

SCHEDULE

CHAPTER 17

SURVEYING, MAPPING AND MINE PLANS

17(1) DEFINITIONS

In this Chapter, unless the context indicates otherwise-

“bedded mineral deposit” means any reef, coal seam, lode, mineral bed or fissure, which occurs conformably within its country rock and is not of a massive nature;

“chart datum” means the height referencing datum as determined by the Hydrographer of the South African Navy;

“competent person” means:

- (a) in the case of an underground mine or an opencast mine where blasting takes place, a person in possession of a Mine Surveyor’s Certificate of Competency issued by the Department of Minerals and Energy; or

a person in possession of at least a Level 6 qualification in mine surveying and mapping registered on the National Qualifications Framework and which qualification includes appropriate and relevant legal knowledge;

- (b) in the case of an opencast mine where blasting does not take place, a person in possession of a Mine Surveyor’s Certificate of Competency issued by the Department of Minerals and Energy; or

a person who has passed the examination for legal knowledge as is required for the Department’s Mine Surveyor’s Certificate of Competency and who is in possession of either –

- (i) an advanced Certificate in Mine Surveying issued by the Chamber of Mines of South Africa and who has at least three (3) years practical experience in mine surveying; or

- (ii) National Diploma in Mine Surveying issued by a tertiary institution accredited by the Department of Education; or

a person in possession of at least a Level 5 qualification in mine surveying and mapping registered on the National Qualifications Framework and which qualification includes appropriate and relevant legal knowledge;

(c) in the case of mining at sea, a person in possession of a Mine Surveyor's Certificate of Competency related to sea mining issued by the Department of Minerals and Energy; or

a person who has passed the examination for legal knowledge as required for the Department's Mine Surveyor's Certificate of Competency and who is in the possession of either –

(i) a National Diploma in Hydrographic Surveying issued by a tertiary institution accredited by the Department of Education; or

(ii) an equivalent qualification in hydrographic surveying recognized by the Council for Professional and Technical Surveyors of South Africa; or

a person in possession of at least a Level 5 qualification in hydrographic surveying registered on the National Qualifications Framework and which qualification includes appropriate and relevant legal knowledge.

“fixed position” means any point other than a **survey station** which is fixed within the relevant accuracy requirements for the class of survey concerned, and which is used for the purpose of locating details to be shown on **plans**;

“fluid material” means any substance, excluding gas, that has a potential to flow, including water, slimes and mud;

“hazardous service” means any object, structure or installation rendering a service with a potential risk to health or safety;

“plan(s)” means any plan, section or projection required to be prepared by these regulations;

“reserve” means any piece of land over which a servitude is registered or reserved for possible registration of a servitude in respect of roads, railways, power lines, pipe lines, conveyor lines, canals, etc.;

“restricted area” means any area where mining is restricted due to significant risk;

“risk assessment” means the hazard identification and risk assessment required in terms of section 11 of the Act;

“safety pillar” means every portion of a reef, mineral deposit or ground left *in situ* for the support and protection of the surface, objects thereon or underground workings;

“sea” means the sea as defined in the Sea Shores Act, Act No 21 of 1935

“**survey point**” means any easily identifiable point located by localised surveying, other than a **survey station**;

“**survey station**” means any point that has been surveyed within the prescribed standards of accuracy; and

“**workings**” means any excavation made or being made for the purpose of searching for or winning minerals or for any purpose connected therewith.

GENERAL REQUIREMENTS AT SEA AND ON LAND

Responsibility for Surveying, Mapping and Mine Plans

- 17(2) The employer must engage the part-time or full-time services of a **competent person** to be in charge of surveying, mapping and mine plans at the mine, and if the services of more than one **competent person** are engaged, ensure that their functions do not overlap.
- 17(3) No person may withhold from the employer any survey records or **plans** prepared in terms of these regulations.
- 17(4) The employer must take reasonable measures to ensure, in all surveying and mapping done and all plans prepared for purposes of these regulations by the **competent person** referred to in regulation 17(2), that-

Units of Measure

- 17(4)(a) all units of measure conform to the metric system, except angular measurements which must conform to the sexagesimal system;

