

Standards in Ghana

Jones OFORI-BOADU, Ghana

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SUMMARY

Standards are of great interest to surveyors both as professionals and also as business people. Standards can be defined as an accepted or approved example of something against which others are judged or measured.

This paper focuses on the standards with respect to Land Surveying practice in Ghana. It also looks at the technical instructions which serve as a guideline for the practice and also the legal framework within which a surveyor should operate.

This paper also looks at the regulatory bodies on surveying in Ghana and some of the evolving standards as a result of modern trends in surveying.

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1. INTRODUCTION

To define what standards is, the dictionary definition of standards is an accepted or approved example of something against which others are judged or measured. The International Organization for Standardization (ISO) gives a definition of standards as the following: standards are documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines, or definitions of characteristics, to ensure that materials, products, processes and services are fit for their purpose.

Standards can clearly be distinguished as ‘norms’ against which we compare items for acceptability or as a formal technical or legal instruction which define more closely what is deemed acceptable for a particular purpose and what is not. These are of very great importance to the surveyor as a professional in the field.

Survey standards in Ghana have a long standing history. This is governed by the Gold Coast Survey Technical Instructions, the Survey Act 1962, Act 127 and legislative instruments L.I. 1444. The first issue of technical instructions for the cadastral branch of the Gold Coast Survey was in 1921 in cyclostyled format under the British colonial rule. This was later revised in 1923 also in cyclostyled format. The first officially printed edition was published in 1928, which marks seven (7) years of serious practice and experience based on the already laid down methods before the publication of the first edition.

The methods adopted were designed to make the field operations and the keeping of field books as simple and straight forward as possible without compromising on the necessary degree of accuracy. The methods were established to be standard throughout the entire branches of the Gold Coast Survey Department and standard forms were used for all computations. Special emphasis was laid on good permanent beaconing together with clear and well kept books and records, and all surveyors were obliged to keep their field notes according to a common system.

As the Institute of Management’s Code of Conduct (quoted in Davies, 1997) puts it: ‘A professional is someone who justifiably claims to provide an expert service of value to society, and who accepts the duties including honouring the special trust reposed by clients, employers, colleagues, and the general public’. Standards are therefore an integral part in the process of professional surveyors fulfilling their obligation in rendering a service to society and to their clientele.

2. TECHNICAL INSTRUCTIONS

2.1 Framework

There are two classes of framework in the country. These are

- Topographical and
- Cadastral framework

2.1.1 Topographical Framework

The topographic framework was used for the construction of the topographical maps. It consists mainly either of theodolite traverse points or of points at which astronomical latitudes and longitudes have been observed. These were done at a lesser accuracy and were to be replaced eventually by the cadastral framework.

2.1.2 Cadastral Framework

The cadastral framework consist of:

- the National cadastral framework and
- the local cadastral framework

2.1.2.1 The National Cadastral Framework

The national cadastral framework is the main framework of first order spanning the country and is necessary for the execution of any lower order cadastral survey. This framework consists of triangulation, traverses and lines of levels and is divided into two classes.

- *Main national cadastral framework* – a network of triangulation, traverses and levels of a very high degree of accuracy and which covers a large area of the country.
- *Minor national cadastral framework* – a similar network to the main network but confined, as a general rule, to limited areas. It is of a lower degree of accuracy than the main framework. It is used to breakdown between points of the main framework with the latter acting as control points to control the accuracy of the minor framework in the formulation of smaller networks.

2.1.2.2 The Local Cadastral Framework

The local framework is an isolated network of triangulation, traverse and levels employed in surveys of limited areas where it is not possible to connect to the national framework. This connection is made later as the opportunity arises.

2.2 Cadastral Plan

A cadastral plan is a map or plan purporting to show boundaries of land with accuracy and giving exact measurement by which the boundaries may be demarcated or re-demarcated on the ground. Such a plan being surveyed by an Official Surveyor or certified by a Licensed

Surveyor and approved by the Director of Surveys or any representative appointed by him. Cadastral plans are usually attached to a Title deed or lease and show boundaries that are legally settled and defined.

2.2.1 Official Surveyor

An official surveyor is the surveyor who is appointed by the Minister of Lands, Forestry and Mines and officially employed in the National Survey Department.

