

LAND ADMINISTRATION & INFORMATION SYSTEM (MBET 1514)

WEEK 8 – INTRODUCTION TO CADASTRE

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OUTLINE

- Cadastre and Cadastral
- Cadastre System
- Cadastral Survey Mapping
- Boundary
- Future Cadastre (Cadastre 2014, 2034, 2.0, Fabric)

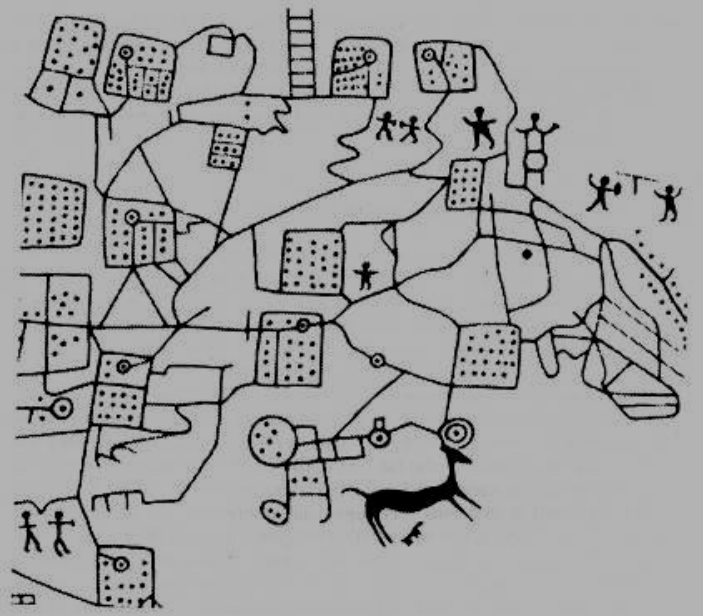
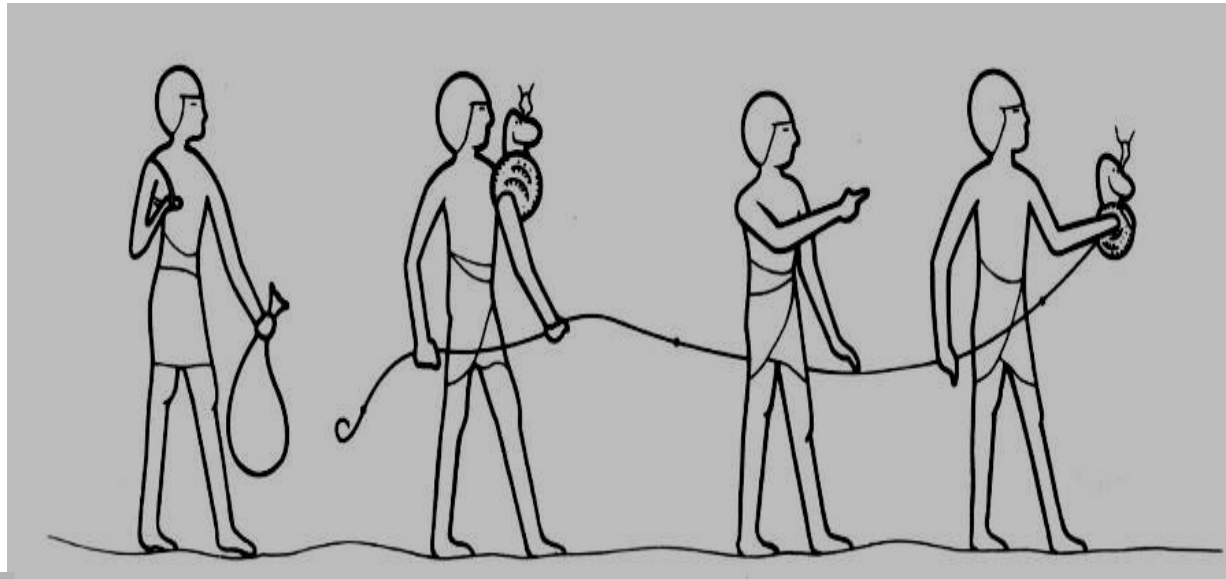
CADASTRE AND CADASTRAL

Objective

To understand the role of the cadastre in the administration of Federal or State or jurisdiction, its operation and components.

History of Cadastres

- Babylonian 4000 BC
- Egyptians 3000 BC
- Italy 1600 BC
- Roman Empire 300 AD
- Domesday Book 1076 AD
- Maria Theresa Cadastre 1792 AD
- Napoleonic Cadastre 1807 AD
- Computerized Cadastre 1980 AD
- Cadastre 2014



The Definition of Cadastre

- ❑ The Cadastre is a land information system, usually managed by one or more government agencies. Traditionally the Cadastre was designed to assist in land taxation, real estate conveyancing, and land redistribution.
- ❑ A cadastre is normally a parcel-based, and an up-to-date land information system containing a record of interests in land (e.g. rights, restrictions, and responsibilities).
- ❑ It usually includes a geometric description of land parcels linked to other records describing the nature of interests the ownership or control of those interests, and often the values of the parcel and its improvements.

The Definition of Cadastre

The International Federation of Surveyors Statement on the Cadastre highlights the importance of the cadastre as a land information system for social and economic development from an international perspective and recognises the central role that surveyors play in the establishment and maintenance of cadastre.

The Definition of Cadastre

□ Effective land management requires land information, for example information about land resource capacity, land tenure and land use. The cadastre is the primary means of providing information about land. The cadastre provides:

- Information identifying those people who have interest in parcels of land;
- Information about those interest, for example nature and duration of right, restriction of interest and responsibility;
- Information about the parcels, for example location, size, improvements and value.

Essential Elements of a Modern Cadastre

- Large scale maps
- Registers
- Cadastre must be complete
- Each parcel must have a unique identifier
- Cadastre must be dynamic
- Information must be correct
- Information must be public
- Cadastre must be supported by a coordinated survey system
- The cadastre must include an unambiguous definition of parcel boundaries both in map form and on the ground.

Cadastre

A successful CADASTRE should provide security of tenure, be simple and clear, be accessible, and provide current and reliable information at minimum cost

Categories of Cadastre

Juridical/Legal Cadastre

Fiscal Cadastre

Multipurpose Cadastre

Juridical/Legal Cadastre

- ❑ Supports land rights.
- ❑ Is concerned with documenting rights and relating them to the land with which they are associated. It is concerned with all forms of property rights.
- ❑ As the information system which underpins land registration.
- ❑ A written record or register containing information about each parcel, such as the spatial information and the rights which appertain to the land.
- ❑ Contains a detailed description of the parcel, in the form of either survey maps or measurements.

Juridical/Legal Cadastre

- ❑ Parcel-based description of interests or rights in real property; typically supported by titles or deeds, and registry.

- ❑ Functions of a legal cadastre:
 - define property rights (often in conjunction with formal and case law)
 - describe the extent (spatial, sometimes temporal) of property rights
 - support land transfer
 - provide evidence of ownership (e.g., using land as collateral)
 - program administration (e.g., enforcement of laws, targeting of incentives)
 - public land management

Fiscal Cadastre

- ❑ An instrument for administering land tax and value policy.
- ❑ The information required to develop and maintain a fiscal cadastre may be collected directly or indirectly through surveys or from other sources, for instance details of land ownership and their property boundaries.
- ❑ Property valuation and land taxation.

Fiscal Cadastre

□ Functions of fiscal cadaster:

- information base for property taxation
- distribution of funds from public programs
- monitoring and supporting land markets
- information for growth management and land use planning

Multipurpose Cadastre

- ❑ Should be maps showing the location and different types of physical features.
- ❑ Concerned with physical attributes such as man-made objects and natural features associated with each land parcel, abstractions, surveying and mapping data can also be referenced to the parcel.

Multipurpose Cadastre

□ Advantages directly beneficial from multipurpose cadastre are:

- (i) an improved conveyancing system;
- (ii) an improved cadastral survey system;
- (iii) improved land use planning, land management and environment management;
- (iv) improved management of publicly owned lands,
- (v) reduction of duplication; and
- (vi) better control of land transactions.

Multipurpose Cadastre

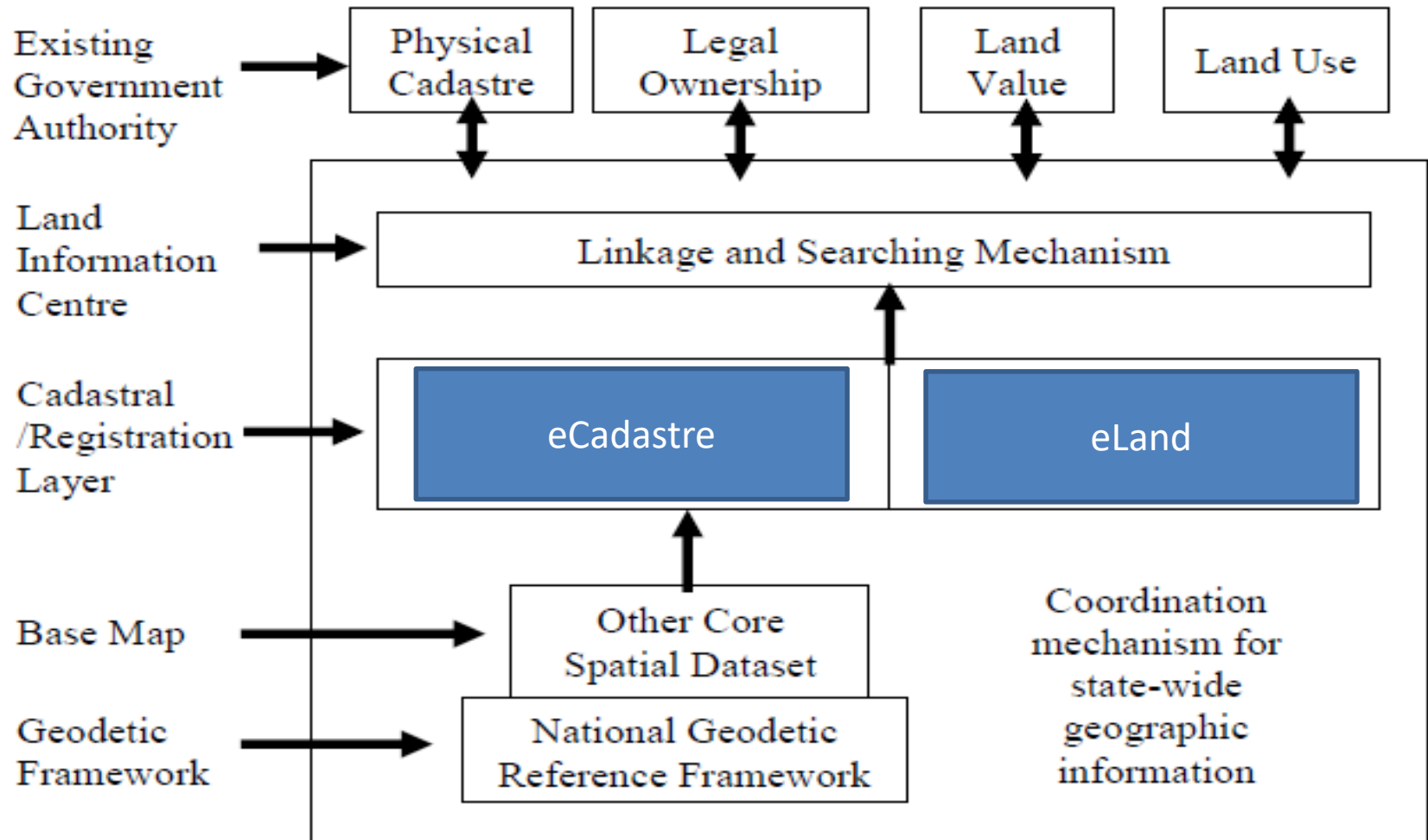
An extension of the basic cadastre, is an essential tool that can include other information from various databases or registers, and can be adapted for local needs. It is a basis for planning for utilities, land information and development management.