Survey System

- 17(4)(b) all mine surveys conform to the National Control Survey System as determined by the Chief Director: Surveys and Mapping as contemplated in the Land Survey Act, Act No 8 of 1997. The projection origin may however be changed to reduce the numerical values of the co-ordinates. Survey systems established on a mine prior to 1 January 1999 may be retained provided that a tabulation of the co-ordinates of at least 3 (three) **survey stations**, in both the existing and the national control survey system, are shown on every sheet comprising a **plan**;

Datum Plane

- 17(4)(c) elevations determined above and below ground on a mine refer to mean **sea level**, based on the South African Land Levelling Datum as determined by the Chief Director: Surveys and Mapping as contemplated in the Land Survey Act, Act No 8 of 1997. In the case of prospecting and mining at **sea**, all elevations determined and soundings taken must refer to **chart datum**;

Chart Datum

- 17(4)(d) elevations determined at sea for all offshore mine surveying and mapping must refer to **chart datum** unless otherwise specified by the Chief Inspector of Mines. The relationship of **chart datum** to the South African Land Levelling Datum must be noted in the title block of all **plans** of prospecting and mining operations;

Colours and Sign Conventions

- 17(4)(e) all **plans** conform to the conventional signs and colours provided by the Director: Mine Surveying; and

Back up of Electronic Information

- 17(4)(f) if survey records required in terms of these regulations are kept electronically, they are adequately backed up.

SAFETY PRECAUTIONS

Responsibilities regarding safety precautions

- 17(5) The employer must take reasonable measures to ensure that the **competent person** referred to in regulation 17(2) is at all times aware of -

17(5)(a) **workings** which are being advanced;

17(5)(b) surface structures or objects which may be affected by mining;

17(5)(c) **workings** being abandoned or closed down, in order to allow the final surveying thereof;

17(5)(d) faces of **workings** being advanced within 50 (fifty) metres or any lesser distance determined by **risk assessment**, from any excavation, mining **restricted area** or any place where there is, or is likely to be, a dangerous accumulation of **fluid material**, noxious or flammable gas; and

17(5)(e) **safety pillars** that are being, or have been, removed.

- 17(6) The employer must ensure that -

17(6)(a) no mining operations are carried out under or within a horizontal distance of 100 (one hundred) metres from buildings, roads, railways, **reserves**, mine boundaries, any structure whatsoever or any surface, which it may be necessary to protect, unless a shorter distance has been determined safe by **risk assessment** and all restrictions and conditions determined in terms of the **risk assessment** are complied with;

- 17(6)(b) where ground movement, as a result of mining operations, poses significant risk, an effective ground movement monitoring system is in place.
- 17(7) No person may erect or construct any buildings, roads, railways, or any structure within a horizontal distance of 100 metres from the **workings** of a mine, or such lesser distance and at such positions and subject to such restrictions and conditions, determined by -
17(7)(a) **risk assessment**; or
17(7)(b) the Chief Inspector of Mines.
- 17(8) The person(s) responsible for activities in terms of regulations 17(6)(a) and 17(7)(a) must -
17(8)(a) in the case of an employer, provide the Chief Inspector of Mines with the distance and accompanying restrictions and conditions for comment, prior to commencement of such activity;
17(8)(b) in the case of other persons, provide the Chief Inspector of Mines with the distance and accompanying restrictions and conditions for approval, prior to commencement of such activity.
- 17(9) The employer must take reasonable measures to ensure that the relevant survey records and **plans** resulting from conditions described in regulation 17(5)(a) to 17(5)(e) are updated by the **competent person** referred to in regulation 17(2) at intervals not exceeding 3 (three) months.

Boundary Pillars

- 17(10) The employer must ensure that on the inside of every mine boundary, continuous pillars are left standing (in situ) the width of which, measured horizontally and at right angles to the boundary line, must not be less than -
17(10)(a) for underground coal mines, 15 (fifteen) metres;
17(10)(b) for all other mines, 9 (nine) metres.
- 17(11) The employer must take reasonable measures to ensure that no boundary pillars are worked or cut through unless written permission has been obtained from all relevant adjacent employers and the Principal Inspector of Mines.
- 17(12) In the absence of any adjacent employer, permission need only be obtained from the Principal Inspector of Mines to work or cut through such boundary pillars.

Check Survey

- 17(13) Should the Director: Mine Surveying be of the view that there may be errors in any survey or **plans** constructed there from or where they do not conform to the standards of accuracy required by these regulations, such Director may cause a check survey to be carried out. The cost of such check survey must be borne by the employer if it is proved that there are errors in any survey or **plans** constructed therefrom, or that they do not conform to the standards of accuracy required by these regulations.

SURVEY PRACTICE ON LAND (SURFACE AND UNDERGROUND) AND AT SEA

- 17(14) The employer must take reasonable measures to ensure that in all surveying and mapping done and all plans prepared for purposes of these regulations by the competent person referred to in regulation 17(2):

Survey Stations

- 17(14)(a) sufficient **survey stations** are established, so that all surface objects and all **workings** can be accurately surveyed. Each survey station must be clearly marked with a unique number and recorded in a register;

Standards of Accuracy: Surface and Underground

- 17(14)(b) the minimum standard of accuracy and class of survey for the fixing of **survey stations** on both horizontal and vertical planes are in accordance with the following formula:

$$A = 0,015 + \frac{S}{30\ 000}$$

where S is the distance in metres between the known and the unknown **survey station**; provided that in the case of a traverse, after a check survey has been completed, the error in direction of a line between any two consecutive **survey stations** must not exceed 2 (two) minutes of arc, provided that the horizontal and vertical displacement between the measured position and final position of a survey station does not exceed 0,1 (zero comma one) metres;

- 17(14)(b)(i) the allowable error for a Primary Survey (Class A) is not greater than A metres. Primary Survey means any survey carried out for the purpose of fixing shaft positions, shaft stations, underground connections, upgrading of secondary surveys to primary surveys and establishing primary surface survey control;
- 17(14)(b)(ii) the allowable error for a Secondary Survey (Class B) is not greater than 1,5A metres. Secondary Survey means any survey carried out for the purpose of fixing main or access development, mine boundaries and establishing secondary surface survey control;

- 17(14)(b)(iii) the allowable error for a Tertiary Survey (Class C) is not greater than 3A metres. Tertiary Survey includes **survey stations** established from secondary **survey stations** for localised survey purposes;
- 17(14)(b)(iv) the allowable error for a Localised Survey is not greater than 0,2 (zero comma two) metres in addition to the allowable error at the nearest **survey station**. Localised Survey means measurements taken from a survey network to locate surface or underground **workings**, structures and features. This includes normal tape triangulation for month-end measurements, plugging, offsetting and tacheometric work;

Accurate Representation on Plan

- 17(14)(b)(v) errors in representation on **plan** do not exceed 0,1% (zero comma one per cent) of the denominator of the scale of the **plan**, in addition to the allowable survey error at the nearest **survey station** or **fixed position**. Where the surveying cannot be accurately done due to significant risks, the estimated position of affected **workings** or objects must be indicated by broken lines. An explanatory note must be written giving reasons why accurate measurements could not be made;

Standards of Accuracy at Sea

- 17(14)(c) all **fixed positions** determined at **sea** for the purpose of locating detail to be shown on **plans**, are verified to within a horizontal accuracy of 30 (thirty) metres. In determining bathymetric data, soundings based on **chart datum** must be established to within 0,30 (zero comma three zero) metres for water depths of 0,0 (zero) to 30 (thirty) metres and to within 1% (one percent) of water depths of 30 (thirty) metres and more;

Details required on Plans

- 17(14)(d) the following detail is depicted on all **plans** where applicable-
- 17(14)(d)(i) date of measurement of **workings**;
 - 17(14)(d)(ii) surface contours;
 - 17(14)(d)(iii) planes of sections or planes of **plans**;
 - 17(14)(d)(iv) a subject heading indicating the name of the mine and the name of the **plan**;
 - 17(14)(d)(v) name and signature of the **competent person** referred to in regulation 17(2) against relevant date of updating;
 - 17(14)(d)(vi) identification number allotted by authorities;
 - 17(14)(d)(vii) the survey system and co-ordinates of origin used;
 - 17(14)(d)(viii) a north point;
 - 17(14)(d)(ix) the scale of the **plan**;
 - 17(14)(d)(x) a legend illustrating colours and conventional signs not provided for by the Director: Mine Surveying;

- 17(14)(d)(xi) co-ordinate lines sufficient in number for the scale of the **plan** to be verified;
- 17(14)(d)(xii) in the case of mining at **sea**, the centre position of the sheet must be indicated in geographic co-ordinates (longitude and latitude);

Material and Size of the Plans

- 17(14)(e) all **plans** are drawn on durable transparent draughting material on sheets of a size not greater than A0 as defined by the International Organisation for Standardisation. The Director: Mine Surveying may request in the case of **plans** produced by means of computer aided draughting (CAD), that such **plans** be produced on suitable draughting material;

Scale of Plans – Land

- 17(14)(f) all **plans** are drawn to a scale of 1:1 500 in the case of a coal mine, and 1:1 000 in the case of any other mine;

Scale of Plans – Sea

- 17(14)(g) in the case of mining at **sea**, the general **plan** referred to in regulation 17(27) is drawn to a legible scale;

Plans to be Kept Up to Date

- 17(14)(h) **plans** are at all times correct to within 12 (twelve) months, except for the **plans** showing the **workings** which must at all times be correct to within 3 (three) months. In the case of offshore prospecting and mining, **plans** must at all times be correct to within 6 (six) months;

Inventory of Plans

- 17(14)(i) inventory of all **plans** and all copies called for in terms of regulation 17(28) is kept, showing the following details -

- 17(14)(i)(A) name of the mine;
- 17(14)(i)(B) name and number of the **plan**;
- 17(14)(i)(C) date of the last updating of the **plan** and the name of the **competent person** referred to in regulation 17(2);
- 17(14)(i)(D) relevant details where a **plan** has been superseded; and

Superseded Plans

- 17(14)(j) when a **plan** or sheet is superseded by another **plan** or sheet, the old and the new **plan** are referenced accordingly.

MINE PLANS

- 17(15) The employer must take reasonable measures to ensure that the **competent person** referred to in regulation 17(2) constructs accurate **plans**, as contemplated in regulations 17(16) to 17(27), which are readily available to the employer. Such **plans** must cover at least all **restricted areas** and the areas where the surface infrastructure or **workings** occur.

Index Key Plan

- 17(16) A legible index key **plan**, showing the areas covered by the relevant **plan** sheets, the mine boundaries and the farm names and boundaries within and adjacent to the mine, or this detail may be shown on every **plan** sheet as an inset key **plan** drawn to a legible scale.

Surface Plan

- 17(17) A **plan** of the surface showing the boundaries of the mining area, names of adjacent mining areas, the primary surface **survey stations**, outcrops and dips of the mineral deposits, perimeters of all surface mining, shafts, openings, rescue boreholes, subsidence or cavities, areas of restricted mining affecting the surface, any **hazardous services** whether on surface or buried and every surface object, structure or **reserve** which requires protection against mining.

Surface Contour Plan

- 17(18) A surface contour **plan** showing relevant mine and farm boundaries, original surface contours, boreholes and watercourses.

Mine Ventilation and Rescue Plan

- 17(19) At every underground mine, a ventilation and rescue **plan** of the **workings**, taking into consideration the requirements of regulation 17(23)(a), drawn to a legible scale depicting the ventilation districts, the direction of air currents, the quantity of air circulating in such ventilation district and the position of each fan, door, regulator, crossing, stopping and telephone, the position of each refuge bay, rope-aided or normal escape route, safe place, first aid room, main water valve, fire fighting equipment site and any area sealed off for fire or spontaneous combustion.
- 17(19)(a) A square grid, lettered horizontally and numbered vertically, drawn to a suitable scale must be shown on the **plan** contemplated in regulation 17(19).
- 17(19)(b) An updated hard copy of the **plan** contemplated in regulation 17(19) must be immediately available at the mine for rescue operation purposes. In the case of a coal mine, an updated hard copy must be submitted to the Principal Inspector of Mines at intervals not exceeding 3 (three) months.

Rehabilitation Plan

- 17(20) A rehabilitation **plan** showing the final surface contours and established water courses.

Mine Residue Deposit Plans

- 17(21) Separate **plans** and sections of mine residue deposits containing **fluid material**.

Geological Plan

- 17(22) A **plan**, drawn to a legible scale, depicting geological features that could affect mining, or these features may be shown on the plan(s) referred to in regulation 17(23).

Plans of the Workings

- 17(23) **Plans** of the **workings** showing the following: boundaries of the mining area; names of adjacent mining areas; outlines and dips of the **workings**; heights representative of **workings**; **survey stations**; relevant **survey points**; areas in which mining has been restricted or prohibited; dams; explosives magazines; lines indicating the planes of sections; faults; dykes and water plugs.

- 17(23)(a) In the case of underground mines:

17(23)(a)(i) Where a **bedded mineral deposit** has an average inclination to the horizontal of more than 60° (sixty degrees), a **plan** showing the projection of the **workings** onto a vertical plane parallel to the average strike.

17(23)(a)(ii) Where multiple **bedded mineral deposits** overlie each other, the **workings** thereof must be shown on separate **plans**.

17(23)(a)(iii) Where a massive or irregular ore body is worked, level **plans** and vertical sections through the **workings** must be kept.

- 17(23)(b) In the case of surface mines:

17(23)(b)(i) Where **bedded mineral deposits** are worked by surface mining methods, there must be shown on the surface **plan** sufficient data regarding the thickness and elevation of every mineral deposit worked in a suitable grid pattern. As an alternative to the grid pattern data, vertical sections may be kept, the lines of which must be indicated on the surface **plan**.

- 17(23)(b)(ii) Where massive or irregular mineral deposits are worked, level **plans** or vertical sections or a composite **plan** showing all the bench outlines, must be kept.

Level Plans and Vertical Sections

- 17(24) Level **plans** must show the outline of all **workings** at suitably chosen elevations. In the case of underground mines, the detail required in regulation 17(23) must be shown.
- 17(25) Vertical sections must be drawn through the **workings** shown on the **plans** contemplated in regulations 17(23)(a)(iii) and 17(23)(b) to show the appropriate detail required for level **plans**.

General Plan – Mining on Land

- 17(26) A general **plan** must be constructed, showing the detail required in regulations 17(17), 17(18) and 17(23) on one **plan** instead of on three separate **plans**, or a general surface **plan** showing the detail required in regulations 17(17) and 17(18) on one plan instead of on two separate plans.

General Plan – Mining at Sea

- 17(27) A general **plan** must be constructed showing the boundaries of the mining area, the names of adjacent mining areas and the locality of semi-permanent production rigs and platforms.

Departmental copies of plans

- 17(28) The employer must provide the Principal Inspector of Mines annually with updated copies of the **plans**. In the case of computer aided draughting (CAD), legible **plans** in book form (approximately A3 size) or a copy of the index key **plan** referred to in regulation 17(16), indicating additionally the outlines of the **workings** as well as the surface infrastructure, and a copy of the back-up referred to in regulation 17(4)(f) must be provided.

Unsatisfactory Plans

- 17(29) Where **plans** are deficient, the Director: Mine Surveying may have the mine surveyed and new **plans** prepared at the expense of the employer.

Plans Confidential

- 17(30) The Principal Inspector of Mines and the Director: Mine Surveying must keep information contained in any **plan** confidential and may only release such information in accordance with the Promotion of Access to Information Act (Act 2 of 2000).

MINE CLOSURE

Plans brought Up to Date

- 17(31) The employer must take reasonable measures to ensure that, before a mine is abandoned, closed or rendered inaccessible, the **plans** and departmental copies thereof referred to in regulation 17(28) are brought up to date by the **competent person** referred to in regulation 17(2) and that the Director: Mine Surveying is notified to inspect such **plans** for approval.

Plans and Books to be Handed In

- 17(32) The employer must take reasonable measures to ensure that updated hard copies of the **plans**, copies referred to in regulation 17(28) and inventories thereof on durable draughting material, together with the **survey station** register are handed in at the office of the Director: Mine Surveying, following the inspection and approval of the **plans** as contemplated in regulation 17(31).

Certificate of compliance

- 17(33) The Director: Mine Surveying must issue a certificate of compliance with the requirements of regulations 17(31) and 17(32) to the employer within 60 (sixty) calendar days of compliance in respect of the said regulations.