2.2.2 Licensed Surveyor

The Licensed Surveyor is a private surveyor appointed by the Director of Surveys with prior approval from the Minister of Lands, Forestry and Mines whose function is to demarcate boundaries and to make survey of lands.

2.3 Certified Plan

The certified plan is a map or plan purporting to show boundaries of land with accuracy and giving exact measurements by which boundaries may be demarcated or re-demarcated on the ground. Such a plan being surveyed and certified by a Licensed Surveyor in accordance with the survey Act 1962, Act 127.

2.4 Demarcation

Demarcation is the marking of boundaries by boundary posts and blazed trees and the accurate survey of such marks.

2.5 Station Marks

2.5.1 Beacon

Beacons are the ground stations of trigonometric points, permanent traverse pickets and boundary posts. A beacon is made invariably of permanent material such as concrete, stone or iron.

2.5.2 Signal

A signal denotes a tripod, banderole, ranging pole, etc which is erected over a trigonometric or traverse station, as distinguished from the beacon, to mark the ground station.

2.5.3 Traverse Pickets

Traverse pickets are not necessarily placed on a boundary and are in no way intended to mark such a boundary. They are only put in as temporary points to help establish inter-visibility between constructed beacons.

2.5.4 Boundary Post

Boundary Posts are permanent marks of concrete, stone or iron put in the ground to mark a boundary on which invariably they are placed; they are intended to show interested persons, who share a common boundary, the exact position of their boundary.

2.5.5 Point of Departure

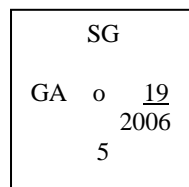
A point of departure consist of three permanent beacons, the two outer of the three being placed one on either side of the central one and as far away from it as is consistent with their being inter-visible from it. The included angle at the central beacon together with the distances to the other two beacons are measured and recorded. This is then compared to the computed included angle and distances to ascertain whether they fall within the accepted accuracy limits.

The fundamental basis of the system of permanent marking of surveys in Ghana is the Point of Departure. The object of which is to preserve on the ground at least two bearings and the included angle.

2.6 Construction and Numbering of Beacons and Boundary Posts

There are two main types of survey beacons in use in Ghana, commonly referred to as Type A and Type C beacons.

Both Type A and Type C beacons are marked with the inscription SG indicating survey of Ghana, then the initials of the region e.g. GA for Greater Accra region, then the serial no. of the job for a particular year, then the year and then the serial no. of the pillars for a particular survey. The figure below indicates a survey executed in the Greater Accra region of Ghana which is the 19th job in the year 2006 with the pillar serial no. 5.



2.6.1 Type A Beacon

Type A beacons consist of a concrete pillar 12 inches high above ground and with a three feet foundation in the ground. The pillar is 9inches by 9inches square where it projects above the surface of the ground and widens to about 12 inches to 15 inches at the bottom of the excavation. It is built with an iron pipe 4 feet long in the centre.

This pipe is filled with small stones tightly rammed to within 12 inches of the top, and the remaining portion is filled with cement mortar (3 parts sand to 1 part cement). A special brass plug with a small hole in the centre is put into the cement mortar during construction to mark the exact centre. The top of the brass plug should be flush with the top of the concrete pillar. An iron arrow can if necessary be inserted into the brass hole when sights are being taken to the beacon.

2.6.2 Type C Beacon

Type C beacon is a concrete block 6 inches square and 18 inches long, with the exact centre mark indicated by a nail or brass plug let into the top. The pillar is set in a concrete foundation 6 inches deep.

Type C pillars are fixed either with the top 6 inches high above the ground or else with its surface flush with the ground surface. They should not be buried below the ground surface unless as in a town survey, their position can be referenced exactly to permanent and well defined detail.

2.6.3 Boundary Post

Boundary posts may consist either of an iron pipe 4 feet long and about $\frac{3}{4}$ inch diameter, set in a concrete pillar of not less than 9 inches square, of which not less than 3 feet will be below the ground and not less than 2 feet above the ground or T iron or angle iron posts not less than 2 $\frac{1}{2}$ inches by 2 $\frac{1}{2}$ inches by $\frac{3}{8}$ inch, 7 feet long embedded 3 feet 6 inches in the ground or a concrete pillar 9 inches square of which not less than 3 feet will be below ground and not less than 2 feet will be above ground.

In the case of the T iron or angle iron posts, every 4th post will be embedded in a concrete base 9 inches square and 3 feet deep and in the case of surveys of concession areas, the pillar or post will have an enameled iron plate not less than 12 inches long and 6 inches wide securely fixed thereto bearing the name or initials of the concession or of the holder of the concession.

In certain special cases notably in town layouts and in the case of boundaries of very small plots of land, etc. boundary posts can, with the approval of the Director of Surveys, consist of concrete pillars of dimensions 4 inches square at the surface and 2 feet long embedded so as to project at least 6 inches above the surface of the ground. When posts of such nature are used, the interval between them shall not be greater than 500 feet.

2.7 Rules for the Demarcation of Boundaries

Boundaries, except in the case of river boundaries of a concession, will be cleared of all trees; bush etc. for a width of 8 feet and trees along both sides of the boundary will be blazed at intervals of 150 feet.

In the case of boundaries passing through plantations, such clearing and blazing will not be necessary if permanent marks, consisting of Type C boundary posts pillars are erected at intervals not exceeding 500 feet. The blaze will consist of three deep cuts one above the other.

Every survey will have at least one point of departure but where the perimeter of the survey or main traverse exceeds 3 miles in length, points of departure must be left at intervals not greater than 3 miles.

Boundary posts will be erected at distances apart along the boundary of not more than $\frac{1}{2}$ a mile apart and also at every turning point or at such a distance as directed by the Director of Surveys.

Rivers of which one bank forms a concession boundary will be demarcated by means of boundary posts erected above flood level. The direction and distance from these posts to the bank where the water level meets it during the dry season will be indicated on the plan. Rivers of which the centre forms a concession boundary will be similarly demarcated, but the distances should be measured to mid-stream.

2.8 Keeping of Field Books

The main principles to be observed in keeping of field books are as follows:

- The field books are to be regarded as essential parts of the survey records.
- They are to be kept in as clear and intelligible a manner as possible.
- It is essential and most important that the various field books should be freely and clearly cross referenced.
- All books are to be kept in ink, no erasures being allowed. If a figure has to be altered, the original figure will be crossed out neatly and the accepted one written above it, the alteration being initialed by the person making it. No alterations are to be made to any measurements made and entered in the field book except as the result of an immediate check.
- Except in the case of record book, only field books that have been numbered and registered at the headquarters of the Survey Department will be used.
- Each book will be properly indexed and the name of the surveyor and the title and number of the survey given at the beginning.
- In general, separate books will be kept for each survey and entries concerning two distinct surveys will not be made in the same book. However, it is permissible to regard a group of small surveys as a single survey for this purpose.

3. LEGAL FRAMEWORK

The legal framework falls under the Survey Act, 1962 Act 127 and the Legislative instrument L.I. 1444. Issues of importance under these laws are as enumerated below.

3.1 Qualification and Registration of Surveyors

- The Minister to whom functions under this Act are assigned by the President of Ghana may appoint official surveyors and the Director of Surveys may with the prior approval of the Minister, license private surveyors whose functions shall be to demarcate boundaries and to make surveys of lands.
- No person other than an official surveyor, a licensed surveyor or any public officer making or preparing any plan in the course of his duties as such shall survey any land for the purpose of preparing any plan for attachment to any instrument of conveyance, leases, assignment, or transfer.
- No person other than an official surveyor or a licensed surveyor shall certify a plan.
- Any person contravening the provisions of this section shall be liable to a fine not exceeding one hundred pounds or to imprisonment for a term not exceeding six months.
- A register of licensed surveyors shall be kept by the Director of Surveys and all regulations made under this part shall be communicated by the Director of Surveys to every licensed surveyor on the register.
- Every licensed surveyor shall before the 15th day of January in each year report in writing to the Director of Surveys for entry in the register.
- A record shall be made in the register referred to above against the name of any licensed surveyor -
 - Who has performed any creditable work or service under the Government or public bodies; or
 - Whose license has been revoked or suspended

3.2 System Of Work

- If the work of a licensed surveyor has not been performed in accordance with provisions of the survey Act and regulations made thereunder or the work is found to contain errors, the Director of Surveys may –
 - The Director of Surveys may call upon the licensed surveyor to do the work in accordance with the provisions of this Act and regulations made thereunder or to rectify the error as the case may be; or
 - Call upon another licensed surveyor to rectify the error.
- A licensed surveyor who willfully renders a false certificate on a plan prepared under this Act and regulations made thereunder shall be liable on conviction to a fine not exceeding 100 pounds or to imprisonment for a period not exceeding six months.
- The Director of Surveys may whenever he thinks fit so to do, direct that the boundaries of any land shall be demarcated or that a survey shall be made of any land or both.
- A surveyor demarcating or surveying a land, may cause a notice to be served on any person owning, occupying or otherwise interested in any land abutting thereon or on any person employed on or connected with the management or cultivation of such land, requiring such persons to attend personally or by agent, before him at such time and place

as may be stated in such notice for the purpose of pointing out the boundaries of such land or of affording such information as may be needed for the purpose of survey or demarcation.

- Where compensation is claimed as a result of a clearance of any line in accordance with a direction of the Director of Surveys under this Act the surveyor shall assess the value of any trees, bush, fences, or growing crops which may have been cut down or removed and pay or tender to the owners thereof the amount of compensation which in his opinion may be allowed there for.
- Every local authority shall –
 - Endeavour to prevent the destruction, damage, or alteration of any boundary mark within the limits of its jurisdiction; and
 - Whenever it becomes aware that any such mark has been destroyed, damaged or altered, report immediately to the nearest Survey Department office.

3.3 Penalties

- Any person who willfully or unlawfully destroys, moves or alters a boundary mark or a survey mark shall be liable to a fine not exceeding one hundred pounds or to imprisonment for any term not exceeding six months or to both.
- If any person willfully obstructs, hinders or resists any official or licensed surveyor in the execution of his duty in ascertaining and marking out of boundaries of any land under the provisions of this Act or any workman or other person acting under the direction of such surveyor, he shall be liable to a fine not exceeding one hundred pounds.

4. MODERN TRENDS OF SURVEYING IN GHANA

In recent times, surveying in Ghana has taken a new turn in that the kind of instruments which surveyors of old were used to for running traverses are being faced out e.g. Theodolite, linen or steel tape, etc. The era of total stations are also gradually diminishing coupled with manual booking in field books as surveyors are now resorting to the use of the data loggers.

As computations were done previously by the help of pocket scientific calculators by going through laborious calculations which you can easily make mistakes, surveyors in recent times have Microsoft Excel packages which go through all the computations required for the submission of the job to the Director of Surveys and also gives a print out to suit the required format.

Having said that, the GPS, in tandem with technology, has become the most preferred choice of instrument by surveyors for field data collection. This, according to a number of surveyors, has come about due to the ease of usage and the convenience as compared to the total station. It is also time effective as far as field work is concerned.

The Ghana local datum based on the adjustment of the primary and secondary network was based on the War Office spheroid. A later adjustment was done by the British military which was based on the Clarke 1880 Modified spheroid. These 2 spheroids have a difference in their parameters and as such there is the need for harmonization of these parameters.

The Land Administration Project (LAP) under the auspices of the Ministry of Lands and Forestry is in the process of addressing this issue by establishing a new Geodetic Reference Network which will be compatible with the WGS84 system. This will address the issue of transformation from the WGS 84 to the Ghana National local Datum based on the Clarke 1880 Modified spheroid or the War Office spheroid.

5. CONCLUSION

In conclusion, land survey standards in Ghana have since the beginning of surveying by the British colonial masters been of a very high standard and this has greatly enhanced the quality of work and maintained very high accuracy limits.

Surely standards are therefore an integral part in the process of professional surveyors fulfilling each of their twin roles both as professionals and as business people.

The Survey Department's task in the field of standards is to assist in the process of developing workable and timely technical, official and legal standards covering the activities of surveyors. The technical instructions manual of the department is currently under review to meet current standards in advancing technology.

The Survey Department in collaboration with the Ghana Institution of Surveyors is also committed in its objectives to developing the skills of surveyors and encouraging the proper use of technology, activities which are becoming increasingly shaped by standards.

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BIOGRAPHICAL NOTES

Jones Ofori-Boadu holds an M.Sc. in Geographical Information Systems (GIS) from the Nanjing Normal University – Nanjing, China and a Post Graduate Diploma in Integrated Map and Geo-information Production from the International Institute for Aerospace Survey and Earth Sciences (ITC) Enschede, The Netherlands.

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