Benefits of Multipurpose Cadastre

□ A modern multipurpose cadastre can lead to improve:

- Conveyancing system.
- Cadastral survey system.
- Land use planning and land management.
- Sustainable development.
- Management of publicly owned lands.
- Reduction of duplication.
- Control of land transactions.

Multipurpose Cadastre Components



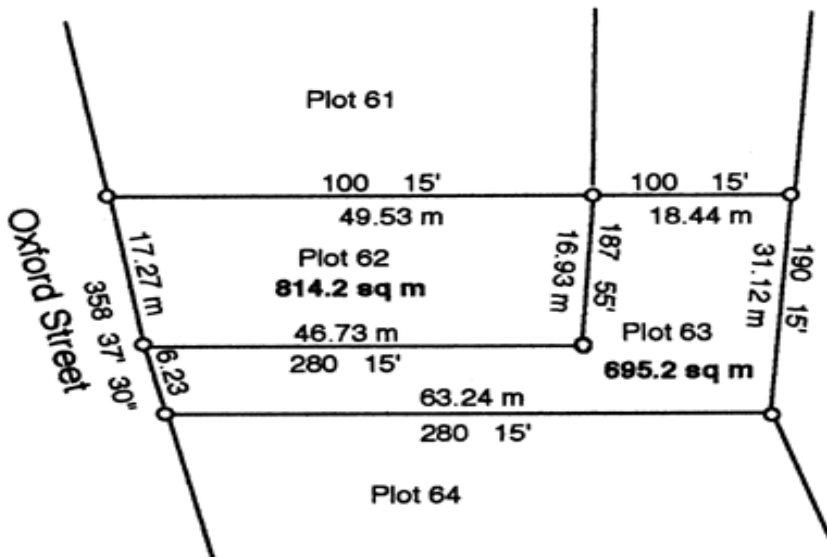
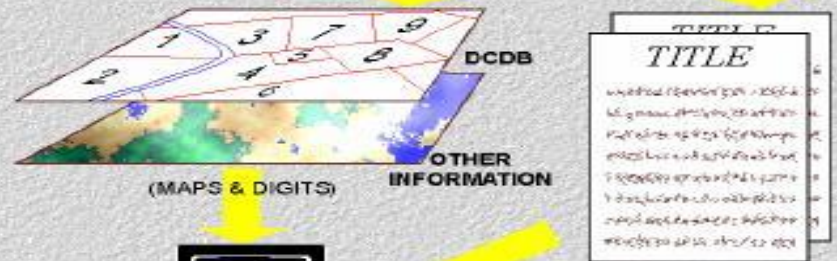
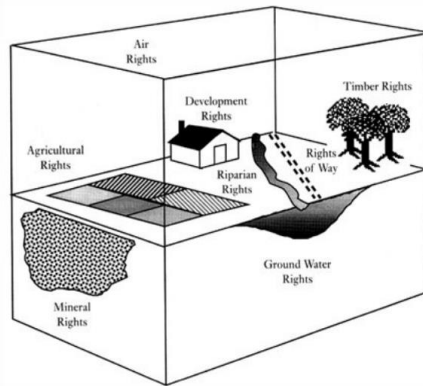
Cadastral

The basic building block in any land administration system is the cadastral parcel. The cadastre consists of two parts:

- Registers
- Maps

The Cadastral Parcel and Ownership Rights

The cadastral parcel and ownership rights



Cadastral Issues

- Documentation of informal or customary rights.
- Land registration (deeds, title or combinations).
- Land titling.
- Parcels and properties.
- Boundaries (fixed, graphical, general).
- Impact of technology.

CADASTRE SYSTEM

Cadastre System

The basic building block in any land administration systems is the land parcel as identified in the cadastre. However, since the concept of a cadastre is difficult to define, it would be better to discuss cadastre systems rather than a cadastre because cadastre systems include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the present and possible future land use (Enemark, 2005). Therefore, it is noted that even though cadastre systems around the world are clearly different in terms of structure, processes and actors, their design is increasingly influenced by globalisation and technology, moving towards multipurpose cadastres (Molen, 2003).

Cadastre System

The cadastre system comprises the map, real estate and land register. The map shows the boundaries of real estates and location of the parcels. Real estates and changes are entered into the cadastre. The land register based on the cadastre contains a list of titles for real estate. Today's cadastre registration not only focuses on property registration but also serves other tasks used by private and public sectors in land development, urban planning, land management and environment monitoring (Federation Internationale de Geometres, 1995; Williamson and Ting, 2001).

Cadastral System

The central components of the cadastral systems are adjudication, demarcation, survey and preparation of boundary descriptions (Dale, 1976). The overall cadastral systems are administered or controlled by the State or federal government, either on its own or in conjunction with the private sector. The outputs of the cadastral system are the boundary descriptions that can be used for the production of cadastral maps, recording titles or boundaries, valuation and taxation or planning and development.

Cadastral System

Nevertheless, it is more important to examine the key processes with the cadastral systems which are associated with adjudicating, transferring and subdividing land rights, rather than look at a free standing concept of a cadastral (Williamson, 1983). It is important to recognise the flexibility of a cadastral. It can record a continuum of land tenure arrangements from private and individual land rights to communal land rights as well as have the ability to accommodate traditional or customary land rights. Additionally, Williamson (1983) suggests that the success of a cadastral system can be measured on how well it achieves these broad social and economic objectives, not the complexity of its legal framework or the technical sophistication of the cadastral surveys or cadastral maps.

CADASTRAL SURVEY MAPPING

Cadastral Survey and Mapping

A section of the United Nations Economic Commission for Europe reads: Cadastral surveys are concerned with setting out and recording the turning point or corners along property boundaries. A variety of techniques may be used, each having its own inherent accuracy and cost. The necessary and sufficient accuracy that is needed for any survey depends on the purposes for which that survey is conducted. (United Nations Economic Commission for Europe, 2005: 90)

Cadastral Survey and Mapping

Federation Internationale de Geometres states that cadastral surveying: is the definition, identification, demarcation, measuring and mapping of new or changed legal parcel boundaries. It usually includes the process of re-establishing lost boundaries and sometimes resolving disputes over boundaries or other interests in real property. (Federation Internationale de Geometres, 1995: 5)

Cadastral Survey and Mapping

The United Nations Economic Commission for Europe (2005: 8) states that “the basic features that are recorded in a cadastre are the land parcels and their boundaries. Good practice will result in laws relating to parcels and their boundaries that: (i) provide a legal definition of a land parcel; (ii) recognize that boundaries may be vertical (for most surface areas) or horizontal (for strata titles); (iii) differentiate between the legal position of a boundary and the physical position of objects such as fences or hedges; (iv) define the priority of evidence, such as survey measurements versus monuments, when re-establishing a boundary line, and indicate whether marks on the ground take precedence over measurements recorded in the registers in the re-establishment of boundaries or whether data on the plans must be followed; and (v) avoid getting into detail over the precision with which boundaries should be surveyed for the purposes of land titling”.

Cadastral Survey and Mapping

In order to guarantee the accuracy of boundary surveys and to apply quality controls to the work of the cadastral survey, it is common for survey regulations to be introduced. These often prescribe the manner in which surveys are to be carried out as well as the standards that must be achieved. Survey regulations may also prescribe the necessary qualification for the granting of licence to undertake cadastral surveys.

Cadastral Survey and Mapping

Cadastral surveying is a general term applied to several different types of survey. It is mentioned here only to make the reader aware of the expression and broad aspects of its use. A rigid definition of a cadastral survey involves only the information required to define the legal boundaries of a parcel of a land, whether it is rural or urban. Therefore, the documentation, bearings, distances and areas would be shown. This definition has now been expanded through common usage to include cultural features, such as building location, drainage features and topographic information, such as spot elevation or contours.

Cadastral Survey and Mapping

Cadastres and cadastral surveys are aspects of land administration. The primary object of a cadastral is to determine for each land parcel, its location, the extent of its boundaries and surface area, and to indicate its separate identity, both graphically on a map or in a record as well as physically on the ground. Its secondary objective is to provide information for a multipurpose cadastre to fulfil the overall information requirements of land administration (Dale, 1976). Cadastral plans can fulfil many of the functions of large-scale topographic maps, not only serving such purposes as boundary control, registration of title and valuation but also forming a basis of planning and development (Dale, 1976).

Cadastral Survey and Mapping

The function of the multipurpose cadastre is to bring together all relevant land information in a compatible data form. The objectives of cadastral surveys are to acquire information, process it, coordinate and finally to present the vital information. Cadastral surveying is an expensive process not only in its execution but also in the loss of capital from delays in development and investment which may arise owing to inefficiency. The challenge is how to meet the short and long term requirements of the fiscal, juridical and multipurpose cadastres at minimum expense with maximum efficiency.

Cadastral Survey and Mapping

The existence of up-to-date maps and records of all existing rights in land provided to every branch of the government that deals with the administration of land is helpful. For instance, the simplification of courts/judicial processes; improved land acquisition for public purposes; and improved administration of forests and other public land are the results of good cadastral maps and a good system of registration of rights to the appreciation of a national agrarian situation and to the elaboration of measures for its improvement and reform.

Cadastral Survey and Mapping

It is mentioned by Rabley and Falk (2004) that cadastral surveys and cadastral maps are fundamental to an efficient and speedy land registration process. They are needed to ensure that rights and restrictions about properties can be quickly identified by referring to the same unique place on the earth. In addition, they all work to define the boundary of real property. In order to speed up and streamline the process of property registration, it is important for cadastral surveys and mapping to emphasize reliable cadastral surveying information, which adds to the security of titles.

Cadastral Survey and Mapping

As Dale and McLaughlin (1999) point out, cadastral surveying is the term generally used to describe the gathering and recording of data about land parcels even though the records do not form part of an official cadastre. When properties are initially registered, government officials have traditionally undertaken the processes of cadastral surveying and land title adjudication.

Cadastral Survey and Mapping

In many countries, the techniques that are used in cadastral surveying are prescribed in the law and in the regulations that specify the standards that are to be achieved and the methods that must be used to deliver them. Surveyors may also need to be licensed in order to carry out their work. Regulations and legislation for licensed surveyors have been introduced in many countries to ensure that quality reliable data is collected. These standards, in many cases, are still monitored by the central government cadastral mapping agency, which are responsible for the accuracy of the work (Dale and McLaughlin, 1999).

Cadastral Survey and Mapping

In conclusion, the methods and precision of cadastral surveys are often prescribed in survey-related laws and regulations although the final standard of the product is not normally defined in laws relating to the registration of titles (United Nations Economic Commission for Europe, 2005). From the legal perspective, it is necessary to prescribe the qualification of those who may conduct cadastral surveys. It is also essential to establish the legal liability of the surveyors for work undertaken and for the consequences in the short and long term of any errors in measurement. The definition of legal liability is important, since quality control is most cost effective when it is undertaken by sampling. Since this implies the risk of failing to identify incorrect data, the level of risk and consequences of mistakes must be clear in order to prevent expensive, unnecessary and time consuming checking of surveys (United Nations Economic Commission for Europe, 2005).

BOUNDARY

Types of Boundary

- ❑ The need to indicate boundaries on the ground came long before the practice of title registration, survey, mapping, or conveyancing.
- ❑ A boundary is a surface which defines where one landowner's property ends and the next begins.
- ❑ The legal boundary is an infinitesimally thin surface extending from the centre of the earth to the infinite in the sky and is essentially an abstract concept.
- ❑ Exceptions lie in three-dimensional property rights or strata titles where the boundary may be horizontal as well.

Types of Boundary

- There are three categories of fixed/specific boundaries:
 - (i) Defined on the ground prior to development and identified.
 - (ii) Identified after development.
 - (iii) Defined by surveys to specified standards.

- A fixed boundary is one that has been accurately surveyed so that any lost corner monument can be replaced precisely from the measurements.

Types of Boundary

- There are also three categories of general boundaries:
 - (i) The situation where the ownership of the boundary feature is not established, so that the boundary may be one side of a hedge or the other or down the middle.
 - (ii) The indeterminate edge of a natural features.
 - (iii) The situation where the boundary is regarded as approximate so that the register may be kept free from boundary disputes.

Types of Boundary

The third type of general boundary is suitable in the determination of actual forest or watershed boundaries, or even lot parcels in some countries using aerial photographs or space satellite techniques to define an accurate boundary line that it can be mapped in the register or document of title.

Types of Boundary

❑ The actual physical location of a boundary line is normally demarcated by:

- (i) Point features such as pegs the straight line between which marks the divide between two properties.
- (ii) Linear features such as walls, hedges and fences.

❑ Such an approach works equally well with three-dimensional properties such as apartments since their construction defines their effective limits. In the case of strata titles, the ownership of parts of buildings can be defined and guaranteed with determination of where, within the walls and floors, one set of property rights changes into another.

Types of Boundary

❑ Advantage of fixed boundaries:

- Landowners can have confidence in where their property limits lie since these are formally recognized within the system.

❑ Disadvantages of general boundaries:

- The precise line of the legal boundary between adjoining parcels is left undetermined.
- The ownership of the land can be guaranteed up to the bounding feature, the ownership of which is left uncertain.

Types of Boundary

Information about the location of parcels and their boundaries is an important part of a land information system, the only differences being the precision with which the location of boundaries is recorded and the extent to which this information can be used as legal evidence.

Boundary Marks

□ Section 5 National Land Code 1965:

- Boundary mark includes any survey stone, iron pipe or spike, wooden peg or post, concrete post or pillar or other mark used for the purpose of marking boundaries.

Boundary Marks

❑ Section 114 National Land Code 1965 (Implied conditions affecting all alienated land):

- The proprietor will, take all reasonable steps to prevent their damage, destruction or unlawful removal.
- The proprietor will if any of them are damaged, destroyed or unlawfully removed, give immediate notice of the fact to the Land Administrator, or to the penghulu having jurisdiction in the area in which the land is situated.
- The proprietor will, if so required by the Land Administrator, pay the cost of repairing or, as the case may be, replacing any of them which may have been damaged, destroyed or unlawfully removed.
- The proprietor will, if so required by the Land Administrator, at his own expense clear any boundary line between any of them.

Types of Boundary Mark

Boundary marks allowed are as follow :

(a) concrete stone, concrete post, granite stone and iron pipe followed size fix by JUPEM;

(b) nail and iron spike in concrete;

(c) mark on rock i.e a mark which punch on rock with an arrow shown to the hole; and

(d) any marks that allowed by JUPEM from time to time.

Type Of Boundary Mark

Abbreviations and symbols used for boundary marks shall be as prescribed by the Department.

i. Should use the permitted type of boundary marks allowed by Department.

ii. Cadastral Reference Mark can be from iron pipe in concrete or iron spike in concrete. The existing boundary marks can be used as Cadastral Reference Mark. Serial number of Cadastral Reference Mark is generated by systems and based on the survey file number.

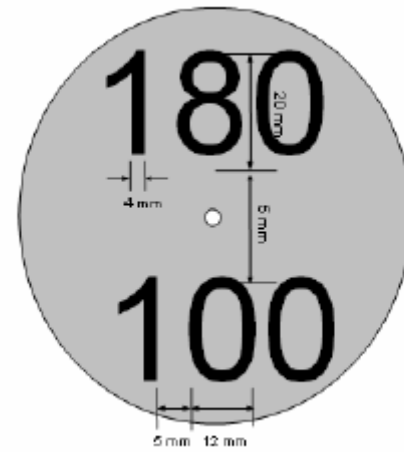
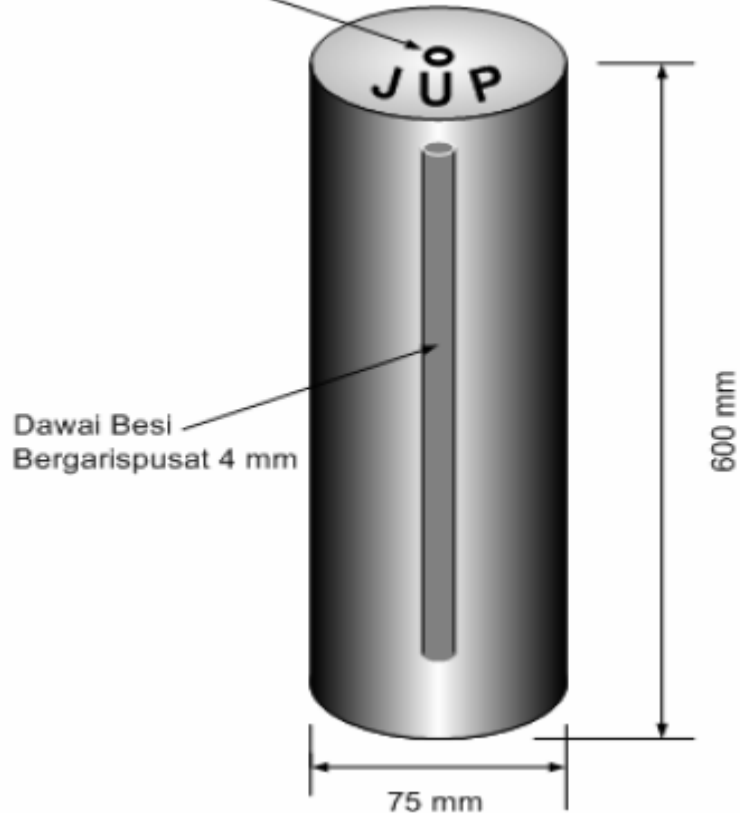
Distance Between Boundary Mark

- ❑ The marks on the boundary line should be planted at intervals of not more than 300 meters away if marks visible each other or at intervals of not more than 200 meters if they are not visible.
- ❑ Boundaries lines shall be marked follow the curve at the end of the chord so normal distance from the curve to the chord line does not exceed 0.2 meters.
- ❑ Minimum distance between two boundary marks is 0.1 meter.

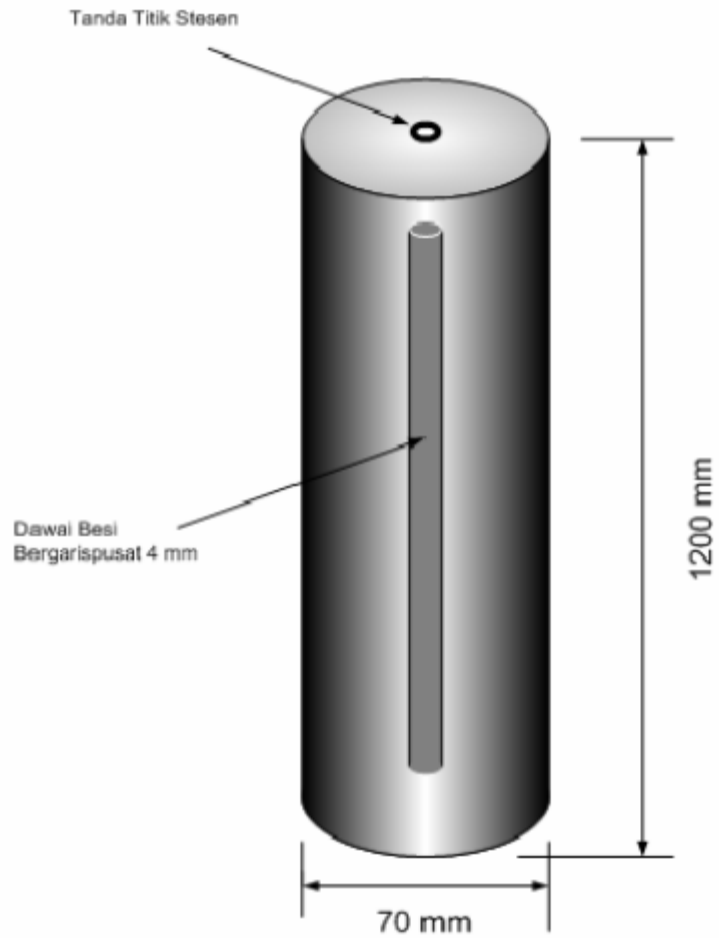


Batu Konkrit

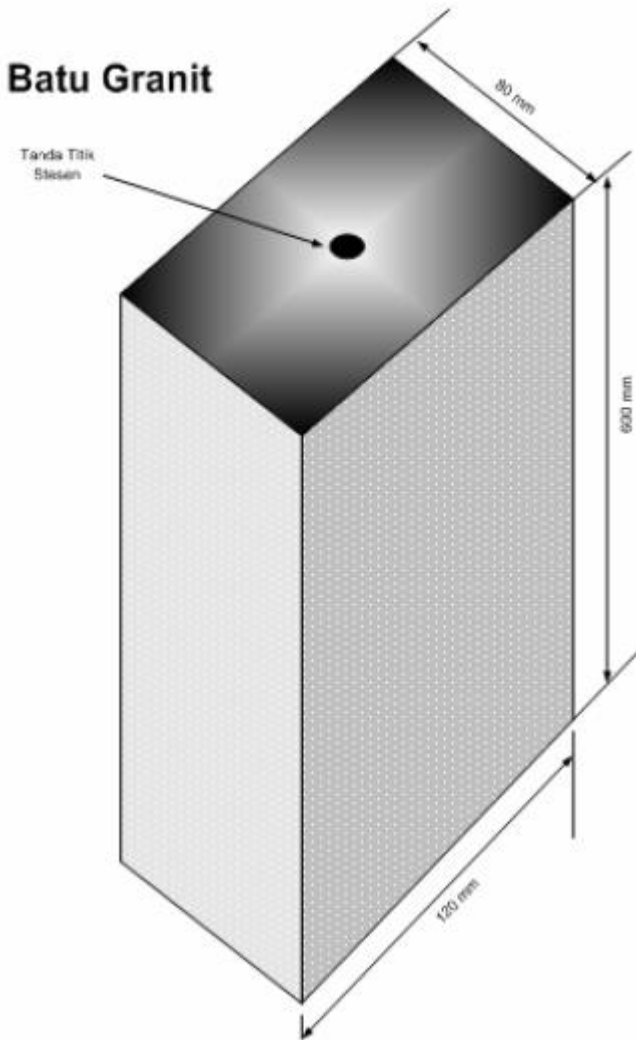
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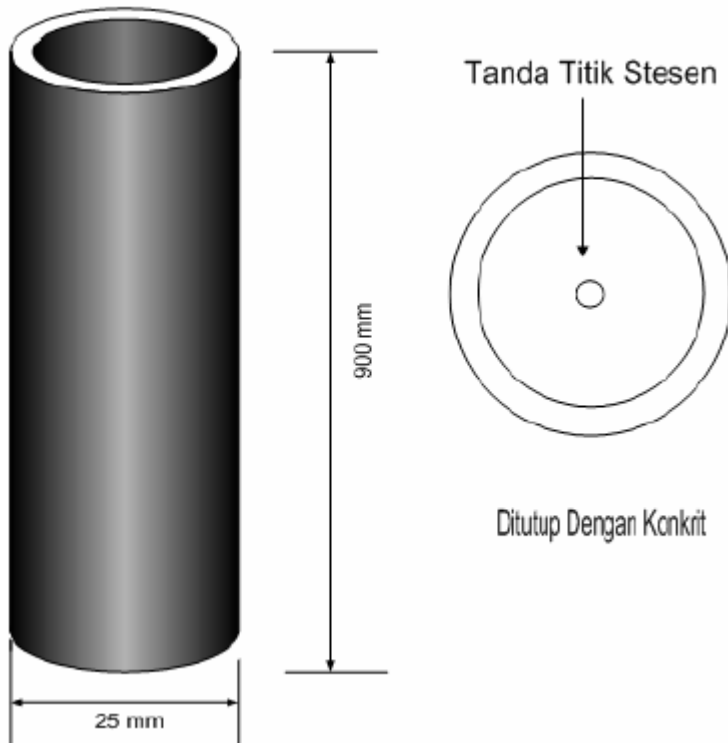
Tiang Konkrit



Batu Granit

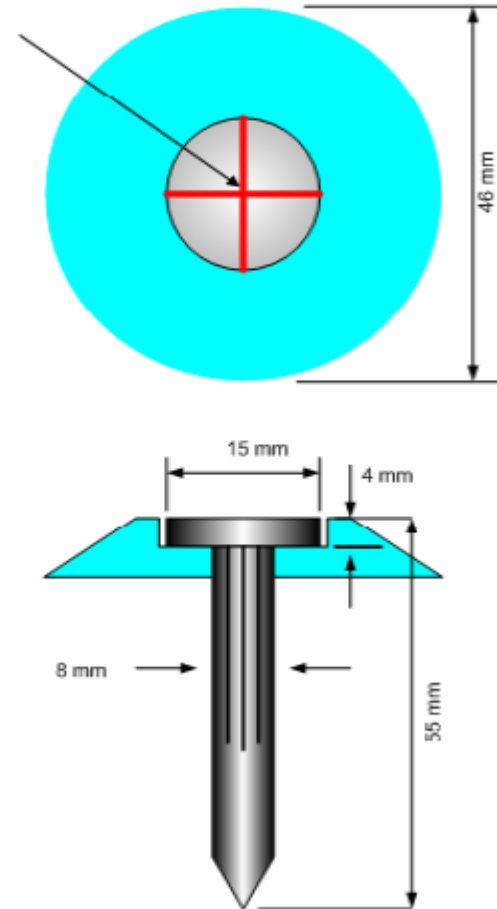


Paip Besi

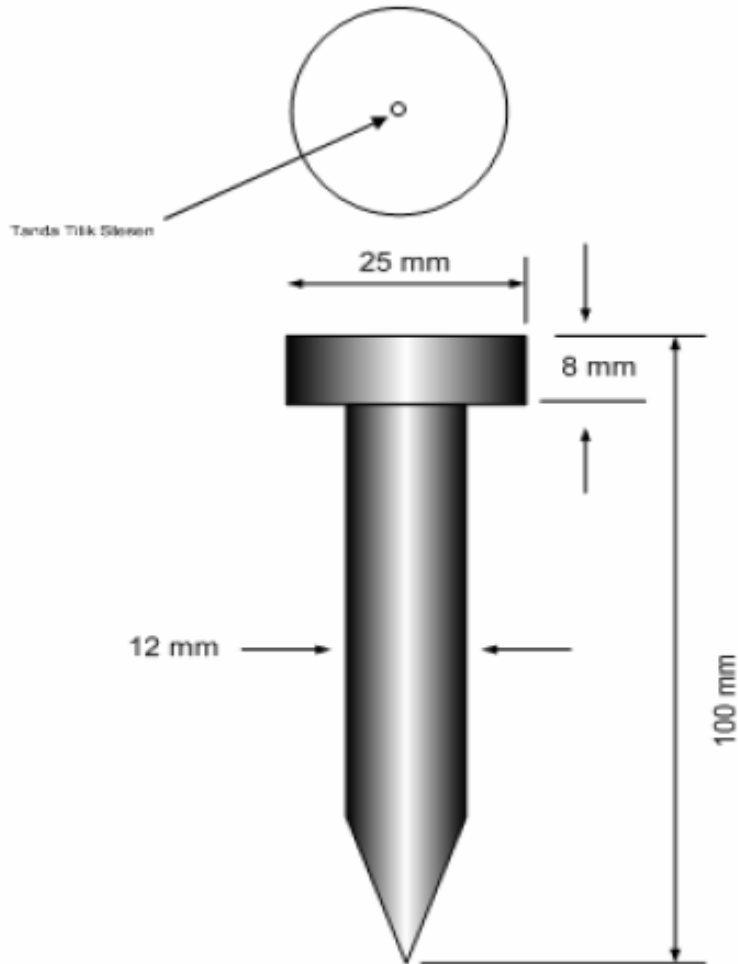


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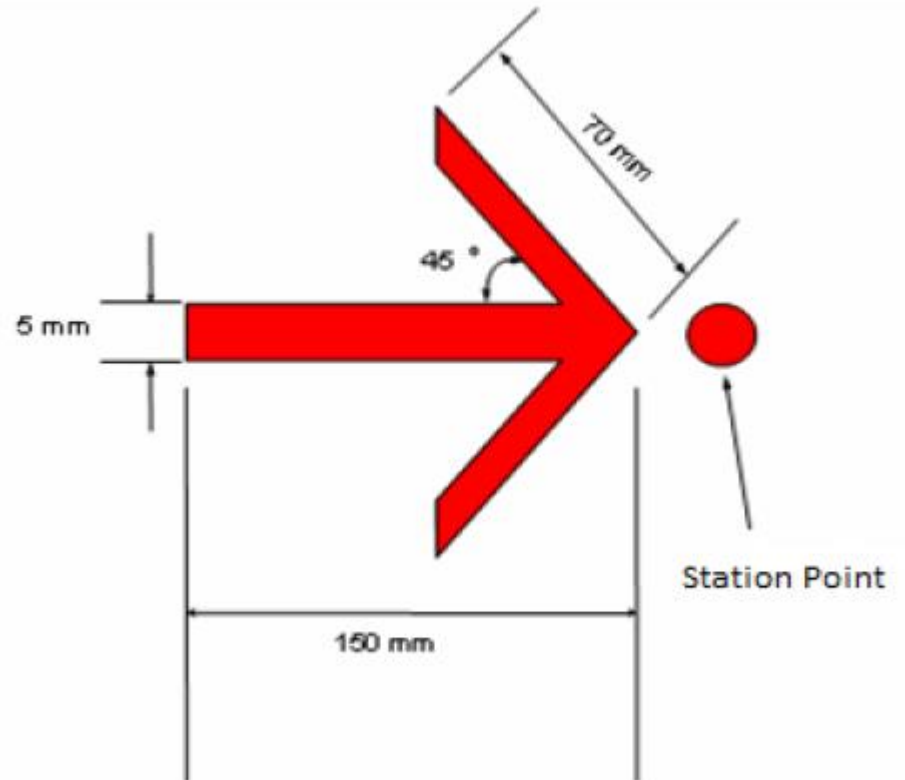
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Pepaku Besi



Tanda Atas Batu



FUTURE CADASTRE

Cadastre 2014

Intended as the replacement for traditional cadastral institutions, Cadastre 2014 is the result of a study by the Working Group 7.1 (Commission 7) of Federation Internationale de Geometres (FIG), and a land recording system. Developed between 1994 and 1998, it took into consideration social, legal, economic, and technical developments in the domain of cadastral systems worldwide. The mission was to develop vision statements, where the cadastre as a concept might be in 20 years' from 1994 (Kaufmann and Steudler, 1998). It sought to deliver certainty of rights and peaceful coexistence as well as wider economic aims of internationalisation (Ting, 2002).

Cadastre 2014

- Statement 1: Show the complete legal situation of the land. Private and public rights and restrictions on the land will be systematically documented;
- Statement 2: The separation between maps and registers will be abolished;
- Statement 3: The cadastral mapping will be dead. Long live modelling;
- Statement 4: Paper and pencil-cadastre will be gone;
- Statement 5: Highly privatised. Public and private sectors will work closely together;
- Statement 6: Cost-recovering.

Cadastre 2014

Kaufmann (2004), in elaborating on Cadastre 2014, states that the three-dimensional aspect is not of primary interest. From the point of Cadastre 2014, the introduction of the three-dimensional aspect depends on the legal framework. If the law defines land objects as being three-dimensional, it is represented in the Cadastre 2014 concept simply with its three-dimensional coordinate values. If the effects of the right or restriction have a spatial significance, the three-dimensional objects should define clearly the space of impact, describing the outlines of the effect of a right or restriction. If spatial impacts are to be evaluated, the functions of spatial exploitations should be developed and used for analysis.

Cadastre 2014

According to Tse and Gold (2003), Cadastre 2014 introduces a more general definition of a land object with homogeneous conditions inside its boundaries. It matches representation of the real world, where one land parcel may have one or more different ownerships, especially for multi-storey buildings and constructions at the underground surface where people need to have access to some part of its visible exterior.

Cadastre 2014

According to the report of Cadastre 2014 by Kaufmann and Steudler (1998), future cadastres will show the complete legal situation of land, including public rights and restrictions. All these rights, restrictions and responsibilities (RRR) related to land are often overlapping. Current legal cadastre systems have shown limitations in some 3D situations. In areas with an increasing pressure on land, there is a growing interest in using space under and above the surface. Therefore, three-dimensional information has become increasingly important in registering today's world (Stoter, 2004).

Cadastre 2014

Since the beginning of the twenty-first century, three-dimensional registrations in both technical and institutional issues of multi-storey developments and complex constructions have become more widespread. Purcell, Murray and Prendergast (2006) believe that many countries such as Norway have looked into the various components associated with three-dimensional registrations. In this regard, Malaysia should also start to look into the legislative aspects of these limitations and come up with a principal framework for 3D property objects.

Cadastral 2034

At the FIG 2010 Congress in Sydney, Australia, Bennett and co-authors from University of Melbourne described six design elements relating to the role and nature of future cadastral, as presented in Cadastral 2034. One of these design elements was 'survey accuracy'. However, Cadastral 2034 has still a long journey to go before implementation and circumstance are bound to change.

Cadastre 2034

- ❑ Cadastre 2034 outlines a vision for a broader cadastre where information is readily accessible and people have confidence in the spatial extent of the various rights, restrictions, and responsibilities related to their land and real property.
- ❑ Cadastre 2034 will guide the evolution of jurisdictional systems and ensure a coordinated and consistent approach to future policies, legislation, standards, models and research; and provide clear direction for the sector as a whole.

Cadastre 2034

- ❑ Fundamental to land and property ownership and is sustainably managed;
- ❑ Multipurpose, truly accessible, easily visualised, and readily understood and used;
- ❑ Fully integrated with broader legal and social interests on land;
- ❑ A representation of the real world, which is survey accurate, 3-dimensional and dynamic; and
- ❑ A national cadastre based on common nationwide standards.

Cadastre 2.0

- ❑ Be multipurpose in nature, meeting a wide range of needs beyond simply recording land ownership of defining parcels for taxation;
- ❑ Enable the full spectrum of rights and parcel definitions to be modelled and managed within the system;
- ❑ Be truly three-dimensional, to reflect better the real three-dimensional overlapping rights, and the registration of multi-level properties.

Future Cadastre

It may be concluded that future cadastre is a methodically arranged public inventory of data concerning all legal land objects in a certain country or district, based on a survey of their boundaries. Such legal land objects are systematically identified by means of separate designations. They are defined either by private or by public law. The outlines of the property, its identifier together with its descriptive data, may show each separate land object in nature, size, value and legal rights or restrictions associated with the land object.

Cadastral Fabric

- A **cadastral fabric** (or parcel fabric) is a continuous surface of connected (map) parcels.
- Parcel polygons are defined by a series of boundary lines that store recorded dimensions as attributes in the lines table. Parcel polygons are also linked to each other by connection lines, for example, connection lines across roads.
- Because each and every parcel is either linked or connected, a seamless network.
- Parcel lines have endpoints, which are the parcel corners. Parcel corner points are common between adjacent parcel boundaries, establishing connectivity and maintaining topological integrity in the network.
- In the geodatabase, topology is the arrangement that defines how point, line, and polygon features share coincident geometry.

Cadastral Fabric

- A cadastral fabric is a representation of the record of survey for an area of land. Parcel boundary line dimensions in the cadastral fabric match the dimensions on the survey record. Dimensions in the cadastral fabric are edited in response to a change in the survey record, for example, a parcel split or resurvey. Parcels that are edited or replaced by new survey records are retained as historic, thus always preserving the original survey record.
- The cadastral fabric acts as a base map for overlying feature classes. Feature classes such as building polygons and utility lines are constructed in relation to parcel boundaries. Standard feature classes using parcel boundaries as a base map will fall out of alignment with an adjusting cadastral fabric.

THANK YOU