Cadastral Surveying: What is it and why do we need it?

The Surveyor in the Field

National Control Survey System

South Africa is fully covered by the National Control Survey System which is of high accuracy and which is marked by a network of trigonometric stations and town survey marks.

It is a legal requirement that all cadastral surveys are connected to this control network, ensuring that the position of every beacon and boundary is accurately known, and that property boundaries do not overlap, and that beacons that are lost or destroyed can be replaced with the minimum delay and expense.

The great majority of non-cadastral surveys, such as those for road construction, are also based on this national control network with tremendous benefits for orderly and cost-effective development in South Africa.

All cadastral and all other surveys that are referred to the National Control Survey System, are calculated in plane coordinates. The projection used is the Gauss Conform Projection (an adaptation of the Transverse Mercator projection), with central meridians at odd-numbered degrees of longitude and two-degree wide belts. The unit of measure of length is the International Metre.

As from 1 January 1999, the South African National Control Survey System has been based on the World Geodetic System 1984 (WGS 84) ellipsoid, with the position of the Hartebeeshoek Radio Astronomy Telescope as the origin of the system.

Survey Methods

Although the methods that may be used in cadastral surveying are not rigidly prescribed, it is a requirement that all work be adequately and carefully checked. All recognised methods, using modern accurate instruments, are acceptable. Special requirements are however laid down when surveys are undertaken, using GPS (Global Positioning System) or photogrammetric techniques. In South Africa most cadastral surveys are one using total stations and/or GPS.

The accuracies to which surveys must be carried out, are prescribed. There are three classes of survey, each with its specified accuracy limit:

- Class A - Surveys for the determination of the positions of reference marks in urban surveys,
- Class B - Surveys in urban and peri-urban areas and for mining titles in respect of precious stones and minerals,
- Class C - Other surveys, including farm surveys and surveys for mining titles in respect of base minerals.

Beacons and Boundaries

South Africa is generally a large open country, with few natural or artificial features that are suitable for adoption as property boundaries. The boundaries of properties or land parcels are marked by permanent corner beacons joined, usually by imaginary straight lines, although the boundary lines between beacons may be curvilinear features in certain circumstances.
The types of beacon that may be used are prescribed by regulation, and new beacons must be iron pegs of specified dimensions. Well-constructed corner fence posts and corners of permanent buildings may also be adopted as beacons. Should rock or buildings prevent placing a beacon, a hole may be drilled to indicate the position.

Although the boundaries between beacons are usually straight lines, certain natural or artificial features that are permanent and clearly defined, may be adopted as curvilinear boundaries. The most common examples are the middle of a river and the top edge of a cliff.

Artificial features which are liable to be moved, such as fences, roads and railway lines, may not be adopted as new cadastral boundaries.

**Original and Division Surveys**

When an unregistered piece of land is granted, a so-called original survey is carried out and a diagram prepared by the land surveyor.

Before being approved by the Surveyor-General, this diagram is made available for inspection by the public to give all interested parties an opportunity to satisfy themselves that the land to be granted does not conflict with their property. Only after any objections have been resolved, is the diagram approved and bound with the deed of grant, which can then be registered in the name of the new owner or grantee. Original grants do not often occur now in South Africa.

Subsequent division and subdivisions do not require making diagrams available for public inspection before approval.

In undertaking a survey to subdivide an existing piece of land, the land surveyor has very specific responsibilities. He/she must:

- study all available information from previous surveys;
- where possible find and determine the positions of the original beacons; then
- determine the best agreement between the old and new surveys.

In the event of disagreement between the evidence on the ground and the data on the diagram, a 1924 High Court decision lays down that the lawful position of a property corner is that occupied by the original beacon itself and not the position according to the diagram. Such disagreement is only likely to occur when dealing with very old original surveys.

The permissible differences between old and new surveys are prescribed by regulation and, if these are exceeded, the land surveyor must obtain the agreement of all affected landowners to the position he has selected for the beacon or boundary. Once the relationship between old and new has been settled, the land surveyor proceeds to place the subdivisional beacons, so as to subdivide the land in accordance with the approval plan of subdivision. The subdivision can be a relatively simple matter, creating a small number of new properties, or it can be a highly complex township layout involving the "pegging out" of hundreds or even thousands of erven, public places and streets.