards