DEPARTMENT OF
ENVIRONMENT AND
NATURAL RESOURCES

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SUBJECT : REVISED MANUAL OF LAND SURVEYING REGULATIONS IN THE PHILIPPINES

The dynamic advancement of surveying science resulted in the new survey technologies and practices. In view of this the "Manual for Land Surveys in the Philippines" issued in 1980 is hereby revised and reissued under the new name "Revised Manual of Land Surveying Regulations in the Philippines". It is an integration of the land surveys rules and regulations of the Land Management and the Mines and Geo-Sciences Bureaus, embracing the DENR policy on integrated approach in surveying and mapping:

REVISED MANUAL OF LAND SURVEYING REGULATIONS

PART I

PROVISIONS GOVERNING ALL CLASSES OF LAND SURVEYS

Chapter I - LAND SURVEYS AND GEODETIC ENGINEERS

CLASSIFICATION OF LAND SURVEYS

Section 1 - For the purpose of these regulations, the survey of lands used for agricultural, residential, industrial, commercial, resettlement and other similar purposes shall be divided into three (3) groups. These are:

(1) Isolated Land Surveys
(2) Cadastral Land Surveys
(3) Geodetic Surveys.

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Section 2 - Isolated land surveys shall comprise all classes of surveys of isolated parcels of land used for agricultural, residential, industrial, commercial, resettlement, or other purpose. These surveys shall be classified as follows:

a) Public Land Surveys

All original surveys of lands of the public domain classified as alienable or disposable pursuant to the provisions of the public land laws.

b) Private Land Surveys

All original surveys of lands claimed or owned by individuals, partnership, corporations, or any other form of organization, undertaken for use in original land registration proceedings pursuant to the provisions of Presidential Decree No. 1529 otherwise known as Property Registration Decree. It includes subdivision, consolidation/subdivision of decreed, patented, or titled properties.

c) Government Land Surveys

All original surveys of lands administered by or belonging to the National Government or any of its branches pursuant to the provisions of Friar Lands Act No. 1120, as amended; Act No. 3038; or similar acts which may hereafter be enacted.

d) Conversion Surveys

All surveys converting graphical cadastral lots into numerical cadastral lots, computed and plotted in the system of the cadastral project.

e) Other Land Surveys

All surveys made for the purpose of determining political boundaries, verifying or relocating prior surveys, delimiting alienable and disposable areas, forestlands, parks and other protected areas, ancestral claims, watersheds, reservations, foreshore land; determining the geographic coordinates, establishing location monuments and triangulation stations, locating roads and streets, easements, and any other survey work not included in the preceding classes.

Section 3 - Cadastral land surveys shall comprise all surveys of extensive areas consisting of several lots for cadastral registration proceedings, agricultural development, or for any purpose, pursuant to the provisions of Cadastral Act No. 2259, as amended; Act No. 3240, as amended; Act No. 3327, as amended; Sections 1850 to 1857 of the Administrative Code (Act No. 2711, as amended); Commonwealth Act No. 141, as amended; or other acts which may hereafter be enacted.

Section 4 - Geodetic surveys shall comprise all surveys of extensive areas that take into account the curvature of the earth. This shall be made for the purpose of determining the geographic positions of reference points of cadastral projects and other expansive isolated surveys.

The establishment of the national geodetic network shall be in accordance with the specification of the Coast and Geodetic Survey Department of the National Mapping and Resource Information Authority (NAMRIA) which follows international standards.

WHO MAY EXECUTE SURVEYS

Section 5 - Land surveys for registration and other surveys with prescribed precision of accuracy as stated in this Manual, shall be made by geodetic engineers or junior geodetic engineers duly registered in accordance with Republic Act No. 4374, as amended.

Section 6 - Geodetic engineers and junior geodetic engineers who are in the service of the Department of Environment and Natural Resources (DENR) may undertake public land surveys, private land surveys, government land surveys and other land surveys, subject to the administrative direction, control and supervision of the Director of Lands Management Bureau through the Regional Technical Director for Lands Management Services.

Section 7 - Duly licensed geodetic engineers and junior geodetic engineers in private practice may undertake private land surveys, subject to these rules and regulations. In the case of Junior Geodetic Engineer, subject further to the limitation of three lots with an aggregate area of not exceeding one hectare and other limitations prescribed by the Geodetic Engineering Board.

Section 8 - Duly licensed geodetic engineers and junior geodetic engineers in private practice may be authorized to undertake surveys of isolated parcels of public and government lands, subject to the administrative direction, control and supervision of the Lands Management Bureau through the DENR-Lands Management Services.

Section 9 - Duly licensed geodetic engineers in private practice may be authorized to undertake cadastral surveys, subject to existing laws and the administrative direction, control and supervision of the Lands Management Bureau through the DENR-Lands Management Services.

BONDS FOR GEODETIC ENGINEERS

Section 10 - Geodetic engineer in private practice may be authorized to undertake survey of isolated parcels of public lands under the administration of the Lands Management Bureau, upon issuance of survey authority. The request for survey authority shall be accompanied by documents that will show the actual occupation of the land by the claimant. Such documents may be a certification of the Barangay Captain or the Municipal Mayor. Survey for homestead, lease or sale application is exempted from this requirement.

In case the geodetic engineer, when so notified, does not make the necessary field correction, he may be required to deposit sufficient amount to defray the cost of field correction survey or if the survey is rejected, a notation will be reflected in the in the records of the survey.

Section 11 - In the case of mineral land surveys, the geodetic engineer duly authorized to execute the same, shall file a bond to be determined by the Regional Executive Director and the Regional Director for Mines and Geo-Sciences in the amount of not more than Twenty Thousand Pesos (20,000). Mineral land surveys includes the survey of mining claims, quarry applications, sand and gravel applications, and other mineral lands for lease, permit, license service contract and other purposes. (Sec. 108 Mineral Land Surveys Regulation, MLSR).

The bond shall guaranty the faithful and efficient execution of the survey. It shall also cover any expenses that may be incurred by the DENR in the verification, correction, or field work. (Sec. 111r, MLSR).

The bonds shall be in the form as stated in Section 14 of this Manual or a Torrens Title covering unencumbered private lands provided the assessed value is not less than twice the amount of the required bond and this encumbrance shall be recorded in the Register of Deeds concerned. The bond shall continue to be in force until the surveys are approved or ordered cancelled or rejected by the Regional Executive Director and/or the Regional Technical Director for Lands. (Sec. 109 & 110, MLSR;DAO 72).

Section 12 - A geodetic engineer in private practice who has been authorized to undertake cadastral project shall file a performance bond in the amount to be fixed by the Regional Executive Director. The bond shall not be less than ten percent of the project cost.

Section 13 - The performance bond shall remain in force in accordance with the terms and conditions of the contract for the cadastral project.

Section 14 - The performance bond shall be in any of the following forms:

a) A cash deposit with the National Treasurer.

b) A cash surety furnished by the Government Service Insurance System

c) Bonds of the Republic of the Philippines.

CHAPTER II - SURVEYING INSTRUMENTS

THEODOLITES, TRANSITS, ELECTRONIC DISTANCE MEASURING AND OTHER EQUIPMENT

Section 15 - Official surveys to be used in the issuance of land patents and leases, adjudication of titles and other administrative or judicial proceedings shall be made with transits, theodolites, photogrammetric instruments and other surveying and mapping instruments certified for use by the Director of Lands Management Bureau or Regional Technical Director for Lands. If theodolites or transits are used, they must be of the following specifications:

THEODOLITE

a) The telescope should have a magnifying power of not less than 30 diameters.

b) The horizontal circle should have a minimum inside diameter of 80 millimeters and provided with microptic reading devices.

c) The horizontal and vertical circles should be full circles with least reading of twenty (20) seconds of arc or less or its equivalent in the centesimal units. Angular units may be in the sexagesimal or centesimal system.

d) The stadia constant should preferably be one hundred (100).

ENGINEERS TRANSIT

a) The telescope should have a magnifying power of not less than 20 diameters.

b) The telescope should possess center cross wires or hairs and preferably with solar squares.

c) The stadia constant should preferably be one hundred (100).

d) The minimum inside diameter of the horizontal circle should be 118 millimeters.

e) The horizontal and vertical circles should be full circles.

The horizontal circle should be provided with two (2) verniers and the vertical circles with one (1) vernier with least reading of one minute or less.

f) The transit should be provided with a magnetic compass with a least reading of one degree or less.

g) The plate levels should have a sensitivity of seventy-five seconds of arc (75") or less per 2mm graduation.

ELECTRONIC DISTANCE MEASURING EQUIPMENT

Section 16 - Electronic Distance Measuring (EDM) equipment of any kind and model shall be tested for zero (prism/instrument) constant, measuring scale frequency with the following specifications:

a) A measuring range of at least 300 meters when using one prism.

b) It should operate with an accuracy of +/- (5 mm + 5 ppm) probable error and within temperature range of 15 to 40 degrees Celsius.

c) It should have a measuring range display read-out to the nearest millimeter.

d) It should be provided with meteorological correction factor for atmospheric conditions, earth curvature, refraction, and reflector constant including cyclic errors.

Section 17 - The EDM instrument should be presented to the Lands Management Bureau for a full calibration or check and if necessary, a separate cyclic test shall be carried out if any of the following is present:

a) Upon receipt of new EDM.

b) After any repair which affects the component such as the light source, internal centering and/or alignment, replacement of parts, etc.;

c) When malfunction is suspected;

d) When the distances measured by the EDM may be or are to be challenged in a Court of Law.

Section 18 - A partial calibration over one of the established calibration base should be carried out before its use in any project if the EDM instrument has not been used for some time. If any discrepancy is noted then a full calibration may be necessary. The UP Calibration Base or the South Superhighway Baseline and other established baseline may be used, provided the said baseline is in accordance with the standards.

Section 19 - To minimize the necessity of regular re-calibration of the EDM instrument, immediately after a full calibration at the U.P. Calibration Baseline or the South Superhighway Baseline and other Regional established baseline, small check base should be established in the project area by the project chief. Two stations, approximately 300-400 meters apart, should be located and pegged with an intervening station at a commonly measured distance. A test over this check base prior to the start of work may suffice to give confidence in the instrument or indicate the need for further checks. The field notes of this test shall form part of the survey returns.

Section 20 - The EDM instrument shall be used at both ends of a line to measure a primary and secondary control distances in the forward and reversed directions. It shall be calibrated over the established baseline by the Lands Management Bureau before and after its use in a project control.

Same requirements and procedures from EDM shall also be applied to the total station instrument.

STEEL, INVAR OR LOVAR, AND OTHER TAPES

Section 21- The measurement of distances shall be made with invar, lovar or steel tapes graduated in the metric system. The true length of these shall be determined by comparison with the standard and tested at the calibration baseline. Other tapes such as Fiberglass, phosphor bronze or nylon-coated steel tape may be used as accessories but must be limited to locating details in topographic survey, locating corners from an established control station or checking distances of witness points and in survey which need not be approved for land registration.

Section 22 - Broken tapes which have been repaired (3) times or less may be used only in lot surveys of tertiary precision. However, tests shall be made to determine the correction to be applied to the measurements. If the correction to be applied is greater than one in ten thousandths (1:10,000) of the tape length, the said tape shall not be used for survey of lands for registration or related purposes. Likewise, tapes that have been repaired more than three (3) times shall not be used for survey of lands for registration or related purposes.

Section 23 - The temperature of thirty-two (32) degrees Celsius shall be adopted as the standard temperature at which each tape shall be of standard length with a tension of ten (10) kilograms when supported horizontally throughout its entire length.

Section 24 - Only steel tapes which are of standard length at temperatures between twenty-seven (27) degrees Celsius and thirty-seven (37) degrees Celsius; may be approved for use in primary, secondary, and tertiary surveys.

Section 25 - All temperature measurements shall be in the Celsius system.

Section 26 - No correction for temperature shall be required for tapes of standard length at temperature ranging from twenty-seven to thirty seven degrees Celsius when used in tertiary surveys and in locating corners from traverse stations.

Section 27 - The coefficient of stretch, standard temperature and unit weight of tape shall be stated in the certificates of examination and approval.

EXAMINATION, TEST, CERTIFICATION, AND RECORDS

Section 28 - The appropriate instrument shall be used in performing a survey. Such equipment must be capable of achieving the standards of accuracy prescribed for each kind of survey as stated in Sections 54, 55 and 116.

Section 29 - To ensure accuracy of angular and linear measurements, surveying instruments used in the survey of lands especially surveys for registration purposes shall be examined, calibrated, standardized, and approved by the Lands Management Bureau.

Section 30 - Surveys made with instruments which have not been examined and approved shall not be accepted for verification and approval.

Section 31 - The original certificate for each instrument approved for use in property surveys, stating its technical data and condition at the time of examination shall be issued by the Land Management Bureau. Subsequent examination and certification, except for GPS receivers, Theodolites, EDMs and other sophisticated instruments, may be done in the Lands Management Services. If subsequent examination proves that the instrument is no longer fit for use in property surveys, the certificate shall be cancelled. A copy of the renewed certificate or letter of cancellation issued by the Lands Management Services shall be furnished to the Lands Management Bureau (LOC No. 80 and 80-1, S-1983).

Section 32 - The Lands Management Bureau shall keep an up-to-date record of the instruments examined. The Lands Management Services shall likewise keep a record of all re-inspected instruments in the region.

Section 33 - Individuals, corporations, or associations engaged in the importation, purchase, sale, repair, or adjustment, etc., of surveying instruments shall submit their instruments to the Lands Management Bureau for examination, test, certification and record shall before the sale.

Section 34 - A certificate for the use of : (1) transits and theodolites shall be valid for a period of five (5) years; and (2) tapes for two (2) years from the date of last examination and certification. A new certificate shall be issued after the physical re-examination of the instrument when the instrument is found fit for use in property surveys. A certificate is deemed cancelled upon its expiry date and Section 30 shall apply.

Section 35 - The fees that shall be charged for the examination, calibration, certification of each instrument and the re-issuance of true copy of certificate thereof shall be as prescribed by DENR from time to time.

OTHER INSTRUMENTS

Section 36 - Thermometers, barometers, chronometers and other instruments used in property surveys shall be frequently tested and compared with established standards.

Section 37 - LMB shall test and calibrate GPS receivers at stations designated by NAMRIA. The results shall form part of the survey returns for verification and approval.

CHAPTER III - POSITION OF SURVEYS

POINTS OF REFERENCE

Section 38 - Land surveys shall be fixed in position on the surface of the earth by monuments of permanent nature and by azimuths and distances to "points of reference" of known geographic positions. The geographic positions shall be in the Philippine Plane Coordinate System - Transverse Mercator/Philippine Reference System 1992 (PPCS-TM/PRS-92). These points of reference shall be as follows:

a) Bureau of Lands Location Monuments (BLLM);

b) Political Boundary Monuments:

1) Provincial Boundary Monument (PBM) and City Boundary Monuments (CBM),

2) Municipal Boundary Monuments (MBM),

3) Barangay Boundary Monuments (BBM);

c) Triangulation stations established by the:

1) Bureau of Lands

2) Bureau of Coast and Geodetic Survey

3) United States Army Corps of Engineers

4) Other organizations, the work of which is of acknowledged standard

d) Primary stations of cadastral surveys;

e. Church towers, historical monuments and other prominent permanent structures of known PRS 92 geographic or grid coordinates;

f. Stations established by Global Positioning Systems, Doppler, Hiran, and Loran, and other similar stations of at least third order accuracy and in the PPCS-TM/PRS-92.

Section 39 - The Lands Management Bureau/Services shall establish at least one pair of standard location monuments to be designated as BLLM No. 1 and BLLM No. 2 in each city and municipality of the Philippines.

Section 40 - Additional location monuments shall be established along the controls of projects. These monuments shall be by pairs with an average interval of five or six kilometers. These shall be designated and numbered as BLLM No. 3 and BLLM No. 4, BLLM No. 5 and BLLM No. 6, and so forth. However, the pair of location monuments shall be established as near as possible to the center of the Barangay.

GEOGRAPHIC POSITION

Section 41 - The complete geographic position of points of reference shall be expressed in latitude, longitude and elevation.

Section 42 - The geographic position of points of reference shall be referred to the standard datum of the Philippines and shall be classified into four categories, namely:

a) First Order
b) Second Order
c) Third Order
d) Fourth Order

Section 43 - The geographic position of the control points shall be derived from the adopted coordinates of previously established stations as referred to the standard datum by a network of triangulation, trilateration, traverse, leveling, GPS, or by any other method of recognized standard.

Section 44 - The standard datum for the Philippines shall be defined by the geographic coordinates of the triangulation station of the Coast and Geodetic Surveys, known as "Balanacan" which are:

Latitude	= N 13 deg. 33 min. 41.000 sec.
Longitude	= E 121 deg. 52 min. 03.000 sec.
Geoid/spheroid separation	= 0.34 meters

The azimuth from triangulation station "Balanacan" to triangulation station "Baltazar" is 9° 12' 37.000" and the distance is 37,680.90 meters. The back azimuth is 189° 11' 50.60".

The description of the triangulation station, Balanacan, is as follows:

Balanacan (Marinduque Province, O. W. Ferguson, 1906, 1907). On the highest hill at the northwest point of Marinduque Island. Salvaria Island in the entrance to Looc Bay bears N. 9° E., distance 3 kilometers, and the highest point to the western one of the two San Andres Islands bears S. 80° E., distance 3 kilometers. It is on the northwest end of the hill, 10 meters northwest of the highest point, and is in a commanding situation, seeing a hundred miles of the south coast of Luzon, much of the north and west coasts of Marinduque, the coast of Mindoro and other islands.

Station mark is the center of a hole 1.5 centimeters in diameter and 6 centimeters deep, drilled at the center of a triangle 16 centimeters on a side, cut in a hard rock. Reference mark is on a hard, white boulder of about one cubic meter in volume, standing 80 centimeters above the ground and 90 centimeters higher than the station. The mark is a hole 1.5 centimeters in diameter and 8 centimeters deep, at the center of a cross cut on top of this stone. From the station, the reference mark is in azimuth 326° 34' and is distant 18.85 meters.

Section 45 - The mean sea level obtained from the tidal observations of the Coast and Geodetic Survey Department/NAMRIA shall be used as vertical datum of bench marks. The elevation of these bench marks shall be used in leveling other points or bench marks.

Section 46 - In topographic or any other surveys where elevations are necessary, the said elevations shall be referred either to an assumed or a local mean sea level, when there are no established bench marks.

PHILIPPINE REFERENCE SYSTEM OF 1992

Section 47 - The Philippine Reference System of 1992 (PRS-92) is the new reference system for all surveys and maps in the country pursuant to Executive Order Number 45 dated 5 January 1992. It is also known as the Philippine Plane Coordinate System-Transverse Mercator/Philippine Reference System of 1992 (PPCS-TM/PRS-92) to distinguish it from the PPCS of 1965. A transition period up to the year 2000 is allowed in order to integrate existing surveys into the system after which the PRS-92 shall be recognized as the sole reference.

Section 48 - The PRS-92 is based from the Luzon Datum with origin at station Balanacan in Marinduque, Luzon Datum as defined in Section 44.

Section 49 - Geodetic control surveys shall be established in the system of PRS-92 by GPS or by conventional surveying methods using duly registered instruments.

Section 50 - Positions read out direct from the GPS Receivers are referred to World Geodetic System 1984 (WGS-84). As such the geographic coordinates are geocentered, earth fixed coordinate system defined by the Global Positioning System (GPS) satellite ephemerides.

The geocentric cartesian coordinates must be transformed to cartesian coordinates on the Luzon Datum with the following parameters:

Translation	:	ΔX	=	127.62195 meters
		ΔY	=	67.24478 meters
		ΔZ	=	47.04305 meters
Rotation	:	Rot X	=	-3.06762 secs
		Rot Y	=	+4.90291 secs
		Rot Z	=	+1.57790 secs
Scale Parameter			=	1.06002

PRS-92 Spheroid - Clark Spheroid of 1866.
The signs are reversed when transforming from Luzon Datum to World Geodetic System 1984 (WGS 84). The general transformation formula that relates the two sets of coordinates is as follows:

$$\begin{pmatrix} X_2 \\ Y_2 \\ Z_2 \end{pmatrix} = \begin{pmatrix} \Delta X \\ \Delta Y \\ \Delta Z \end{pmatrix} + (1+Sc*10^{-6}) \begin{pmatrix} 1 & R_z & -R_y \\ -R_z & 1 & R_x \\ R_y & -R_x & 1 \end{pmatrix} \begin{pmatrix} X_1 \\ Y_1 \\ Z_1 \end{pmatrix}$$

where:

X_2, Y_2, Z_2	are the transformed cartesian coordinates
$\Delta X, \Delta Y, \Delta Z$	are the shifts for the change in origin
R_x, R_y, R_z	are the rotations of each axis
Sc	is the scale change in parts per million
X_1, Y_1, Z_1	are the coordinates to be transformed.

Section 51 - Observation Requirements for GPS Surveys shall be as follows:

Order	1	2	3	4
Min observation period in minutes	60	30	15	15
Independent occupations per station				
at least three(% of total stations)(b)	20%	10%	-	-
at least two (% of total stations(b)	50%	30%	30%	-

Common satellites observed simultaneously				
Min. number	4	3*	3*	3*
Min. Period in minutes	30	15	15	15
Min. number of quadrants with satellite observations	3	3	3	2
GDOP value to be achieved during an observing period (c)	5	6	7	10
Max period between meteorological observations in minutes (d)	60	Optional	Optional	Optional
Min crystal frequency standard warm-up period hours	(e)	(e)	(e)	(e)
Min elevation of satellite in degrees	10	5	5	5

* Provided a precise ellipsoid height is known for each station and/or an atomic frequency standard is used to constrain the solution.

Those in parenthesis mean:

(a) Independent occupations per station may be back to back, but the antenna must be re- setup for each occupation. Antenna heights are to be changed by at least 0.5 m. The full specified minimum observation period must be observed with each occupation.

(b) For 1st ORDER Network;

(I) 20% of stations are to be occupied at least three times;

(II) 50% of stations are to be occupied at least twice.

(c) Geometric Dilution of Precision (GDOP) is an indicator of the geometrical strength of a four or more satellite constellation as it applies to instantaneous point position fixing. The lower the number, the better the geometry for achieving an accurate point position.

Caution should be used in applying this parameter as an absolute acceptance/rejection criterion. This is particular in relative GPS positioning where longer observation periods largely remove common biases.

Rapidly changing GDOP during a recording session assists in the determination of ambiguities. Therefore it is desirable to incorporate at least one such period in an observing session.

Ideal constellations, in addition to exhibiting rapidly changing GDOP is less than or equal to those values detailed in the above Table.

(d) Observations of temperature and relative humidity should be collected at or near the location of the phase centre of the antenna. Observations of wet-bulb and dry-bulb temperature readings should be recorded to the nearest 0.5 c. The relative humidity should be measured to the nearest 2%. Barometric readings at the station site should be recorded to the nearest millibar and corrected for any significant difference in height between the antenna phase centre and location of the barometer. The meteorological instruments should be brought and compared against a standard at least once a month. The logs should include the name of manufacturer, model, and serial numbers of instruments used.

(e) The amount of warm-up time required is instrument dependent. It is very important to follow the manufacturers specification.

(f) Elevations may be reduced if suitable models for tropospheric refraction are used in the data reduction.

Section 52 - For land surveys the **Relative Positioning Technique** is advisable to be used. With this technique, positions can be determined with respect to another point, taking one point as the origin of a local coordinate system. Relative positioning may be **Static or Kinematic**. Static refers to the positioning of stationary object while kinematics is the positioning of a moving object.

Section 53 - In the establishment of geodetic networks, connections must always be made to a network that is higher in accuracy than the one to be established.

Section 54 - To integrate all surveys to the PRS-92, all subsequent interconnections must be surveyed at the following geometric relative positioning accuracy standards:

Positional Accuracy

1st Order	-	10 parts per million	-	1/100000	- 1 cm per km
2nd Order	-	20 parts per million	-	1/50000	- 2 cm per km
3rd Order	-	50 parts per million	-	1/20000	- 5 cm per km
4th Order	-	100 parts per million	-	1/10000	- 10 cm per km

Vertical Accuracy

2nd Order - 8.4 mm times square root of the distance
3rd Order - 12.0 mm times square root of the distance

Section 55 - The accuracy of the following surveys or connection surveys to PRS-92 shall be in accordance with the orders in the preceding section.

(a) Densification of the 1st Order PRS-92 National Network shall be in 2nd and 3rd Order accuracy.

(b) Project controls of cadastral projects shall be at least in 3rd Order accuracy.

(c) Political boundary surveys shall be at least in 3rd Order accuracy.

(d) Delimitation surveys of Integrated Social Forestry Projects; mineral land surveys; relocation or delimitation of national parks and other protected areas, reservations, classified forests including buffer zones; delimitation of ancestral claims shall be in 4th Order accuracy.

(e) Ground control surveys for topographic and hydrographic activities shall be in 4th Order accuracy.

Section 56 - New GPS Stations in PRS-92 may be established by government agencies and accredited geodetic engineering professionals with capabilities in GPS surveying; provided their receivers are duly registered with NAMRIA or LMB.

Section 57- The GPS Station in PRS-92 shall be monumented with subsurface marking and reference point numbering of the 1st, 2nd and 3rd Order accuracy. It shall follow those established by CGSD/NAMRIA in setting up the PRS-92. CGSD/NAMRIA should be consulted as to what number shall be used.

The Lands Management Bureau and/or Lands Management Services and the CGSD/NAMRIA may design their own set of numbering for new stations of lower accuracy. The RTD for Lands shall forward, through the Lands Management Bureau, whatever system they adopt to CGSD/NAMRIA for completion of the central data bank.

Section 58 - Geodetic Engineers in the government and private sectors who established GPS Station which form part of the national geodetic network, shall submit to CGSD/NAMRIA the GPS Survey Pre/Post requirements for evaluation of the design and survey results using GPS Receivers. This shall contain the following:

a) Type of GPS Receivers (Brand/Model);

b) Technique/survey practices to be utilized in the survey;

c) Reduction techniques and computer programs for adjustment;

d) Network design;

e) Results of a minimally constrained least squares network adjustment computed on the ellipsoid associated with the datum on which the observations were acquired;

f) Number of existing horizontal control points to be occupied;

g) Time per occupation as a function of satellite geometry;

h) Number of occupation per site;

i) Number of repeated baselines;

j) Cut off elevation;

k) Antenna set-up specifications;

l) Number of receivers; and

m) Ephemeris source and age.

GPS receivers that will be used in land surveys, survey controls and establishment of Political boundary shall be submitted to the LMB for certification based on the aforementioned requirements.

Section 59 - The connection survey returns of the reference points monumented in Section 38 using conventional instruments such as Theodolite, EDM and/or total stations shall be submitted to Lands Management Services for verification and approval before its integration to PRS -92. A copy of these approved data shall be sent to the Lands Management Bureau and CGSD/NAMRIA for incorporation into the National Geodetic Data Bank.

PHILIPPINE PLANE COORDINATES SYSTEM AND THE PHILIPPINE REFERENCE SYSTEM OF 1992

Section 60 - Philippine Plane Coordinate System (PPCS), also known as Philippine Transverse Mercator Grid (PTM), are transformed cartesian coordinates on the Luzon Datum from geographic coordinates determined through astronomical observations. PPCS-TM was adopted in 1965 as the reference system in the Philippines. Prior to the adoption of PRS92, the geographic coordinates of the points of references enumerated in Section 38 are transformed into the Philippine Transverse Mercator Grid System. The transformed coordinates are simply referred to as PPCS-TM Grid. The geocentered geographic coordinates of a reference point defined by the Global Positioning System (GPS) Satellite ephemerides which are referred to WGS 84 Satellite Datum are transformed to geocentered cartesian coordinates. This is then transformed to cartesian coordinates on the Luzon Datum (PRS-92) using the transformation formula and parameters in Section 50 before its transformation to geographical PRS-92 coordinates. The transformed cartesian coordinates on the PRS92 Luzon Datum is referred to in the survey returns as PPCS-TM/PRS-92.

Section 61 - The characteristics of the Philippine Plane Coordinate System are:

1. Spheroid : Clarke's Spheroid of 1866
2. Projection : Transverse Mercator, in zones of two degrees net width
3. Point of Origin : Intersection of the Equator and the Central Meridian of each zone, with Northing of 0 meter and an Easting of 500,000 meters
4. Scale factor at the Central Meridian : 0.99995
5. Zonification :

Zone No.	Central Meridian	Extent of Zone
I	117°	116° 00' to 118° 30'
II	119°	117° 30' to 120° 30'
III	121°	119° 30' to 122° 30'
IV	123°	121° 30' to 124° 30'
V	125°	123° 30' to 127° 00'

Section 62 - The geographic coordinates of PRS-92 can be converted to PPCS-TM/PRS-92 Grid Coordinates and vice versa using the following formulas:

From Geographic to Grid

$$N = (I) + (II)P^2 + (III)P^4$$

$$E = (IV)P + (V)P^3 + (VI)P^5 + 500{,}000$$

$$P = .0001\,(\Delta\lambda'')$$

From Grid to Geographic

$$\phi = \phi' - (VII)q^2 + (VIII)q^4$$

$$\lambda = (IX)q - (X)q^3 + (XI)q^5 + \lambda_{CM}$$

$$q = 0.000001(E-500{,}000)$$

Section 63 - In converting the PRS 92 geographic coordinates to PPCS-TM/PRS 92 grid coordinates and vice versa, the transformation formulas in Section 62 and the procedures as contained in DNR/Bureau of Lands (now DENR/LMB) Technical Bulletin Number 26 (Philippine Transverse Mercator Grid Tables) shall be used.

Section 64 - All computations, maps and plans of cadastral surveys, public land subdivisions and group settlement surveys and other kinds of surveys shall be prepared using the PPCS-TM/PRS 92. This shall be submitted to the Lands Management Services for verification and approval.

Section 65 - The assignment of provinces into the map projection zones of the PPCS-TM/PRS 92 shall be as follows:

a. Cordillera Administrative Region (CAR)	
1) Abra	Zone No. III
2) Benguet	-do-
3) Ifugao	-do-
4) Mountain Province(Bontoc)	-do-
5) Kalinga	-do-
6) Apayao	-do-

b.	National Capital Region (NCR)	
	1) Metro Manila	Zone No. III
c.	Region No. I	Northwestern Luzon
	1) Ilocos Norte	Zone No. III
	2) Ilocos Sur	-do-
	3) La Union	-do-
	4) Pangasinan	-do-
d.	Region No. II	Northeastern Luzon
	1) Batanes	Zone No. III
	2) Cagayan	-do-
	3) Isabela	-do-
	a. Municipalities West of 122° E.	Longitude - Zone III
	b. Municipalities East of 122° E	Longitude - Zone IV
	4) Nueva Viscaya	Zone No. III
	5) Quirino	-do-
e.	Region No. III	Central Luzon
	1) Bataan	Zone No. III
	2) Bulacan	-do-
	3) Nueva Ecija	-do-
	4) Pampanga	-do-
	5) Tarlac	-do-
	6) Zambales	-do-
f.	Region No. IV	Southern Tagalog
	1) Aurora	Zone No. III
	2) Batangas	-do-
	3) Cavite	-do-
	4) Laguna	-do-
	5) Marinduque	-do-
	6) Occidental Mindoro	-do-
	7) Oriental Mindoro	-do-
	8) Palawan	Zone 1(a)
	* Central Meridian	118° 30' E
	9) Quezon	
	a. Municipalities East of 122° E. Longitude	Zone No. IV
	b. Municipalities West of 122° E. Longitude	Zone No. III
	c. Polillo Islands	Zone No. III
	10) Rizal	Zone No. III
	11) Romblon	Zone No. IV

g.	Region No. V	Bicol
	1) Albay	Zone No. IV
	2) Camarines Norte	-do-
	3) Camarines Sur	-do-
	4) Catanduanes	-do-
	5) Masbate	-do-
	6) Sorsogon	-do-
h.	Region No. VI	Western Visayas
	1) Aklan	Zone No. IV
	2) Antique	-do-
	3) Capiz	-do-
	4) Iloilo	-do-
	5) Negros Occidental	-do-
	6) Guimaras	-do-
i.	Region No. VII	Central Visayas
	1) Bohol	Zone No. V
	2) Cebu	Zone No. IV
	a. Camotes Island	Zone No. V
	3) Negros Oriental	Zone No. IV
	4) Siquijor	-do-
j.	Region No. VIII	Eastern Visayas
	1) Eastern Samar	Zone No. V
	2) Leyte	-do-
	3) Northern Samar	-do-
	4) Samar (Western Samar	-do-
	5) Southern Leyte	-do-
	6) Biliran	-do-
k.	Region No. IX	Western Mindanao
	1) Basilan	Zone No. IV
	2) Zamboanga del Sur	Zone No. IV
	3) Zamboanga del Norte	-do-
l.	Region No. X	Northern Mindanao
	1) Bukidnon	Zone No. V
	2) Camiguin	-do-
	3) Misamis Occidental	Zone No. IV
	4) Misamis Oriental	Zone No. V
m.	Region No. XI	Southern Mindanao
	1) Davao del Norte	Zone No. V
	2) Davao del Sur	-do-
	3) Davao Oriental	-do-

	4) South Cotabato	-do-
	5) Sarangani	-do-
n.	Region No. XII	Central Mindanao
	1) Lanao del Norte	Zone No. V
	2) North Cotabato	-do-
	3) Sultan Kudarat	-do-
o.	Region No. XIII	
	1) Agusan del Norte	Zone No. V
	2) Agusan del Sur	-do-
	3) Surigao del Norte	-do-
	4) Surigao del Sur	-do-
p.	Autonomous Region of Muslim Mindanao (ARMM)	
	1) Lanao del Sur	Zone No. V
	2) Maguindanao	-do-
	3) Tawi-Tawi	Zone No. III *
	4) Sulu	Zone No. III
	(* Zones are revised)	

Section 66 - The transformation of geographic to grid coordinates and vice-versa, the determination of the convergence between the local and central meridians, and the determination of the scale factor at any station, shall be referred to DNR/BL (now DENR/LMB) Technical Bulletin Number 26.

Section 67 - The Coast and Geodetic Surveys Department of NAMRIA and the Lands Management Bureau shall publish the Philippine Reference System of 1992 (PRS-92), geographic and grid coordinates and descriptions of the established points of reference in the cities and municipalities of the Philippines.

Section 68 - In all land surveys, the position of BLLM No. 1 of each municipality or city as referred to the national datum shall have its corresponding coordinates in the Philippine Reference System of 1992 (PRS-92). All other location monuments, triangulation stations, etc., situated within the jurisdiction of the municipality or city shall have their coordinates in the PRS-92.

Section 69 - In the case of islands, which form part of the municipality, the location monument which is most centrally and conveniently located in the island shall be referred to the Central Meridian of the province.

ASTRONOMICAL OBSERVATIONS

Section 70 - Astronomical observations for time, latitude, longitude and azimuth shall be made whenever necessary to determine the following:

a) The error in the time shown by watches or chronometers.

b) The latitude and longitude of points of reference which have not been connected to other points of known geographic coordinates.

c) The azimuths of lines of survey.

d) A check for the geographic position.

Section 71 - Astronomical observations shall be made on either the sun or the stars, as the geodetic engineer may prefer, using the procedures as prescribed in this Manual. However, the azimuth between BLLM Nos. 1 to 2 shall be obtained through stellar observations if there is no direct connection made to established geodetic control lines.

Section 72 - All observed altitudes of the sun shall be corrected for index error, refraction and parallax in the order given. Only corrections for index error and refraction shall be applied to observed altitudes of the star.

Section 73 - The altitude of the sun's center shall be determined by observing its lower or upper limb and correcting the vertical angle observed. The correction shall be done by adding or subtracting its angular semi-diameter or by centering the sun's disc in the solar circle or square which shall be taken first with the telescope direct, then twice with the telescope reversed and finally with the telescope direct.

Section 74 - In solar observations and computations of declination of the sun, the standard time (120° EMT) shall be determined by:

a) Observing for the local apparent time, converting it into mean time and finally reducing to standard time.

b) Comparing watch time with the official standard time signals.

Section 75 - When making solar observations the following shall be observed:

a) The index error of the vertical circle shall be determined by direct and reversed sighting at a fixed point. The average of at least ten direct and ten reversed readings on as many points of different elevations shall be used for determining the index error. The observed vertical angles shall be corrected by the amount of the index error. The value of the index correction shall be entered with the data for each solar observation.

b) Observations shall be taken when the altitude is not less than twenty degrees.

Section 76 - If the direct and reversed readings of the vertical angles to a point, corrected for index error, differ by more than thirty seconds of arc, the instrument shall be tested and adjusted accordingly.

TIME

Section 77 - For the purpose of determining the hour angle of the sun's center or the hour angle of the vernal equinox at any instant, observations for time shall be made to find the error of a timepiece.

Section 78 - Observations on celestial bodies shall be made when the observed body is on the prime vertical. If this is not possible, observations can be made along the meridian but this should be limited.

Section 79 - Any of the following methods for determining the time shall be followed:

a) Time by transit of the sun;

b) Time by transit of a star;

c) Time by an altitude of the sun at any hour angle;

d) Time by an altitude of a star at any hour angle;

(e) Time by equal altitudes of a star.

Section 80 - The official or standard time to be used in astronomical observation shall be the mean time corresponding to the one hundred twentieth degree (120°) meridian east of Greenwich.

Section 81 - Geodetic engineers shall use accurate watches or chronometers for astronomical observations.

Section 82 - The accuracy of the times kept by a watch or chronometer shall be verified by comparison with standard chronometers or by observations for local mean time. This is to determine the correction to be applied to the time indicated by the watch or chronometer.

Section 83 - Local mean time shall be determined by altitude observations on the sun or stars at the moment of meridian passage or at any hour angle.

Section 84 - When local mean time is determined by altitude of the sun before or after meridian passage the procedure outlined in Section 104 for determining azimuth shall be followed.

Section 85 - Any formula for determining the hour angle may be used, but the following tangent formula shall be adopted from altitude observation for time:

$$\text{Tangent } 1/2\ T = \sqrt{\cos S \sec(S-P) \sin(S-H) \csc(S-L)}$$

where : $S = 1/2\ (P+H+L)$

T = Hour angle of the observed celestial body

H = Observed altitude of the celestial body, corrected for refraction in case of stars and parallax and refraction in the case of the sun.

L = Latitude of the place of observation

P = North polar distance of the celestial body

Separate computation shall be made for each set of observations with the telescope in the direct and the reversed positions as provided in Sections 103 and 104.

Section 86 - The time obtained by observations on the sun is local apparent time which shall be transformed into local mean time. Equation of time is equal to apparent time minus local mean time.

Section 87 - The time obtained by observations on the star is local sidereal time which shall be transformed into local mean time.

Section 88 - At least two complete sets of observations shall be made. The average shall be transformed into local mean time. The data obtained for determining time may be used also for determining the azimuth of line.

LATITUDE

Section 89 - Observations for latitude shall be made whenever the latitude of the station occupied is not known from previous observations or from connection to a point of reference of known latitude.

Section 90 - Of the various methods for determining latitude, the following may be used with the transit or Theodolite:

a) By a circumpolar star at culmination

b) By meridian altitude of a southern star

c) By circum-meridian altitudes

d) By altitude of Polaris at any hour angle

e) By altitude of Sun at noon

Section 91 - The highest recorded altitude of the sun when corrected for refraction, index error, semi-diameter and parallax may be accepted and used for determining the latitude.

Section 92 - Observations on the sun shall consist of a series of not less than 8 altitude observations alternately with the transit in the direct and the reversed positions. Half of the series shall be made before the time of the meridian passage and the other half after the time of meridian passage.

Section 93 - When more accurate results are desired, the latitude shall be determined by observations of Polaris at culmination. The average of the reduced altitudes shall be accepted and used for determining latitude.

Section 94 - When a latitude is determined by Polaris or any circumpolar star at any hour angle, these procedures shall be followed:

a) Set and level the instrument over the point.

b) By means of the upper motion take several altitude observations on Polaris in the direct and reversed positions.

c) Take note of the time at each pointing of the star.

d) Apply index correction to the observed altitude when necessary and then take the mean of the altitudes and the mean of the times and treat the results as a single observation.

e) Compute the hour angle of the star.

f) Compute the latitude (f) using the formula:

$$\text{Lat} = h - p \cos t + 1/2\, p^2 \sin^2 t \tan h \sin 1''$$

where : h = corrected mean observed altitude

t = hour angle of Polaris or any circumpolar star (difference between sidereal time and the star's right ascension)

p = polar distance in seconds of Polaris or any circumpolar star.

Section 95 - In all land surveys, the latitude shall be determined by a control connection with points of reference of known geographic positions.

Section 96 - Latitude determination by observations on the star or the sun at meridian passage shall be made using the following formula:

For the star's and the sun's center south of the Zenith but north of the equator:

$$L = Z + D$$

and for those south of the zenith and south of the equator:

$$L = Z - D$$

In those north of Zenith and north of the equator

$$L = D - Z$$

where : L = Latitude of observer

Z = Zenith distance of celestial body

D = Declination

Section 97 - The latitude used in the computations for azimuth shall be derived from the latitude as determined by the position computation.

Section 98 - If the above method is not feasible, the latitude shall be determined by astronomical observations.

LONGITUDE

Section 99 - Longitude shall be determined by means of control starting from reference points of known geographic positions. Other methods for determining longitude shall be used as follows:

a) Longitude by transportation of a timepiece.
b) Longitude by transit of the moon.
c) Longitude by the time signals.
d) Laplace observation method.

ELEVATION

Section 100 - Elevations may be determined by lines of levels starting from bench marks of known elevations, by trigonometric leveling, spirit leveling or by means of the barometer.

AZIMUTH

Section 101 - The azimuths of all lines of survey lines shall be reckoned from the south as the zero direction following clockwise of the quadrants. This shall be carried from the astronomical azimuth of one or more lines of the survey.

Section 102 - The astronomical azimuth of a line shall be determined by observations on the sun or stars. It shall consist of at least one to eight series of observations as required using an instrument tested beforehand.

Section 103 - Each series shall consist of two sets of observations. One set shall consist of the mean of observed readings with the telescope in the direct and reversed positions.

Section 104 - In solar observations for azimuth using the vertical and horizontal cross wires, the cross wires shall be made tangent to the left and lower, right and upper, right and lower, or left and upper limbs of the sun, as the case maybe. The procedures to be followed are:

1) Set up the instrument over the station and level the instrument.

2) Set the vernier plate or micrometer reading to 00°00'00" and sight the rearward station, the azimuth of which is to be determined using the lower motion and lower tangent screw.

3) Screw the colored prismatic glass to the eyepiece and using the upper motion and upper tangent screw turn the telescope toward the sun.

4) Observe the sun in accordance with the following tangent positions and record the time, vertical angle or zenith distance and horizontal angle for each sighting as shown by the following example:

Set	Telescope Position	Time	Horizontal Circle Reading.	Zenith Angle
I	(1) D	8:34:10	69-56-03	50-58-39
	(2)	8:34:39	70-41-18	50-20-20
	(3) R	8:35:36	250-47-55	309-22-44
	(4)	8:36:19	250-11-41	310-04-00
II	(5) R	8:36:48	250-15-26	309-38-47
	(6)	8:37:18	251-01-00	310-17-35
II	(7) D	8:38:25	71-10-11	50-00-35
	(8)	8:38:57	70-32-36	49-20-43

(1)	Telescope direct	(5)	Telescope reverse
(2)	Telescope direct	(6)	Telescope reverse
(3)	Telescope reverse	(7)	Telescope direct
(4)	Telescope reverse	(8)	Telescope direct

5) After the eight sightings, turn the telescope to the rearward station using the upper motion then read and record the horizontal angle. The time interval between successive sightings shall in no case exceed two minutes. The eight sightings constitute one series of observation and shall be completed within twenty minutes otherwise the results shall be voided and another series shall be made.

6) The allowable horizontal angle of closure shall be within +/- 30 seconds of arc and must be distributed equally among the horizontal angle readings.

7) After the observations have been completed, test the accuracy of the observations by determining the rate of motion of the sun. This is to detect any mistake in the observations and to be able to make additional series as required.

The test for solar variation shall be made by horizontal and vertical variation methods as follows.

a) To find the variation in horizontal angle divide the difference in horizontal angle readings by the corresponding difference in time. Combinations are from any two horizontal readings from the left-side of the telescope vertical cross-hairs or any two readings from the right-side of the vertical cross-hairs.

$$HVar = \frac{(Hn - Hm)}{(Tn - Tm)}$$

(1)	(4-1)	(5)	(8-4)	(9)	(7-2)
(2)	(5-1)	(6)	(8-5)	(10)	(6-3)
(3)	(8-1)	(7)	(3-2)	(11)	(7-3)
(4)	(5-4)	(8)	(6-2	(12)	(7-6)

b) To find the variation in vertical angle divide the difference in vertical angle readings by the corresponding difference in time. Combinations are from any two vertical readings from the upper-side of the telescope horizontal cross-hair or any two readings from the lower-side of the horizontal cross-hair.

$$Vvar = \frac{(Vn - Vm)}{(Tn - Tm)}$$

(1)	(3-1)	(5)	(7-3)	(9)	(8-2)
(2)	(5-1)	(6)	(7-5)	(10)	(6-4)
(3)	(7-1)	(7)	(4-2)	(11)	(8-4)
(4)	(5-3)	(8)	(6-2)	(12)	(8-6)

In both cases, the results should not differ from the mean variation by more than two seconds of arc per second of time. Other combinations using the mean of a direct and reverse positions shall be used to determine the variation.

Additional safeguard against mistakes in observations shall be determined by noting that the average apparent angular diameter of the sun is about thirty two minutes of arc in the vertical and thirty-two minutes of arc divided by secant of altitude in the horizontal.

Section 105 - In case of stellar observations, the star shall be centered as closely as possible at the intersection of the crosswires. The accuracy of the observations shall be tested by comparing the rate of motion of the stars in the horizontal and vertical angles.

Section 106 - For observations on circumpolar stars for azimuth at elongation, the following formulas for determining the hour angle and azimuth of a star shall be used:

$$\cos t = \tan L \cot D$$

$$\sin Z = \sin P \sec L$$

where : t = hour angle of star at western elongation

and $t = 24 - t$ at eastern elongation

L = latitude of place

D = declination of star

P = north polar distance of star

Z = angle of star reckoned from the north

The time shall be determined from the following formulas:

$$S = \alpha_s + t_s$$

$$S = (\alpha_{sun} + 12^h) + T$$

where: S = sidereal time

α_s = right ascension of star

T = local civil time

ts = hour angle of star

α_{sun} = right ascension of sun (n)

Section 107 - The procedure for observing stars for azimuth at elongation shall be as follows:

1) Find the sidereal time of elongation:

   a) Compute the hour angle (t) of the star of elongation ($\cos t = \tan L \cot D$).

   b) Add the hour angle for western or eastern elongation to the right ascension of the star to get sidereal time.

2) Find the local civil time at the same instant.

   a) Determine the $(\alpha_{sun} + 12^h)$ corrected for longitude

   b) Subtract the result of (a) from the sidereal time determined in step (1). The result is sidereal interval which shall be converted to local civil time by the application of correction from sidereal into mean solar time.

   c) The result shall be corrected for longitude difference to reduce to 120° E time.

3) Set the instrument over the station in position at least thirty minutes before the time of elongation.

4) Set the micrometer (vernier) reading to approximately 00°00'00" and sight the azimuth mark.

5) About five minutes before elongation bisect the star with the cross wires and follow it as it moves toward elongation using the tangent screw.

6) At elongation, read and record the horizontal angle and time.

7) Reverse the telescope, bisect the star again and read and record horizontal angle and time.

8) Return the telescope to the azimuth mark and check the closing reading.

Section 108 - In all azimuth observations, points occupied and observed shall always be stations of the survey controls.

Section 109 - The following formula shall be used for determining azimuth of a line by observations on the sun or stars at any hour angle:

$$\cot 1/2\ A = \sqrt{\sec S \sec (S-P) \sin (S-H) \sin (S-L)}$$

The result shall be checked using the formula:

$$\cos A = \tan H \tan L - \cos P \sec H \sec L$$

In both formulas:

A = angle between the celestial body and the south

H = observed altitude of the celestial body corrected for refraction in case of stars and for parallax and refraction in the case of the sun

L = Latitude of the place of observation

P = north polar distance of the observed celestial body.

S = 1/2 (P + H + L)

P is (90-D) when the declination is north and (90+D) when the declination is south.

In the morning the azimuth of sun is 360° minus A and in the afternoon, the azimuth of sun is A. If the station mark is to the left of the sun, the horizontal angle is to be subtracted from the azimuth of the observed celestial body; if to the right it is to be added.

CHAPTER IV - GEODETIC AND PROJECT CONTROL SURVEYS

CLASSES OF CONTROL SURVEYS

Section 110 - There shall be two classes of control surveys; namely, geodetic and project control surveys.

Section 111 - The basis of classification of geodetic and project control surveys shall in general be the accuracy with which the length and azimuth of a line of the triangulation, traverse or trilateration is determined.

GEODETIC CONTROL SURVEYS

Section 112 - Geodetic control surveys shall consist of triangulation, traverse, trilateration and any combination thereof, which together with leveling and astronomic observations, shall determine the accurate geographic positions of points on the earth's surface taking into account the curvature of the earth. It also includes determination of positions of points through satellite survey or photogrammetric aerial triangulation.

Section 113 - Geodetic control surveys shall be made in accordance with the general instructions contained in the special publications used by the Coast and Geodetic Survey Department/NAMRIA for first, second and third order control work.

PROJECT CONTROL SURVEYS

Section 114 - Project control surveys shall consist of traverse, triangulation or any combination thereof, which together with leveling, shall determine the positions of control points between stations of geodetic accuracy over an area of limited extent such as isolated tracts of lands, group settlement, barangay areas, municipalities or group of municipalities.

Section 115 - There shall be three classes of project control surveys, namely, primary, secondary and tertiary controls.

Section 116 - The following classification and standards of accuracy in project control establishment shall be adopted.

CLASSIFICATION AND STANDARDS OF ACCURACY OF PROJECT CONTROLS FOR LAND SURVEY

SPECIFICATION	TRAVERSE		
	Primary	Secondary	Tertiary
Spacing of stations	between 100 m. to 1,000m	100 m. to 500 m.	as required
*Angular error of closure not to exceed	$2".5\sqrt{P}$	$10".0\ \sqrt{S}$	$30"\ \sqrt{T}$
No. of observations: Positions with 1 second Theodolite	2	1	as required
Sets with 20 or 30 second transit	6 D/R for interior and exterior angles	4 D/R for interior angle for circuit and loop traverse clamped	Clamped plate
**Linear error of closure not to exceed	$0.0001\ P_p$	$0.0002\ P_s$	$0.0005\ P_t$
Azimuth reading	1.0 second	10 to 15 sec.	30 sec. to 1 minute
Instrument least reading	1 sec. Theodolite; 20" to 30"transit	1 sec. Theodolite or 20" to 30" transit	1 minute transit
Astronomic Observations: No. of series night or day	8 or 4, am and 4, pm	4 or 2, am and 2, pm	
Probable error of astronomical observations not to exceed	5"	10"	15"
Azimuth checks not to exceed	20"	30"	as required
No. of stations between azimuth checks not to exceed	25	35	50
***Distance Measurement	Nearest mm. with C_s,C_t', C_p and C_g C_s measured twice	Nearest mm. with C_s'C_t' C_p'C_g,C_s measured twice	Nearest cm. measured once
Probable error or distance measurement not to exceed	1:40,000	as required	as required

Relative error after azimuth adjustment	1:20,000	1:10,000	1:5,000
*P, S, T is the no. of stations **P_p, P_a, P_t is the perimeter of the control ***C_{tt}, C_t, C_p, C_g & $C_{s.l.}$ is correction due to sag, temperature, pull, grade & sea level			

SPECIFICATION	TRIANGULATION		
Spacing of stations not to exceed	1-3 Km	1 Km	Consistent with good sighting
Angular Observations Positions with 1 second Theodolite	2	2	as required
Sets with 20-30 seconds transit	6 D/R for interior and exterior angle	4 D/R for interior and exterior angle	2 D/R
Triangle closure not to exceed Base Measurement:	5"	10"	30"
Probable error not to exceed	1:40,000	as required	as required
Check on base not to exceed	1:20,000	1:10,000	1:5,000

Section 117 - Project controls shall be classified as follows:

a) Primary control:

The azimuth shall be determined to the nearest one second of arc and the distances shall be measured twice to the nearest millimeter taking into account the temperature, sag, pull, grade and sea level corrections.

b) Secondary control:

The azimuth shall be determined to the nearest fifteen seconds of arc or less and the distances shall be measured once to the nearest millimeter, taking into account the temperature, sag, pull, grade and sea level corrections.

c) Tertiary control:

The azimuth shall be determined to the nearest one minute of arc or less and the distances shall be measured once to the nearest centimeter, taking no account of temperature, pull, sea level and sag corrections if the weight of the tape per meter does not exceed fifteen thousandths (0.015) kilogram.

Section 118 - The main control shall be the primary, secondary, or tertiary control, as the case may be, from and to which all other controls established in the survey of an area shall begin or close.

Section 119 - When the main control is fixed by:

a) Primary control, the details of the survey may be located by the primary control or by secondary and tertiary controls connected thereto.

b) Secondary control, the details of the survey may be located by the secondary control or by tertiary control connected thereto.

c) Tertiary control, the details of the survey may be located by the main control or by other tertiary controls connected thereto.

Section 120 - A traverse which closes to the point of its origin shall be known as a **circuit traverse.** A traverse starting from a station and closing into another station of the same or another traverse shall be known as a **loop traverse.** A traverse which does not close into another station of the same or of any other traverse shall be known either as a **loose tie line or connection traverse.**

Section 121 - The quality of control to be used for isolated land surveys shall be as follows:

AREA TO BE CONTROLLED	QUALITY OF CONTROL
less than 1,500 hectares	Tertiary control
1,500 to 15,000 hectares	Secondary control
over 15,000 hectares	Primary control

In isolated parcels of land having an area of less than 1,500 hectares to be subdivided into fifty or more lots, at least one pair of location monuments shall be established. The location monument shall be connected by a control of secondary precision from previously established reference point provided that no lots shall have a distance of more than one (1) kilometer from the nearest point of reference.

Section 122 - The main control for cadastral projects shall be established by traverse, triangulation, trilateration, or combination thereof with primary accuracy precision.

Section 123 - The main control starting from and closing to the BLLM No. 1 of the project shall be established to control all subsidiary controls within the project.

Section 124 - When no location monuments have been previously established, a pair of BLLMs, to be numbered 1 and 2 shall be established at the most suitable place and as near as possible to the center of the municipality or the project.

Section 125 - From the BLLM No.1, the main control shall generally follow the project boundary. If the place is rugged, it may be run through fairly level area near the boundary and include at least three second or third order geodetic control stations.

Section 126 - In case mountain peaks or hills define the boundary of the municipality or project, the primary control shall be located at the base of the mountains or hills. If the terrain is rugged, it may be run through existing road located as near as possible to the boundary for convenience and to produce a more reliable control. Traverse lines may be longer than 1,000 meters as prescribed in Section 129 as systematic errors on angle and distance measurements will be smaller.

Section 127 - Whenever the main control includes established geodetic control stations as specified in Section 125, the main control shall be divided into loops, each loop starting from one geodetic control station and closing on another geodetic control station.

Section 128 - Main control stations shall be numbered consecutively from one for each project. This shall be inscribed on the monuments in a clockwise order and shall be indicated in the field notes, computations and maps as P1, P2, P3, P4, and so on. The BLLM No. 1 of the project shall be the first main control station to be known as P1 of the main control; the BLLM No. 2 shall be made as the second or last main control station, without changing the marks thereon.

Section 129 - The primary traverse station shall be established on the ground so that the distance between consecutive stations shall not be less than 100 meters nor more than 1,000 meters whenever conditions may allow.

Section 130 - Additional pairs of location monuments shall be established along the control of the project at an interval of from 5 to 6 kilometers to be designated and numbered as BLLM No. 3 and BLLM No. 4; BLLM No. 5; and BLLM No. 6; etc. and given corresponding equivalent main control station numbers without changing the marks thereon.

Section 131 - All main control stations except the BLLMs shall be defined by cylindrical concrete monuments fifteen centimeters in diameter by fifty centimeters in length (15 by 50 cm). These shall be reinforced preferably by barbed wire and set not more than twenty centimeters (20 cm) above the ground. The station center shall be defined by a cross on a galvanized iron (G.I.) spike, set flush into the concrete monument.

Section 132 - After the main control stations have been monumented, preferably before starting the measurement of angles and distances, the positions of the stations shall be determined by a preliminary survey using the transit and tape or stadia. The preliminary survey shall define the approximate project boundaries to be used in the generation of information for the preparation of provisional progress map and preliminary control for the immediate commencement of sketching operations. Reference points of the monuments shall be located during the preliminary survey.

Section 133 - The measurement of distances for primary control shall be made with calibrated steel tapes or electronic distance measuring (EDM) equipment.

The EDM shall be tested and calibrated at the calibration base line before and after its use in the project as required in Section 20. It shall also be tested as often as necessary over a calibrated line in the project. Kinked or broken tapes, even if repaired, shall not be used in the measurement of primary and secondary controls.

Section 134 - Distances of primary control lines that can not be directly measured shall be indirectly determined by traverse triangulation or by broken base measurement.

POSITION AND BASE MERIDIAN OF THE PROJECT

Section 135 - The geographic position of BLLM No. 1 of the cadastral survey shall be derived from the second and third order geodetic control stations as specified in Section 125. It shall be included in the main control of the project.

In the absence of second and third order geodetic control stations at a distance of ten (10) kilometers from the project boundary, connection of primary precisions shall be made to any other point of reference accepted by the Lands Management Bureau.

Section 136 - The central meridian of the zone shall be the base meridian to which all azimuths of lines of the project shall be referred.

GRID AZIMUTH

Section 137 - The azimuth used in the cadastral project shall be known as grid azimuth to distinguish it from astronomical azimuth which may be observed within the project.

Section 138 - The grid azimuth shall be derived from at least two established geodetic control lines within or near the project.

Section 139 - When the grid azimuth for the cadastral project cannot be obtained by direct connection to established geodetic control lines, it shall be determined by: (1) stellar observations for azimuth on BLLM Numbers 1 - 2 of the project independent of any previous determination; and (2) by the application of the convergency correction between the station occupied and the central meridian of the adopted zone. Astronomical observations for azimuth shall be made on other pairs of location monuments of the cadastral project to check the carried grid azimuth of the line.

Section 140 - When the main control of the project is connected to the main control of an adjoining project, as required in Sections 154-160, astronomical observations for azimuth shall likewise be made on the two extreme stations common to the two project controls.

Section 141 - Astronomical observations for azimuth on the lines of the main control other than the line defined by BLLM Nos. 1-2 shall be used only as a check on the carried grid azimuth of the line, except as provided in Section 139.

Section 142 - Check on azimuth shall be from azimuth line to another azimuth line. The azimuth line is when eight (8) series of astronomical observations are made as prescribed in Section 102. The astronomical azimuth is reduced to grid azimuths. Angular errors shall be within $2.5" \sqrt{P}$, where P is the number of stations between the azimuth lines. Azimuth closure shall be distributed among the angles between the azimuth lines. The linear error of closure is determined and if within allowable limit, the latitude and departure errors shall be distributed accordingly. If this procedure is used, the angular loop closure and adjustment at interval of 20-25 stations must not be done.

Section 143 - The astronomical observations on the sun for azimuth shall be determined in accordance with Section 104. The arithmetical mean of at least four acceptable series taken in the morning and four series taken in the afternoon of the same or different days shall be used to determine the astronomical azimuth of the line.

Section 144 - The astronomical observations for azimuth on the stars shall be determined by at least four acceptable series taken on the east stars and four series on the west stars. The arithmetical mean shall be used as the astronomical azimuth of the line.

Section 145 - The probable error of the arithmetical mean of the observations under Sections 143 and 144 shall not exceed five (5) seconds of arc.

Section 146 - The probable error of the mean azimuth from two sets composing one series of observations shall be determined as follows:

a) Determine the difference in azimuth between the first and second sets.

b) Express this difference (D) in seconds and compute the probable error (P.E.) from the formula:

$$P.E. = 0.33725\ D$$

c) The result will be seconds of arc which shall not exceed five seconds for base meridian and primary, ten seconds for secondary and fifteen seconds for tertiary controls.

d) Adopt the mean azimuth if the result is within the limit.

Section 147 - The probable error of the mean azimuth from several series of observations shall be determined only from a series whose probable errors are within the limit provided in the preceding section. The procedures in determining the probable error shall be as follows:

a) Determine the arithmetical mean of the azimuths of the selected series of observations.

b) Determine the differences (v's) between the arithmetical mean azimuth and the azimuth of each series of observations.

c) Express these differences or residuals in seconds of arc and determine the square the residuals.

d) Add the squares of the difference (v^2) or residuals and compute the probable error from the formula:

$$\text{Probable Error} = 0.6745 \sqrt{\frac{\Sigma v^2}{n\,(n-1)}}$$

where: Σv^2 = the sum of all the squares of the residuals

n = the number of series of observations

Section 148 - When the probable error of the astronomical azimuth observations is more than the allowable limit, the azimuths having residuals greater than 10" from the mean shall be rejected. Additional observations for azimuth in accordance with Sections 143 and 144 shall be made until the allowable limit is obtained.

Section 149 - When the main primary control is divided into traverse loops, astronomical observations for azimuth similar to those taken at location monuments as provided for in Section 139 shall be made at the main station common to the loops.

Section 150 - When the primary control consists of one traverse circuit along the perimeter of the project, astronomical observations for azimuth shall be made at every 20 to 25 stations to check the carried grid azimuth of the lines in addition to the requirements of Sections 140 and 149.

Section 151 - The astronomical azimuths determined at the main control lines shall be corrected for convergency of meridians in accordance with Sections 152 or 153 and shall be within twenty seconds (20") of arc with the carried grid azimuths of the lines.

Section 152 - The amount of convergency correction in seconds of arc to be applied to the observed astronomical azimuth shall be computed using Table III, Determination of Convergency and Scale Factor, Technical Bulletin No. 26. If the latitudes and longitudes of the stations occupied are known, the convergency correction may also be computed by means of the formula for geodetic position computation.

Section 153 - The convergency corrections may also be determined by multiplying the number of kilometers of departure of the place of observation from the central meridian and the number of seconds of angular convergency corresponding to the following tables:

CORRECTION FOR CONVERGENCY

Latitudes	Convergency
4°	2.26"
5°	2.83"
6°	3.40"
7°	3.97"
8°	4.55"
9°	5.12"
10°	5.70"
11°	6.29"
12°	6.87"
13°	7.46"
14°	8.06"
15°	8.66"
16°	9.27"
17°	9.88"
18°	10.50"
19°	11.13"
20°	11.76"
21°	12.41"
22°	13.06"

The angular convergency is for one kilometer of departure east or west from the central meridian.

The correction shall be added to the astronomical azimuth for points west of the central meridian and subtracted from the astronomical azimuth for points east of the central meridian.

CONNECTION WITH ADJOINING PROJECTS

Section 154 - In case the main control of an adjoining cadastral project has been located or completed, connection therewith shall be made at the extreme main control stations of their common lines. This connection shall be made by measuring the horizontal angle and distance at each of the main control stations to which connection is made to the two adjacent stations of the previous main control.

ADJOINING PROJECT IN THE PHILIPPINE PLANE COORDINATE SYSTEM PRS-92

Section 155 - If the adjoining project is in the Philippine Plane Coordinate System (PPCS)/PRS-92, the main control of the project shall be conformed or adjusted to the main control of the adjoining project. If, however, the angular error and/or the error of the closure of the main control exceeds the allowable limits, investigation shall be made and the results of which shall be reported to the Director of Lands Management Bureau.

ADJOINING PROJECT IN THE LOCAL PLANE COORDINATE SYSTEM

Section 156 - If the adjoining project is in the Local Plane Coordinate System (LPCS), the distances and horizontal angles of the main control common to those projects undergoing survey shall be reduced to the grid system (PPCS/PRS 92). This shall be used in the main control of the project undergoing survey. The latitude and departure of the line defined by the two junction stations with the main control or the adjoining project shall be transformed into the Philippine Plane Coordinate System/PRS 92.

Section 157 - The following formulas shall be used to transform the latitudes and departures of lines in the LPCS to the PPCS:

$Xp = (L \cos \Delta\alpha \sin \alpha + L \sin \Delta\alpha \cos \alpha) * (K)$

$Yp = (-L \sin \alpha \sin \Delta\alpha + L \cos \alpha \cos \Delta\alpha) * (K)$

L = length of line in LPCS

α = local azimuth

$\Delta\alpha$ = grid convergence

K = scale factor at the midpoint of the line

Xp = grid departure of the line

Yp = grid latitude of the line

Section 158 - The horizontal angles and distances of the adjoining project shall be used to complete the main control of the project undergoing survey. If the angular error or the linear error of closure of the main control exceeds the allowable limit, investigation shall be made the results of which shall be reported to the Director of Lands Management Bureau.

Section 159 - The difference between the grid azimuths of the common control lines as carried from their respective base meridians when reduced by the angle of convergency between these base meridians shall be less than thirty seconds of arc; otherwise, an investigation shall be made and reported to the Director of Lands Management Bureau.

Section 160 - If connection to the main control of an adjoining project is no longer feasible, connection shall be made by including all recoverable monuments of the adjoining project along or near their common boundaries in the main control of the project.

PRIMARY CONTROLS - MEASUREMENTS OF HORIZONTAL ANGLES

Section 161 - The horizontal angle formed at each primary station by the two primary lines meeting thereat and its explement shall be measured clockwise by the method of repetition.

Section 162 - The measurement of horizontal angles by the repetition method using a transit with a least reading of 30" or less shall be performed as follows:

1) First angle

   a) Set and level the transit over the primary station where the angle is to be measured;

   b) Set vernier A to read 0°00'00"; record the readings at verniers A and B. With the telescope in the direct position, backsight at the rearward station using the lower clamp and lower tangent screw.

   c) Loosen upper clamp, rotate telescope in a clockwise direction, sight the forward station. Read and record the readings on verniers A and B. This is the first reading.

d) Loosen lower clamp and backsight at the rearward station and proceed as in (c) for a total of six times except that the vernier is read only after the six sighting.

e) Closing the horizon: Invert the telescope, loosen lower clamp and backsight at forward station. Loosen upper clamp and then revolve instrument again in a clockwise direction then sight the rearward station. Repeat this process six times. The vernier reading should be 0°00'00" for the horizon closure. If it differs from 0°00'00" by more than 30", reject the result and make another set of repetitions.

f) The value of the angle is computed by getting the difference between the mean of the initial and closing readings and the sixth reading and dividing this difference by six. For angles more than 60° add to the quotient multiple of 60° nearest to, but lower than, the first reading.

2) Second Angle (explement)

a) Proceed as in 1 (b) to 1 (e) but take backsights at the forward station first and foresights to the rearward station. In closing the horizon, take backsights at the rearward station and foresights at the forward station.

b) If the horizon closure in this measurement is within the allowable 30", compute for the value of the angle as in 1 (f).

Section 163 - The sum of the 1st and 2nd angles shall not differ from 360 by more than +/-10"; otherwise, make additional measurements.

Section 164 - A simpler method is the direction method of observation where the azimuth of primary lines shall be determined by observing two positions with a one-second direction Theodolite. One position is as follows:

a) With the telescope in direct position, bisect the signal on the rearward station using the horizontal clamp and tangent screw.

b) Set any initial reading approximately at zero degree and one minute (0°01'00"). Bisect again the signal on the rearward station. Record the micrometer reading.

c) Release the horizontal clamp and turn the telescope in a clockwise direction to the forward station. Tighten the clamp and bisect the signal accurately by means of the tangent screw. Record the micrometer reading.

d) Release again the clamp, reverse the telescope, and sight again the forward station by means of the clamp and its tangent screw. Record the micrometer reading.

e) Release the clamp and turn the telescope to bisect the rearward station. Record the micrometer reading.

The difference between the initial reading and the closing reading on the initial line shall not exceed 10 seconds of arc; otherwise, the observations shall be repeated.

The second position is made by following the above procedure, but the initial reading shall be set at approximately ninety degrees more than the first initial reading at (b).

The discrepancy between the mean readings of the 1st and 2nd positions shall not be greater than five (5) seconds; otherwise, the observations shall be repeated.

The angle is determined from the list of directions by subtracting the direction to the rearward station from the direction to the forward station.

PRIMARY CONTROL - MEASUREMENT OF DISTANCES

Section 165 - The distances between primary stations which must be inter-visible shall be measured twice with the use of steel tapes. The observed data shall be entered in the prescribed field notes form together with the corrections for temperature, sag, tension, slope or grade, and sea level, including the name of observer, the tape numbers and weights of the tapes, etc. The first measurement shall be made with one tape in one direction and the second measurement, with another tape in the opposite direction.

Section 166 - The temperature correction for each tape measurement shall be computed using the following formula:

$$C_t = L\,(t_a - t_s)\,K$$

where: C_t = correction due to temperature (plus or minus)

L = measured length

t_a = actual temperature of the tape

t_s = standard temperature of the tape

K = coefficient of expansion of the tape material (.0000116°C for steel tape)

Section 167 - The sag correction for each tape measurement between two consecutive supports shall be computed using the following formula:

$$C_s = \frac{w^2 l^3}{24\,p^2} = \frac{W^2 L}{24\,P^2}$$

where: C_s = Sag correction (always negative) between two consecutive supports (span)

w = unit weight of tape

W = total weight of tape

l = length between supports

p = pull applied

Section 168 - The pull correction for each tape measurement shall be computed using the following formula:

$$C_p = \frac{L\,(P_a - P_s)}{SE}$$

where : Cp = pull correction (plus or minus)

L = measured length

Pa = actual pull applied

Ps = standard pull

S = cross sectional area of the tape

E = modulus of elasticity of tape material

or

$\frac{1}{SE}$ = coefficient of stretch

In order to eliminate error due to pull, the standard tension for the tape shall be used.

Section 169 - The slope or grade correction for each tape measurement shall be computed using the formula:

$$C_g = \frac{h^2}{2s} + \frac{h^4}{8s^3};$$

where : Cg = slope or grade correction (always to subtracted)

s = measured slope length corrected for temperature, sag and tension

h = difference in elevation of the end points of each tape measurement

lc = l - Cg = corrected horizontal distance

Section 170 - Sea level correction shall be determined using the formula:

$$C_{sl} = -\frac{Bh}{R} + \frac{Bh2}{R2}$$

where : C_{sl} = sea level correction

B = actual measured length of the line in meters corrected for temperature, sag, tension, slope

h = average elevation of the line

R = radius of curvature of the spheroid corresponding to mean latitude of the line; for the Philippines
R = 6,370,000 meters

Section 171 - Elevations of points to be used in sea level correction shall be determined in accordance with Section 100.

Section 172 - Distances between monuments of primary lines may be measured with standardized one hundred meter steel tapes, without breaks or splices. The measurements shall be made over accurately aligned tripods. For this purpose the tripods of transits, plane tables or other instruments shall be used. When these are not available, similar devices constructed locally may be used.

A board about 4 x 8 x 80 centimeters may be bolted through its center to the tripod head. The bolt shall be left loose enough to permit movement of the board in the horizontal plane so that the end graduation of the tape will fall on the board. The bolt shall be tightened to give firm and steady surface on which to mark the measurement. The point where the end graduation falls shall be marked with an office pin stuck in the board. When measuring the end point of the line, the tripod shall be set slightly beyond the monument and the board is set to swing until the plumb line held over the monument strikes an edge of the board. This point shall be marked by a pin and then measurement shall be made.

Section 173 - The tape shall be supported at every twenty-five meter interval. The intermediate supports shall provide full and free support to the tape and shall not exert any strain on the tape in any direction except to support it against the action of gravity.

Section 174 - In rough terrain where the use of tripods is impractical, the measurement may be made by the use of two transits correctly aligned between the stations. The distance between the two transits shall be equal to, or slightly less than the length of the tape used in the measurement. The tape shall, as much as possible, be supported at every twenty-five meter interval and measurement shall be made between the horizontal axes of the transits. Extreme care shall be used in reading the tape and the vertical angles. For each tape interval, vertical angles shall be read from both transits.

Section 175 - In measuring primary distances, the thermometers shall be attached to the tape.

Section 176 - In measurement of less than a full tape length, the tape shall be stretched the full length, supported at every twenty- five meter interval, standard tension applied and the distance measured in the same manner as for a full tape length.

Section 177 - In cases where tapes are used under conditions different from those under which they are standardized, corrections for temperature, sag and tension, and slope shall be applied to the measurements.

Section 178 - When the correction for slope is being made, difference in elevations shall be determined for each tape length. The vertical angle shall be measured to the nearest thirty seconds of arc in the case of transits and to the nearest second of arc in the case of theodolites. In both cases, readings shall be taken in the direct and reversed positions. If the vertical angle is taken to the nearest thirty seconds of arc, no measurement with slope greater than ten degrees shall be allowed.

Section 179 - The spring balance to be used in determining tension shall be tested by weighing with a standard weight of not less than ten kilograms in government offices having such standard weight. If an index error is found, it shall be applied according to its sign to the tension indicated by the spring balance.

Section 180 - The tape thermometers shall be frequently compared with a standard thermometer. If an index error is found, it shall be applied to the temperature according to its sign.

Section 181 - All corrections for temperature, sag, pull, slope, and sea level shall be computed to the nearest millimeter.

Section 182 - After the corrections for temperature, sag, and pull have been applied to the measured inclined or slope distance, reduction of the inclined distance to the horizontal shall be made. The horizontal line is then reduced to sea level distance.

Section 183 - When the two measurements of a primary line have been corrected for temperature, sag, pull and slope and reduced to the sea level the arithmetic mean of the measurements shall be adopted as the length of the line provided the probable error of the arithmetic mean is 1:40,000 or less of the adopted mean.

Section 184 - The probable error of the arithmetic mean of the two measurements shall be computed as follows:

Probable Error = 0.33725 D

where : D represents the difference between the two measurements of the line.

The probable error divided by the arithmetic mean shall be one in forty thousand (1:40,000), or less.

Section 185 - When the probable error obtained of the two measurements as obtained in Section 184 is greater than the ratio of one in forty thousand (1:40,000), additional measurements shall be made until the required precision is obtained.

Section 186 - In general, when more than two measurements of a primary line are made with equal care, none of the measurements shall be discarded. The arithmetic mean of all the measurements shall be computed and the probable error shall be determined to the nearest millimeter in accordance with the general formula for probable error as described in Section 147.

Section 187 - The distance measurements of the primary line shall be entered on the same consecutive pages of the primary distance book. Reference shall be made to the page of the primary angle book where the azimuth determination for the primary line is found.

Section 188 - Primary distances may also be measured with an Electronic Distance Measuring (EDM) equipment in accordance with Sections 16 to 20. Each primary line measured ten (10) times using an EDM instrument shall have a rejection limit of not greater than 0.005 meter from the mean. (156a; LOC 123)

PRIMARY CONTROL COMPUTATIONS

Section 189 - After the measurements of the horizontal angles, the values to be adjusted for the first and second angles shall be the mean of the repetitions in each case plus (+) or minus (-) the horizon closure correction. This shall be applied equally to each angle. The sum of the adjusted first and second angles shall be 360 degrees.

Section 190 - The sum of the interior angles of the traverse polygon shall be equal to one hundred and eighty degrees multiplied by the number of lines in the circuit less two. The angular error of the closure for a primary traverse polygon shall be determined using the formula:

$$A_e = A-[180^0 (P-2)]$$

where : Ae = the angular error of polygon closure
A = the sum of all interior angles of the primary traverse polygon
P = the number of stations or angles or lines in the primary traverse polygon

Section 191 - Another method of determining the angular error of closure is as follows:

a. With the first angle

(1) At the initial station, add the first angle mentioned in Section 189 to the back azimuth of the preceding or initial line. The sum is the forward azimuth of the forward line. If the sum exceeds 360 degrees, the forward azimuth is the sum minus 360 degrees.

(2) At the second station, add 180 degrees to the forward azimuth of the preceding line to obtain its back azimuth. If the sum exceeds 360 degrees, the back azimuth of the line is the sum minus 360 degrees.

(3) To obtain the azimuth of the forward line on the second station, add the first angle determined at the station as in (1) above.

(4) Continue the procedure until the back azimuth of the initial line is obtained.

(5) The difference in the starting back azimuth and the closing back azimuth of the initial line is the angular error of closure.

b. With the second angle

(1) At the initial station, subtract the second angle mentioned in Section 189 from the back azimuth of the preceding or initial line. The difference if positive is the forward azimuth of the forward line. If the difference is negative, add 360 degrees. The positive sum is the forward azimuth.

(2) To obtain the back azimuth at the second station repeat "a(2)"

(3) To obtain the forward azimuth at the second station repeat "b(1)"

(4) Continue the procedure until the back azimuth of the initial line is obtained.

(5) Repeat "a(5)".

Section 192 - The maximum allowable angular error of closure for primary traverses shall be determined using the formula:

$$A_p = 2.5'' \sqrt{P_s}$$

where : Ap = maximum allowable angular error for primary traverses expressed in seconds of arc

Ps = the number of stations or angles in the primary traverses

Section 193 - If the maximum allowable angular error of closure is exceeded, the work shall be verified in the field and corrected accordingly.

Section 194 - The allowable angular error of closure of the traverse shall be distributed uniformly among the interior angles or the azimuth of the primary lines, as the case may be, to close the polygon.

Section 195 - In case angle measurements are made under different conditions, relative weights may be assigned to the measured angles for determining corrections. The angular error of a loop traverse shall be determined and distributed only among the lines of the loop traverse.

Section 196 - After the angles are corrected, the azimuths of primary traverse lines shall be determined to the nearest one second of arc. The corrected azimuths shall be recorded in the primary angle book.

Section 197- After the corrected azimuths have been determined, the latitudes and departures of the traverse shall be computed to the nearest millimeter. Grid azimuths to the nearest second of arc and grid distances to the nearest millimeter shall be used in the computation.

Section 198 - The actual linear error of closure shall be determined from the formula:

$$Ec = \sqrt{L^2 + D^2}$$

where : Ec = the linear error of closure
L^2 = the error in latitude squared
D^2 = the error in departure squared

The linear error divided by the perimeter is the relative error.

Section 199 - The relative error for primary traverse shall not be greater than one part in twenty thousand (1:20,000) of the perimeter.

Section 200 - If the relative error of closure is greater than the limit provided for in the preceding section, the field and office work shall be verified to determine where the error lies. Re-observation shall be made until the error is within the prescribed limit of precision.

Section 201 - Latitudes and departures shall be balanced as prescribed in Section 203 and the coordinates of the traverse stations shall be determined to the nearest millimeter. After the traverse has been closed and approved, no change shall subsequently be made in the bearings or distances except after consultation with and advice in writing from the Director of Lands Management Bureau or from the Regional Technical Director for Lands.

Section 202 - When the primary traverse starts from and closes to primary stations of another closed, coordinated primary traverse, the linear error of closure shall be determined as follows:

a) Add algebraically the latitudes and departures of all the primary lines of the new traverse and the unadjusted latitudes and departures of the primary lines of the previous traverse which are common to the new traverse to get the errors in latitude and departure.

b) Determine the linear error of closure as prescribed in Section 198. The relative error shall be determined by dividing this linear error by the perimeter of the entire circuit. The result shall not exceed one part in twenty thousand (1:20,000) of the perimeter, as provided in Section 199.

If the relative error of closure is greater than the limit provided for in the preceding section, the field and office work shall be verified to determine where the error lies. Re-observation shall be made until the error is within the prescribed limit of precision.

Section 203 - The primary traverse loop shall then be balanced as follows:

a) Determine the latitude and departure from the accepted coordinates of the two primary stations of the previous traverse from which the new primary traverse started and closed.

b) Add algebraically the latitudes and departures of the new primary traverse.

c) The difference, if any, between the latitudes and departures determined as prescribed in (a) and (b) shall be distributed proportionally among the lines of the new primary traverse.

Section 204 - When the primary traverse control of a project consisting of a circuit and several loops connected thereto, and the circuit has not been finally coordinated, the entire system of primary circuit and loop traverses shall be adjusted and coordinated as follows:

a) Distribute the angular error of closure among the angles of each traverse polygon. The distribution shall be made in such a way that each polygon shall close in accordance with the principle enunciated in Section 194.

b) Compute the coordinates of the primary stations, always beginning from and closing to the BLLM No. 1 through different routes.

c) The final coordinates of each junction station shall be the weighted mean of all the coordinates of the station as computed from different routes.

d) Coordinate other primary stations by distributing the error in latitudes and departures between junction stations, considering BLLM No. 1 as a junction station.

SECONDARY CONTROL - LOCATION OF SECONDARY STATIONS

Section 205 - Secondary traverses starting from and closing to primary stations shall be established at or near the barangay boundaries as far as local conditions may permit following a general direction of either:

a) North and south, along arcs of meridians, or
b) East and west, along arcs or parallels.

Section 206 - The secondary traverse lines shall be established at intervals of approximately every one minute of arc in the portions of the project where the land is divided into small lots and at intervals not exceeding three minutes of arc in those portions where the land is divided into larger lots such as extensive haciendas, reservations and other similar tracts.

Section 207 - When the terrain is rough, hilly or mountainous the secondary traverse shall be located where it may be of maximum use provided it shall be available to control lot surveys within the area represented by the cadastral maps. Secondary traverses shall also serve as the political boundary controls. The barangay corners may be located by simple triangulation or short traverses. If there are several barangays in the project area, the first set of secondary traverses shall be big enough to cover two or more barangays. The angular and linear errors of these loops may be adjusted simultaneously by the method of least squares to avoid propagation of errors up to the last lines. Additional secondary traverses shall be established to cover the other barangays.

Section 208 - The secondary stations may be located along public highways or railways and at or near the barangay boundaries. They shall be defined by concrete monuments of not less than ten centimeters in diameter and fifty centimeters in length centered by a small nail and numbered consecutively starting from one. The monuments shall be set to not more than five centimeters above the ground. Secondary lines shall not exceed five hundred meters in length.

SECONDARY CONTROL - AZIMUTHS AND DISTANCES

Section 209 - The azimuths of secondary traverse lines shall be determined by the clamped plate method. With a one- second Theodolite, the azimuth of a secondary line may be determined by a single observation of the angle between two secondary lines. In orienting the instrument on the primary stations, the vernier shall be set to read the azimuths of the primary lines to the nearest fifteen or twenty seconds of arc for transits and to the nearest one second of arc for theodolites.

Section 210 - Azimuths shall be read from the instruments to the nearest fifteen or twenty seconds of arc as the case may be for transits and one second of arc for theodolites. Magnetic bearings shall be read and recorded except when the instrument used is not provided with a magnetic compass.

Section 211 - The azimuth error of closure at the primary station where the secondary traverse closes is the difference between the carried azimuth and the azimuth of the primary line. This difference must not exceed the amount as determined by the following formula:

$$As = 10'' \sqrt{S}$$

where: As = maximum allowable azimuth error of closure for secondary traverses

S = the number of secondary stations in the traverse

Section 212 - Astronomical observations for azimuth shall be taken at every twenty-five to thirty-five stations in single loop of a secondary traverse and at the junction stations with the control traverse of an adjoining project. However, when the secondary control is divided into loops, astronomical observations shall also be taken at junction stations between the loops.

The astronomical observations shall consist of at least two series of two sets each and the probable error shall not exceed ten second of arc as provided in Section 146. The astronomical azimuths determined at the secondary stations after correction for convergency shall conform with the carried azimuth to within thirty seconds of arc.

Section 213 - The distances between secondary stations shall be measured in the manner provided for primary controls in Sections 165 to 172, except that the measurements shall be made once instead of twice. Stadia distances may be read and recorded for each secondary line if measured with the tape to check possible omission of a tape length).

Section 214 - The number of secondary control stations shall be indicated on the monuments, in the field notes, computations and plans with the letter "S" prefixed to the station number. Azimuths and distances shall be recorded on prescribed LMB forms.

SECONDARY CONTROL COMPUTATIONS

Section 215 - The azimuth error of closure to the nearest fifteen seconds of arc shall be distributed in units of fifteen seconds of arc as follows:

a) Divide the total azimuth error of closure by fifteen (15). The quotient represents the number of fifteen second (15") units.

b) Add one to the number of units determined in (a) and divide by this sum the number of secondary lines between which the azimuth error shall be distributed.

c) The quotient represents the number of groups of stations which will be corrected by the same amount.

d) The group shall be corrected by amounts increasing so that the total error shall be eliminated.

Example:

In a traverse of fifteen lines with an azimuth error of closure of thirty (30") seconds.

a) By (a), 30 ¸ 15 = 2(15") units

b) By (b) and (c), 15 divided by 3 = 5 stations per group
By (d), there will be three groups of five stations each

The correction shall be:

First group	00"
Second group	15"
Third group	30"

The above method shall be adopted only when the clamped plate method of traversing is used. Otherwise, the allowable azimuth / angular error of closure shall be distributed to close the traverse polygon as in the case of the primary traverse as stipulated in Section 194, provided that the azimuth of the secondary line shall be reduced to the nearest fifteen seconds of arc.

Section 216 - After the distribution of the azimuth error of closure, the latitudes and departures shall be computed to the nearest centimeter. The bearings and distances to be used in the computations shall be to the nearest fifteen seconds of arc and to the nearest millimeter, respectively.

Section 217 - In the case of azimuths measured with one second Theodolite, the azimuth shall be recorded to the nearest second and the computations shall be made as the preceding section.

Section 218 - The relative error of closure for secondary traverses shall not be greater than one part in ten thousand (1:10,000) of the perimeter. The linear error of closure shall be determined as prescribed in Section 198.

Section 219 - If the relative error of closure is greater than the limit provided for in the preceding section, the field and office work shall be verified to determine, re-observe and correct any possible error until the error is within the prescribed limit of precision.

TERTIARY CONTROL - LOCATION OF TERTIARY STATIONS

Section 220 - Tertiary traverses of cadastral surveys shall start from primary or secondary stations except in cases provided in Section 119(c).

Section 221 - Asmuchas possible, the monuments defining corners of tracts shall be occupied and used as tertiary stations. All other stations shall preferably be defined by stakes, centered with tacks or small nails.

Section 222 - Tertiary station numbers shall not be assigned to primary, secondary or location monuments when such stations are occupied in connection with tertiary traverses.

Section 223 - Tertiary stations shall be numbered consecutively from one for each project or survey and indicated in the field notes, computations and plans with the letter "T" prefixed to the station number.

TERTIARY CONTROL - AZIMUTHS AND DISTANCES

Section 224 - The azimuths of tertiary traverse lines shall be determined by the clamped plate method.

In the case of cadastral survey, the instrument shall be oriented on primary or secondary traverse lines of the cadastral project to the nearest thirty seconds of arc. In the case of isolated land survey, the instrument shall be oriented to the nearest thirty seconds of arc on established reference lines like location monuments or by astronomical observations for azimuth.

Section 225 - All azimuths shall be read directly from the instrument to the nearest one minute of arc except at the closing line where the azimuth shall be read to the nearest thirty seconds of arc. Magnetic bearings shall be read and recorded for each tertiary line.

Section 226 - The maximum allowable azimuth error of closure at the primary or secondary stations in the case of cadastral survey or of other tertiary stations in the case of isolated land survey, shall be determined from the following formula:

$$A_t = 30'' \sqrt{T}$$

where : A_t = maximum allowable azimuth error of closure for tertiary traverse

T = the number of tertiary stations in the traverse

Section 227 - The difference between the closing azimuth reading and the actual azimuth of the line on which the tertiary traverse closes shall be the azimuth error of closure. This shall not exceed the maximum as determined in the preceding section otherwise the work shall be verified to determine and correct in the field any possible error until the prescribed maximum limit is attained.

Section 228 - The distances between tertiary stations shall be measured with standardized measuring devices to the nearest centimeter. In hilly or mountainous terrain, vertical angles or zenith distances shall be taken and slope distances reduced to the horizontal. Stadia distances shall be read and reduced for each tertiary line when measured with a tape.

TERTIARY CONTROL FOR ISOLATED SURVEYS

Section 229 - Tertiary controls of isolated land surveys shall start from points of reference, other control stations or marked corners of approved surveys and may be circuit or loop controls. When the lot to be surveyed is within one (1) kilometer from a point of reference, the tertiary control shall start from and close to this point of reference.

Section 230 - The traverse lines in isolated land surveys shall follow approximately the boundaries of the properties undergoing survey. Retracing or returning through the same stations of the traverse to close it is not a correct practice and shall not be accepted for traverse closure.

Section 231 - When the tertiary control is independent of primary or secondary control, as it is usually in isolated land surveys, the true azimuth of at least one line shall be determined by astronomical observations.

Section 232 - If the azimuth is derived from the tertiary control of another survey, or derived from location monuments and carried by long circuit tie line traverse to the location of the property under survey, an astronomical observation for azimuth must be made to check the carried azimuth.

Section 233 - An astronomical observation for azimuth shall be made at intervals of not more than fifty stations in circuit and loop traverses. The difference between the observed and carried azimuth in the system shall not exceed the maximum allowable error of closure as provided in Section 226. Such error shall be distributed among the lines in the sections for which the error has been determined.

Section 234 - When the traverse loops are located as links forming a chain, an astronomical observation for azimuth shall be required at alternate loops, provided that astronomical observations shall be made on the first and last loops.

Section 235 - When the data recorded on plans of approved surveys are used, the points occupied, the azimuth used, the class and Bureau of Lands survey number and the name of the applicant of the previous survey shall be stated in the field notes. Azimuth of lines not included in the closed traverse of the former survey shall not be used in the traverse of the new survey.

Section 236 - The astronomical azimuth for tertiary controls in isolated land surveys shall be determined by a series of two sets of observations taken as prescribed by Sections 103 -105. The geographic position of the station occupied shall be determined in accordance with Sections 89-99.

Section 237 - The probable error shall be determined as prescribed by Section 146 which shall not exceed 15 seconds of arc.

TERTIARY CONTROL COMPUTATIONS

Section 238 - The azimuth error of closure to the nearest one minute of arc shall be distributed as in the case of secondary traverses described in Section 215, except that one minute of arc shall be used as unit instead of fifteen seconds of arc.

Section 239 - After the distribution of the azimuth error of closure, the latitudes and departures shall be computed to the nearest centimeter. The bearings and distances to be used in the computation shall be to the nearest one minute of arc and the nearest centimeter, respectively.

Section 240 - The linear error of closure shall be determined as prescribed by Section 198. The relative error for tertiary control shall not be greater than one part in five thousand (1:5,000) of perimeter.

Section 241 - If the relative error of closure is greater than the limit provided for in the preceding section, the field and office work shall be verified to detect and correct any possible error or re-observe suspected lines that are erroneously observed until the error is within the prescribed limit of precision.

TRIANGULATION CONTROL

Section 242 - When triangulation control is used for establishing points of control in the survey of cadastral projects, the general requirements shall be as follows:

(a) The position of the triangulation stations shall be selected so that no angle may be less than thirty degrees.

(b) Whenever possible, a scheme of quadrilaterals shall be established and the angles between the diagonals and sides of the quadrilaterals shall be measured.

(c) Other schemes may be used whenever it is not practical to completely use the quadrilaterals scheme.

(d) Each angle of the triangles shall be measured either by the repetition method or by the direction method as in the case of the measurement of the horizontal angles of primary controls described in Sections 162 and 164.

(e) The length of the base lines shall be measured with the same degree of accuracy as that of the primary control lines described in Sections 165 to 188.

(f) At least two base lines shall be measured, one situated at the beginning and the other at the end of the triangulation scheme and the triangulation control shall be adjusted between these base lines.

Section 243 - Detailed special instructions shall be issued by the Director of Lands Management Bureau, whenever necessary concerning the scheme of triangulation and methods of adjustments to be used.

Section 244 - When the distance of a primary, secondary or tertiary control line cannot be measured directly, it may be determined by traverse-triangulation or by broken base measurement. The projected length of the broken lines on the control line shall be adopted as the distance of the line.

Section 245 - The three angles of the triangle shall be measured as follows:

(a) For primary controls, by the repetition method as prescribed in Section 162 or by the direction method as prescribed in Section 164 of primary angles.

(b) For secondary controls, by the repetition method as prescribed in Section 162 but the repetition shall be four times instead of six or the direction method as prescribed in Section 164.

(c) For tertiary controls, by the repetition method as prescribed by Section 162 but the repetition shall be two times instead of six.

Section 246 - The base lines for primary, secondary or tertiary traverse -triangulation shall be measured as in the case of primary, secondary or tertiary traverse lines, respectively.

LOCATION MONUMENTS SURVEYS

Section 247 - Location monuments shall be established as required in Sections 39, 40, 123, 130, and 543 in the poblacion/center of each municipality/city and in other places thereof at an interval of about six (6) kilometers.

Section 248 - These monuments shall be made of concrete with specifications prescribed in Section 272(c).

Section 249 - The distance between each pair of location monuments, such as 1 and 2, 3 and 4, and so on, shall not be less than one hundred meters, and whenever possible, it shall preferably be about three hundred meters.

Section 250 - The location monuments shall be established whenever possible on the corners of the plazas such that there will be no danger of the line between the monuments being obstructed by buildings or other permanent objects.

Section 251 - Each monument shall be referenced by bearings and distances to at least three permanent objects such as corners of substantial and permanent buildings, nearby edible fruit trees, etc. and by azimuths to visible church spires, peaks and other similar objects.

Section 252 - The azimuth of the line defined by each pair of location monuments shall be determined as required in Sections 102 to 109 for the establishment of the base meridian of a survey project.

Section 253 - The geographic position of BLLM No. 1 shall be determined by a direct connection with a second or third order geodetic control station.

Section 254 - If there is an established triangulation point within ten kilometers of these monuments, connection shall be made therewith by at least secondary control accuracy. If by secondary traverse, a closed circuit or loop shall be run; and if by triangulation, the triangle or triangles must be well conditioned. Angles shall be measured by direction or by repetition method.

Section 255 - The distance between each pair of location monuments shall be determined as required in Sections 165 to 188, inclusive, for primary traverse lines.

Section 256 - The other location monuments established in each municipality shall be connected by at least secondary control starting from and closing to the BLLM No. 1 of the adjoining municipalities.

Section 257 - The BLLM No. 1 of the municipality shall be connected by secondary control with the BLLM No. 1 of the adjoining municipalities.

Section 258 - The description of each location monument in the field notes shall contain the data required in Section 251 and the location of the monuments with respect to streets and specifications as prescribed in Section 272(c).

The condition of the recovered location monuments (BLLMs, PBMs, MBMs) in the adjoining projects shall be described in the Location Monument Recovery Report form and a copy submitted to the Land Management Bureau. (DAO 61, S-1993)

Section 259 - The field notes of the secondary control lines from one municipality to another shall be kept in one field book and all secondary stations shall be numbered consecutively from one (1).

Section 260 - The secondary controls connecting location monuments shall be run along public highways unless more direct routes are possible.

Section 261 - The most prominent points of churches, schools, chapels, railroad stations, sugar mills or other large buildings along the line of control shall be located and their descriptions written for future reference.

Section 262 - The points where the control lines cross provincial and municipal boundaries shall be carefully determined. When monuments are found, such monuments shall be accurately located and fully described in the field book and on the Location Monument Recovery Report form.

Provincial and municipal authorities shall be requested to furnish all available data on provincial and municipal boundaries. Barangay boundaries shall also be located and surveyed.

Section 263 - Information on the general character of the area on both sides of the road such as heavy woods, brush, cogon, swamps, nipa, rice, hemp, tobacco, corn, sugar, coconuts, homelots etc. shall be entered in the field book opposite the secondary stations. Likewise, the general characteristics of the area beyond shall also be described. The width of the road and the location of its center line with reference to the control station shall be stated.

Section 264 - Railroad lines shall be traversed in the same manner as public roads. Telegraphic posts at every kilometer along the line, bridges and culverts shall be located.

Section 265 - All stone or concrete culverts or bridges crossed by the control line shall be marked. This mark shall consist of a hole seven millimeters in diameter and three centimeters deep, with the letter B.L. These structures shall be sketched, showing the location of the point, and described in the field book.

Section 266 - If culverts or bridges are not available, road monuments of natural objects, such as fixed boulders or stone ledges, at intervals of approximately three kilometers from each other and from BLLMs, preferably at the intersection of the provincial roads or at the intersection of streams or railroads shall be located, marked and indicated in the field book as prescribed in the preceding section.

Section 267 - Names of towns, barangays and geographical features shall be determined by diligent inquiry from the best informed people in the locality. In case of dispute in geographical names a complete report shall be submitted to the Lands Management Bureau.

Section 268 - A location monument description book shall be prepared for each project.

CHAPTER V - MONUMENTS OF SURVEYS

NATURE OF MONUMENTS

Section 269 - The position of reference points and corners of boundary lines of provinces, cities, municipalities, barangays, estates and other tracts of land shall be defined and marked on the ground by monuments of permanent nature, except when such corners lie near physiographic or natural features. The first and last corners situated near natural boundaries shall be monumented.

Section 270 - The following objects shall be considered as monuments of permanent nature to be used in defining and marking lot corners:

a) Standard concrete monuments.

b) Concrete posts which are parts of the fence when not less than ten centimeters in diameter, or metal pipes not less than two centimeters in outside diameter.

c) Living edible fruit trees not less than fifteen centimeters in diameter or trees belonging to the first group with diameter from fifteen to fifty centimeters.

d) Points on masonry or concrete walls.

e) Immovable or fixed hard rocks or boulders with exposed surface of more than one meter in diameter.

f) Peg, being of a composition that will resist destruction by fire, natural corrosion or decay with nominal dimensions of 50 millimeters square in cross-section for at least 100 millimeters from the top and not less than 400 millimeters in length.

Section 271 - The following objects shall not be used to define corners:

a) Adobe and other soft stones.

b) Clumps of bamboos, banana or abaca stalks, papaya trees and other similar forms of plant life.

c) Living trees less than fifteen centimeters in diameter, except when such trees are used to define corners along natural boundaries.

Section 272 - The standard concrete monuments to define the permanent position of points of survey shall be as follows:

a) For provincial, city and municipal boundaries, thirty (30) centimeters square by one (1) meter long (30 x 30 x 100 cm.) centered by a galvanized iron spike and level on top, set sixty (60) centimeters in the ground leaving a projection of forty (40) centimeters above the ground.

b) For barangay boundaries, twenty (20) centimeters square by one meter long (20 x 20 x 100 cm.) centered by a galvanized iron spike and level on top, set sixty (60) centimeters in the ground leaving a projection of forty (40) centimeters above the ground.

c) For Bureau of Lands Location Monuments, forty (40) centimeters square by one (1) meter long (40 x 40 x 100 cm.) centered by a galvanized iron spike and level on top, set eighty (80) centimeters in the ground leaving a projection of twenty (20) centimeters above the ground.

d) For corners of tracts of land, subject of the Property Registration Decree (PD 1529), at least fifteen centimeters in diameter by fifty centimeters in length, if cylindrical in form, and fifteen by fifteen by fifty (15 x 15 x 50) centimeters, if parallelepiped in form, set not less than thirty-five (35) centimeters in the ground. The top shall be centered by a galvanized iron spike or by a conical hole not exceeding two (2) centimeters in diameter and not less than one (1) centimeter in depth to define the corner to which measurements shall be made and marked by the letters "P.S." (Private Surveys) for surveys undertaken by geodetic engineers in private practice and "G.S." for surveys undertaken by government geodetic engineers.

e) In the case of the Integrated Social Forestry (ISF) Surveys, the corners of the prominent turns of the boundaries shall be defined by concrete monuments 15 x 15 x 50 cm marked on top "ISF" and the corner number below, and set 40 cm in the ground. The intermediate points of the boundary may be "x" marks on immovable or fixed hard rocks or boulders with exposed surfaces of more than one (1) meter in diameter or trees belonging to the first group.

To define the corners, the same markings shall be made in the case of forest delimitation surveys except that the monument shall be marked on top with "FZ" and the corner number below it and centered by a galvanized iron spike or a conical hole not exceeding two (2) cm. in diameter and not less than one (1) cm in depth. The boundary monuments of forests shall be set not less than five hundred (500) meters apart. (Department Administration Order No. 72, series 1990, and P.D. 705).

f) The delimitation survey of the A & D areas, or classified forest areas, national parks and other protected areas, the boundary shall be marked with parallelepiped concrete markers 15 x 15 x 50 cm and set 35 cm in the ground leaving a projection of 15 cm above the ground and centered by galvanized iron spike. The corner number is engraved on the top. The corners maybe also "X" marks on big immovable boulders with an exposed surface of one (1) m. in diameter or living trees especially along the natural features which define the boundary such as the creeks, rivers, streams, etc. provided that the first and the last corners situated along the natural boundaries shall be marked by concrete monuments. (DAO 72 s-1990)

g) The corners of mining claims shall be marked with parallelepiped concrete monuments 20 x 20 x 50 cm set 40 cm in the ground for the principal corners and cylindrical concrete monuments of 15 cm in diameter x 50 cm long set 40 cm in the ground for the other corners.

The corresponding corner and survey numbers used in the computation of mining claim shall be etched on top of the monument. The corners of the mining claim may also be cement patch on immovable boulders, centered with a hole, spike, or nail and marked with the corresponding corner number and survey number as indicated in the declaration of location. The latitude and longitude of the principal corner shall also be indicated on the sides of the concrete monuments when it coincides with the full one (1) minute and or 1/2 minute latitude and longitude, respectively. (73 MLSR)

When the mining claim undergoing survey adjoins submerged lands, witness corner monuments along the boundary leading the shoreline shall be set on the ground to witness the boundary-point- corner on the claim at the low tide level of the sea or lake. Concrete monuments, galvanized iron spike, fixed rocks, boulders or wooden post shall be set to define the corners of the claim along the shoreline at the low tide level.

h) Similarly, boundaries of the foreshore lands shall be marked as in the preceding paragraph.

i) The corners of the prominent turns of the boundary or reservations or ancestral claims shall be defined by concrete monuments 15 x 15 x 50 cm., set 35 centimeters in the ground, marked on top by appropriate symbol and the corner number below it. The first and last corners situated along natural features (rivers, creek, arroyo) shall be marked with monuments. Intermediate corners along the natural features may be "X" mark etched on large immovable boulders with exposed area of not less than one meter in diameter or on living trees belonging to the first group with diameters of at least fifteen centimeters.

Section 273 - Acceptable living trees when used to define corners shall be blazed at about twenty (20) centimeters above the ground and when possible, by cutting the bark on the side where the boundary line passes.

The blaze shall be at least ten centimeters. A cross shall be chiseled upon the blaze and at the point of intersection of the cross, a galvanized iron spike shall be driven to indicate the corner to which measurement shall be made.

Section 274 - When concrete posts, masonry, concrete walls, immovable rocks or boulders are used, the corner shall be defined by a galvanized iron spike driven into the structure to which measurement shall be made. If for any reason it is not feasible to drive a galvanized iron spike into a structure, the corner shall be defined by a cross (x) mark chiseled upon such structure.

Section 275 - When metal pipes having an outside diameter greater than two (2) centimeters are used, such pipes shall be filled with concrete and the corner shall be defined either by a galvanized iron spike or by a conical hole not exceeding two centimeters in diameter and not less than one centimeter in depth, or by a cross (x) mark chiseled on the concrete top.

Section 276 - When a cross (x) is used to define a corner, such mark shall be chiseled to a depth of at least five (5) millimeters. Each arm of the cross shall be, whenever possible, not less than five (5) centimeters in length and the point of intersection of the arms shall define the corner to which measurement shall be made.

Section 277 - When a corner is inaccessible, its position shall be defined by two witness monuments each of which shall be placed as near as possible to the inaccessible corner. The witness monuments and the inaccessible corner shall be considered as corners of the tract surveyed.

Section 278 - All witness monuments shall be identical in nature to corner monuments as prescribed in Section 270.

Section 279 - Wooden posts of narra, ipil, molave, yacal or any other durable hardwood of not less than fifteen centimeters in diameter forming part of a house, a fence or other permanent structure may be used as corner markers when such posts are situated at the corner of a tract to be surveyed. This corner shall be defined by a galvanized iron spike set at the center of a cross to be marked thereon.

Section 280 - The galvanized iron spike used to indicate corners shall preferably be at least one centimeter in diameter and eight centimeters in length driven flush or level to the surface of the monuments or objects used.

MANUFACTURE OF CONCRETE MONUMENTS

Section 281 - The political boundary and location monuments shall be constructed at the place where such monuments can be established permanently. The names of the political subdivisions shall be inscribed at the corresponding sides of the political boundary monuments. The monument shall be in the form of a frustum of a quadrangular pyramid as per design of the Land Management Bureau. As much as possible, sub-surface marks shall be established to define its permanency for future surveys.

Section 282 - Standard concrete monuments shall be made of the following mixture:

Cement	-	1 part
Sand	-	2 parts
Gravel or broken stone	-	4 parts

or such other proportions as may be necessary to insure the best results, depending upon the quality of the cement and sand used. Sand and gravel must be clean, free from dust or mud or other organic matter.

Section 283 - Concrete monuments shall be marked on top with engraved letters such as G.S., P.S., I.S.F., F.Z., or such other letters designated according to their use.

CORNERS WHICH SHALL BE MONUMENTED

Section 284 - Whenever conditions permit, all corners, except those otherwise provided, shall be defined by monuments of the nature specified in Section 272.

Section 285 - Other corners except the first and the last, situated near natural boundaries, such as the high tide line of seashores, lakes, etc., the banks of rivers, ravines, streams etc., and ditches which are one meter or more in width used for irrigation or other purposes, may be defined by large stones, rocks, boulders and trees of specification below the requirement of Section 270, if monuments of permanent nature are not available. In the absence of these objects, wooden stakes as specified in Section 279 may be used to define such corners.

Section 286 - The first and last corners situated near natural boundaries shall be monumented whenever possible; otherwise, witness monuments for these corners shall be placed in accordance with the requirements of Sections 277 and 278.

Section 287 - Acceptable living trees, fixed rocks or boulders, or galvanized metal pipes may be used to define the corners when the tract undergoing survey is an island or is surrounded by natural boundaries and it is not practical to use standard concrete monuments.

Section 288- Boundary lines of parcels shall be marked with concrete monuments at intervals not to exceed five hundred (500) meters in length. In forest delimitation surveys pursuant to P.D. 705, boundaries between forests and alienable and disposable land shall be clearly marked and maintained on the ground with infrastructure road, or concrete monuments or with acceptable visible markers to ensure protection of the forests. However, in other surveys when such boundary lines pass through mountains or hills or rolling country the intervals between consecutive monuments should be inter-visible.

The corners at prominent turns of the boundaries inside classified forestlands shall be defined by monuments of permanent nature described in Section 272 and the other corners thereof may be defined by monuments as specified in Section 270.

Section 289 - Corners which are common to two or more adjoining properties shall be defined by monuments of the nature specified in Section 270.

Section 290 - When the boundary line follows the direction of irregular rice land dikes, monuments shall be placed at the corners situated within an average interval of not to exceed twenty-five meters measured directly from monument to monument. The intermediate points may be marked by wooden post, stakes or any kind of stones.

Section 291 - In isolated surveys, corners of previous survey which were not monumented at the time of survey and which are common to the property undergoing survey shall be monumented. In relocating the position of the corner to be monumented, the data of the previous survey shall be used.

Section 292 - Curvilinear walls of stones, concrete, etc. defining boundaries of properties shall be marked by galvanized iron spikes set at intervals depending upon the degree of curvature of such walls so as to form chords not less than one meter in length.

Section 293 - In the case of housing subdivision projects, the block corners shall be marked with permanent concrete monuments in accordance with Section 272 (d) and surveyed in accordance with Section 560 to 571.

Section 294 - In cases which are not provided for in this Manual, geodetic engineers may use and place monuments in the manner which in their opinion shall be best. Such cases shall be fully stated in their field notes. In public land subdivision surveys within areas planted to trees, geodetic engineers shall use only concrete monuments or living edible fruit trees or trees belonging to the first group as corners,

Section 295 - To insure uniformity in the description of corners, the following outline is suggested:

a) Concrete monument 15 centimeters in diameter by 50 centimeters set 35 centimeters in the ground leaving a projection of fifteen(15) centimeters above the ground marked P.S., G.S., I.S.F., F.Z., on top.

b) Standard PS Cylindrical concrete monument 15 x 50 centimeters set 40 centimeters in the ground, (marked P.S., G.S., I.S.F., or F.Z., on top.

c) Fixed rock or boulder with exposed surface of more than 1 meter diameter marked with a cross (x) centered with galvanized iron spike.

d) A _____ tree _____ centimeters in diameter with a galvanized iron spike _____ centimeters above the ground.

e) A _____ post _____ by _____ centimeters with a galvanized iron spike _____ centimeters above the ground.

f) Galvanized iron spike in cross marked on _____ fence or wall.

g) Stake or Peg.

In general, the description of corners shall be as brief as possible, definite and devoid of ambiguity.

PUBLIC HIGHWAYS AND RAILWAYS

Section 296 - The Department of Public Works and Highways shall be consulted on the widths and center lines of existing public highways or roads or those to be constructed.

Section 297 - The Sangguniang Bayan and Sangguniang Barangay shall be consulted on the minimum widths of municipal and barangay roads.

Section 298 - The Local Government Planning and Development Office shall be consulted on the minimum widths of roadways within residential subdivisions.

Section 299 - The railway company shall be consulted on the railroad right-of-way.

Section 300 - Right-of-way of highways or railways shall be monumented as follows:

a) The points of curvature (P.C.) and points of tangency (P.T.) shall be marked with monuments provided in Section 272.

b) The points along the curve need not be monumented unless expressly desired by the owners or claimants. The position of points along the curve shall be determined by computation using the standard metric curve of twenty meter chord.

Section 301 - Owners or claimants of land adjoining a public highway or street shall be advised of the minimum right-of-way measured from lot line to lot line for that particular street or highway as provided in Sections 296 to 298.

Legitimate efforts shall be exerted to inform survey applicants of the importance of accepting the right-of-way lines as the boundary of their properties.

Section 302 - When the claimant insists upon his right to a portion of the proposed right-of-way, the area claimed by him shall be surveyed and indicated as a separate parcel, but monuments shall be placed only upon the right-of-way lines. If the public highway is unimproved and the District Engineer or his authorized agent fails to establish the center line of the right-of-way, the geodetic engineer shall locate the boundary of the land as pointed out by the survey applicant, stating the fact in the field notes and Geodetic Engineer's Certificate.

Section 303 - When the boundary adjoins private roads, the owner of such roads shall be notified of the survey. Monuments shall be placed along the common boundary of the property undergoing survey and the private road. The width of the road and the name of the owner shall be indicated in the field notes, plans and certificate of survey.

Section 304 - When the property undergoing survey adjoins a railroad right-of-way, the railroad company shall be notified and requested to show the extent of the right-of-way. Monuments shall be established at the points of intersection between the right-of-way lines and the boundaries of the property and along the tangent or curve of the right-of-way, as provided by Section 300.

CHAPTER VI - PHYSIOGRAPHIC FEATURES

Section 305 - For the purpose of this Manual, the following are defined:

a) An arroyo shall be any narrow natural bed or channel through which the water flows continuously or intermittently throughout the year.

b) An estero shall be any bed or channel through which stagnant, dirty or salt water flows under the influence of the tides.

c) A creek is a stream of water longer than a brook that empties into the river.

d) A river shall be any wide natural bed or channel through which water flows continuously or intermittently throughout the year.

e) A lake shall be a considerable inland body of standing water, also an expanded part of a river.

f) A pond is a body of water naturally or artificially confined and usually smaller than a lake.

g) A pool is a small body of standing or stagnant water.

h) A seacoast is a shore or border of the land adjacent to the sea or ocean.

ARROYOS, ESTEROS AND RIVERS

Section 306 - The classification of streams as arroyos, esteros, creek or rivers is at times difficult as such streams gradually merge into one or the other. In cases of doubt, the local designation or name of the stream shall determine its classification and shall be clearly indicated in the field notes and on the plan of the survey.

Section 307 - The natural bed or channel of arroyos, esteros, creeks or rivers shall be the ground within the banks covered by water during the highest floods which do not cause inundation.

Section 308 - Navigable esteros or rivers shall be those which contain sufficient water to allow rafts, boats, cascos, etc., to float thereon and engage in transportation or other activities.

Section 309 - RA 1273 Amending Section 90 of Act 141 which took effect in June 14, 1955 provides that a strip of forty (40) meters wide starting from the banks on each side of any river or stream shall be demarcated and preserved as permanent timberland; that even after patent or lease contract has been issued no clearing can be done thereon or the same cannot be utilized for farming purposes but shall be planted to trees of economic value.

Section 16(7) and 16(8) of PD 705 dated 19 May 1975 provides that twenty (20) meters strips of land along edge of the normal high waterline of rivers and streams with channels of at least five meters wide; and strips of mangrove or swamplands at least twenty- meters wide along shorelines facing oceans, lakes, and other bodies of water; and strips of land at least twenty meters wide facing lakes are areas needed for forest purposes and are inalienable; and that even if titled, steps shall be taken, if public interest so requires, to have said title cancelled or amended.

Section 310 - Conformably, the extent of surveys near rivers and streams shall be as follows:

a) For lands classified in accordance with R.A. 1273, the boundary lines of surveys shall extend to a line forty (40) meters from the bank on each side of rivers or streams with channels of at least five (5) meters wide.

b) For lands classified pursuant to P. D. 705, the boundary line of survey shall extend to a line twenty (20) meters from the edge of normal high waterline of rivers and streams with channels of not less than five (5) meters wide; twenty (20) meters from the terrestrial limit of a lake being the line reached by its highest ordinary depth.

These strips of land of forty (40) and twenty (20) meters along the edge of the high waterline of river and streams with channels of at least five (5) meters wide are retained as permanent forest for river and stream bank protection. They shall be excluded from the survey, otherwise said survey shall not be accepted.

c) Side shots to points on the bank of stream to show that these strips of land are excluded from the survey shall be indicated in the field notes and computation sheets and plotted on the plan. These points shall be connected in red dotted lines to the traverse stations from which they were observed.

d) A strip of fifteen (15) meters in width on each side of the centerlines of trails and roads which are reserved for right-of-way and timber outlet should be set on the ground, and indicated in the field notes and on the plan.

e) The corresponding land classification maps shall be consulted by the Geodetic Engineer for information on the width of bank protection to be excluded from the survey, the strip preserved for road right-of-way and timber outlet.

Section 311 - In addition to the twenty or forty meters stream bank protection, streams having natural beds or channels five (5) meters or more in width shall be excluded from the boundaries of the property undergoing survey. Likewise, streams less than five (5) meters in width through which water flows continuously shall be excluded from the survey.

Section 312 - Strips of lands at least twenty (20) meters wide, along shorelines facing oceans, lakes, and other bodies of waters which are needed for forest purposes, shall likewise be excluded from the survey in accordance with Section 16 of P.D. 705 (Forestry Reform Code).

Section 313 - The field notes and plans of the tract undergoing survey which adjoins or near irrigation ditches, creeks, arroyos, esteros, rivers, etc. shall indicate the following:

a) The widths of the body of water.

b) Whether it is navigable or not.

c) Whether right or left bank, with the observer facing downstream.

d) The direction of the flow of water by an arrow.

e) The distance in meters from the bank of the river or creek to the lot line.

Section 314 - Private claims, temporary or permanent structure or other works which prevent the free use of the easement mentioned in Section 322 shall be definitely located on the ground and indicated in the fieldnotes and on the survey plans.

LAKES, PONDS, AND POOLS

Section 315 - The boundaries of properties bordering lakes, ponds or pools, whether navigable or non-navigable, shall be located and surveyed. The bodies of water which are entirely included in the property or estates shall be approximately sketched and the area and name shall be indicated on the plan of the survey.

Section 316 - The ownership or name of claimant of the natural bed or basin of lakes, ponds or pools beyond the boundary lines shall be indicated in the survey.

Section 317 - The natural bed or basin of lakes, ponds or pools is the ground covered by the water when at their greatest ordinary depth.

Section 318 - Private claims located along the shores of Laguna de Bay or other similar lakes, the waters of which advance or recede with changes of the season, shall be surveyed up to the boundary line twenty (20) meters from the high-water mark at the time of greatest depth of water. The shore line at the time of survey and the high-water mark at the time of the greatest depth of water shall be located and indicated in the fieldnotes and on the plan of the survey.

Section 319 - The municipal authorities and the LLDA in the case of Laguna de Bay shall be requested to indicate the shore line of adjoining shallow lakes and marshes used mainly as municipal fishponds.

SEACOAST

Section 320 - The boundary line of lands bordering the sea or its arms shall be the shoreline which is the line reached by the highest equinoctial tide.

Section 321 - When the tide line is not be distinguishable, the boundary line shall extend to the limit reached by the sea water during ordinary tempest or storms.

Section 322 - Private claims, permanent structures or other artificial works which extend seaward beyond the shore line or which will interfere with the easement or salvage or coast police zone shall be accurately located and indicated in the fieldnotes and plans of the survey.

EASEMENTS, SALVAGE ZONES AND BANK PROTECTION

Section 323 - For the purpose of recreation, navigation, floatage, fishing and salvage, the banks of esteros, arroyos, creeks and rivers throughout their entire lengths, situated in urban areas, agricultural areas, and forested areas shall be subject to the three meter, twenty-meter, and forty-meter easement of public use, respectively. The shorelines of seas and lakes, throughout their entire lengths are subject to twenty-meter easement pursuant to P.D. 705.

Section 324 - Lands bordering the seas, gulfs, bays, or ports are subject to easements of salvage zone of twenty meters measured landward from the interior limit of the shoreline and an easement of coast police of six meters wide from the shoreline within the salvage zone. The easement of coast police is the obligation to leave a right of way six meters wide within the salvage zone.

Section 325 - In surveying lands which border esteros, rivers, navigable lakes, the sea or its arms, the geodetic engineer shall locate on the ground and indicate in the field notes and plans of the survey the easements for public use as defined in the preceding Sections 323 and 324 except when they are within the strip of forty meters for bank protection which is excluded from the survey as provided for in Sections 309 to 312.

In subdividing decreed or titled properties, these easement and river bank protections shall be surveyed as separate lot and is inalienable.

CHAPTER VII - SURVEY COMPUTATIONS

GENERAL REQUIREMENTS

Section 326 - All computations from the field data of astronomical observations, survey controls, lot surveys, transformation etc. shall be made on forms prescribed by the Lands Management Bureau using standard mathematical formulas in surveying books and within the limits of accuracy prescribed in this Manual or as may be issued hereafter.

Section 327 - All survey computations shall be done on LMB prescribed forms for:

a) Logarithms

b) Natural functions and mechanical calculators

c) Scientific calculators

d) Programmable calculators

e) Microcomputers

Computations done with (a), (b), (c), (d) shall be duplicated in accordance with Section 333. When calculators are used, the brand and model shall be entered in the computation form.

Section 328 - When the computations are to be done on a micro-computer, the LMB prescribed format or a pre-approved format design submitted by the geodetic engineer shall be used. Computations shall be on 2- ply, 70 gsm or substance 20 plain bond computer tabulating stock form of the prescribed size. The name, brand and model of the microcomputer shall be indicated on the form. Preferably, the program on a diskette shall be submitted with the survey returns.

Section 329 - Hard pencils of good quality of the "2-H" degree of hardness shall be used in all computations so that the figures will withstand considerable handling without being blurred or erased.

Section 330 - The blanks on the headings of computation forms for the class of survey, name and address of applicant, location of land (barangay, municipality, city, province), reference page to field notes, station occupied, etc. shall be properly filled in.

Section 331 - All figures shall be written in a clear and legible handwriting and computation sheets shall be kept clean. Illegible figures and crumpled or soiled computation sheets shall not be accepted.

Section 332 - The following rule of approximation shall be used in all cases of logarithms, distances or numbers required in computation, whether the final number is in the unit's, tenth's, hundredth's, thousandth's or any other decimal place. Rounding off values are as follows:

a) Digit to be rounded off is less than 5. When the digit to be rounded off is less than 5, leave the preceding digit unchanged. Thus 2.1234 becomes 2.123 when rounded to the nearest thousandth, 2.12 to the nearest hundredth, and 2.1 to the nearest tenth.

b) Digit to be rounded off is equal to 5. When the digit to be dropped is 5, the preceding digit is unaltered, if it is even and increased by 1 if it is odd. Thus 20.485 becomes 20.48 and 20.475 becomes 20.48.

c) Digit to be rounded off is greater than 5. When the digit to be dropped is greater than 5, add 1 to the preceding digit. Thus, 35.6874 becomes 35.69. Also, 35.6754 becomes 35.68.

Section 333 - All computations shall be duplicated, except when provided otherwise, the original and duplicate computations shall be made independently by different computers. The final checking of the original and duplicate computations shall be made by comparing them. When the same person has to perform the computations, he shall use different formulas or methods to check the results obtained.

Section 334 - A pencil check shall be placed at the foot of each column to indicate that the data in that column have been checked by comparison of the original and duplicate computations.

Section 335 - The persons who perform the various computations and checking shall sign their full names and dates of computation or checking in the respective blanks provided for in the computation forms.

SURVEY CONTROLS COMPUTATIONS

Section 336 - All controls computations shall be made on authorized L.M.B. Forms.

Section 337 - In the case of traverse controls, if the algebraic sum of the north and south latitudes and/or the east and west departures is not zero and if the linear error of closure is within the allowable limit as prescribed for controls computations the traverse shall be balanced as follows:

(a) For latitudes:

The correction to be applied to the latitude is to the latitude of the line as the total error in latitudes (or algebraic sum of N and S latitudes) is to the absolute sum of all the latitudes.

(b) For departures:

The correction to be applied to the departure is to the departure of the line as the total error in departures (or algebraic sum of E and W departures) is to the absolute sum of all the departures.

Each correction shall be applied to increase or decrease the latitude or departure so as to finally eliminate the errors after balancing.

Section 338 - Other methods of adjustments may be used such as the Transit rule, compass rule, the Crandall Method, or least squares method. In certain cases, the traverse may be balanced arbitrarily in accordance with the recommendation of the geodetic engineer.

Section 339 - The errors in latitudes and departures, the perimeter, linear and relative errors of closure shall be computed and indicated at the end of each traverse computations and on the spaces provided therefor.

Section 340 - In isolated land surveys, the traverse shall be computed and closed and the relative error of closure shall be determined before leaving the place of survey.

LOT DATA COMPUTATIONS

Section 341 - Lot data computations shall be made on the prescribed DENR format. (See Annex B)

Section 342 - The computation for astronomical azimuth, traverse, lot data and area shall be made in the L.M.B. forms designed for (a) logarithmic method, (b) natural functions and mechanical calculators, (c) scientific calculators, (d) programmable pocket calculators, and (e) microcomputers.

Section 343 - At least one direct tie line to corner one of each lot from a reference location monument shall be computed at the beginning of the computations. In cadastral or public land subdivision surveys, all tie lines shall be computed from the nearest Location Monument.

COMPUTATIONS OF TRIANGULATIONS, INTERSECTION AND OTHERS

Section 344 - All traverse triangulations and intersections shall be sketched and computed on authorized L.M.B. forms.

Section 345 - In triangulation control computation the following procedure shall be followed:

a) Prepare the abstracts of directions from the field notes.

b) Prepare the lists of directions from the abstract of directions.

c) Determine the observed angles from the lists of directions and transfer the data to the triangle computation form for the computations of the sides of the triangles using the plane angles.

d) Adjust the triangle closure error either by the method of simple triangle adjustment or quadrilateral adjustment as required.

e) Derive the grid or true azimuths as the case may be for all the lines of the triangulation control.

f) Transfer the data of triangle sides and the azimuths derived in (e) on the control/traverse computation sheets.

g) Compute, adjust and coordinate the triangulation control in accordance with Sections 189 to 205.

Section 346 - The computation sheets shall be kept properly arranged to facilitate reference whenever needed and shall show the steps taken in the solution of the problem. In a control consisting of traverse and triangulation caution should be taken to ensure that the triangulation control is adjusted independently of the traverse.

Section 347 - The computations for geodetic positions, least square adjustment of triangulation control and all other similar computations shall be carefully verified. In the form for intersection computation, the formula (either the sine or tangent formula) that will give the best result shall be used.

Section 348 - When the scheme of quadrilaterals is adopted to control a project, the quadrilateral adjustment outlined in authorized LMB forms shall be used. All computations shall be performed on this form to insure uniformity of procedures and to facilitate the verification.

CHAPTER VIII - MAPS AND PLANS OF SURVEYS

STANDARD BASE MAPS

Section 349 - Maps and plans of all land surveys in the Philippines shall be plotted on appropriate standard base maps projected upon spheroidal quadrangles of Clarke's spheroid of 1866.

Section 350 - The standard base maps of the Philippines shall be classified into cadastral maps, barangay boundary and index maps, municipal boundary and index maps, municipal, provincial, and regional base maps.

CADASTRAL MAPS

Section 351- The cadastral maps shall comprise areas within spheroidal quadrangle of one minute of arc in latitude and one minute of arc in longitude and shall be drawn in the Philippine Plane Coordinates System (PPCS)-PRS 92 to the standard scale of 1:4000 on drafting material of stable base of uniform size of approximately 54 x 54 centimeters. Sectional cadastral maps shall be drawn on larger scales on the same material and of the same size as the standard cadastral maps to show tracts of land which otherwise will appear too small on the standard scale of 1:4000.

The sectional cadastral maps shall be in the scale of 1:2,000; 1:1,000; 1:500; 1:250 and shall comprise areas within spheroidal quadrangles of thirty seconds, fifteen seconds, seven and one half seconds or three and three-fourths seconds of arc, respectively.

SYSTEM OF NUMBERING OF CADASTRAL MAPS

Section 352 - The extreme west and east meridians and the extreme south and north parallels of cadastral map in the scale of 1:4000 shall be full minute meridians and parallels, respectively.

Section 353 - The latitude and longitude of the point of intersection of the extreme west meridian and extreme south parallel of each spheroidal quadrangle shall be used to designate the corresponding map number of the quadrangle. If the latitude and longitude of the point of intersection of the extreme west meridian and extreme south parallel of the map are 14 deg. 49 min. N and 120 deg. 54 min. E, respectively, the map shall be numbered as follows:

CM 14°49'N - 120°54'E.

Sectional cadastral maps in the scale of 1:2000 may be prepared to indicate the NW, NE, SE and SW section of the standard cadastral maps and shall be numbered, respectively as follows:

NW Quadrant CM 14°49' N - 120°54' E sec. 1

NE Quadrant	CM	14°49' N - 120°54' E	sec. 2
SE Quadrant	CM	14°49' N - 120°54' E	sec. 3
SW Quadrant	CM	14°49' N - 120°54' E	sec. 4

Sectional cadastral maps in the scale of 1:1000 may be prepared to indicate NW, NE, SE and SW quadrant sections of the sectional cadastral maps of scale 1:2000 and shall be numbered, respectively, as follows:

NW Quadrant	CM	14°49' N - 120°54'E	sec. 1-A
NE Quadrant	CM	14°49' N - 120°54'E	sec. 1-B
SE Quadrant	CM	14°49' N - 120°54'E	sec. 1-C
SW Quadrant	CM	14°49' N - 120°54'E	sec. 1-D

Sectional cadastral maps in the scale 1:500 may be prepared to indicate NW, NE, SE and SW quadrant sections of the sectional cadastral map of scale 1:1000 and shall be numbered, respectively, as follows:

NW Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NW
NE Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NE
SE Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-SE
SW Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-SW

Sectional cadastral maps in the scale of 1:250 may be prepared to indicate the NW, NE, SE and SW sections of the sectional cadastral map of scale 1:500 and shall be numbered, respectively, as follows:

NW Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NW-1
NE Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NW-2
SE Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NW-3
SW Quadrant	CM	14°49' N - 120°54' E	sec. 1-A-NW-4

Other sectional cadastral maps on larger scale may be likewise prepared. The general rule in numbering sectional cadastral map is as follows:

The first sectional cadastral map number shall be assigned to the top-left (NW) quadrant; the second, to the top-right (NE) quadrant; the third, to the bottom-right (SE) quadrant and the last, to the bottom-left (SW) quadrant.

Section 354 - Contiguous cadastral maps (CCM), consisting of four or sixteen sheets, shall be drawn on a single sheet of the same material and size as the standard cadastral map in the scale of 1:8,000 or 1:16,000, respectively, to show parcels which would be too big on the standard scale of 1:4,000. The cadastral map number of the extreme southwestern cadastral map shall be used to designate the contiguous cadastral map number. If the extreme southwestern cadastral map number is CM14°24' N-120°36'E, the contiguous cadastral map number is CCM14°24'N - 120°36'E, scale 1:8,000 or CCM14°24'N - 120°36'E, scale 1:16,000.

Section 355 - The map numbers of adjacent cadastral maps, whether standard, sectional or contiguous, shall be indicated on the left side of the quadrangle below the lower marginal line of each cadastral map.

BARANGAY BOUNDARY AND INDEX MAPS AND MUNICIPAL BOUNDARY AND INDEX MAPS

Section 356 - Barangay Boundary and Index Maps (BBIM) and Municipal Boundary and Index Maps (MBIM) shall be prepared and drawn in the grid system on drafting material of stable base and of uniform size of 54 x 54 centimeters, using a scale based on the maximum differences in northings or in eastings, which ever is bigger, tabulated as follows:

Maximum Difference in Coordinates	Scale to be Used
0 to 2400	1: 8000
2400 to 3600	1: 12000
3600 to 4800	1: 16000
4800 to 6000	1: 20000
6000 to 9000	1: 30000
9000 to 12000	1: 40000
12000 to 18000	1: 60000
18000 to 24000	1: 80000
24000 to 30000	1:100000
30000 to 36000	1:120000
36000 to 45000	1:150000
45000 to 60000	1:200000
60000 to 75000	1:250000
75000 to 90000	1:300000

MUNICIPAL BASE MAPS

Section 357 - Municipal base maps shall be prepared and kept up-to-date for each city, municipality or municipal districts. They shall comprise areas within spheroidal quadrangle of 15 minutes of arc in latitude and 10 minutes of arc in longitude. This shall be drawn in the Philippine Plane Coordinate System/PRS 92 to a standard scale of 1:60,000 on drafting materials of stable base and of uniform size of approximately 54 x 54 centimeters.

Section 358 - All information derived from approved surveys shall be plotted on the municipal base map/s of each municipality. Boundaries of Barangays and other municipalities/municipal district and cities as well as other relevant information that may be available from other sources shall be plotted thereon.

PROVINCIAL BASE MAPS

Section 359 - Provincial Base Map/s shall be prepared and kept up-to-date for each province. They shall comprise areas within spheroidal quadrangles of one degree and thirty minutes of arc in latitude and one degree of arc in longitude. This shall be drawn in the Philippine Plane Coordinate System/PRS 92 to a standard scale of 1:400,000 on drafting materials of stable base and of uniform size of approximately 54 x 54 centimeters.

Section 360 - All information derived from approved survey projects shall be plotted in the provincial base map/s of each province. Boundaries of municipalities and of the province as well as other relevant information that may be available from other sources shall also be plotted thereon.

REGIONAL BASE MAPS

Section 361 - Regional Base Map/s shall be prepared and kept up- to-date for each region. They shall comprise areas within spheroidal quadrangles of six degrees in latitude and four degrees in longitude. This shall be drawn in the Traverse Mercator projection to a standard scale of 1:800, 000 on drafting material of stable base and of uniform size approximately 104 x 104 centimeters.

Section 362 - All relevant information derived from approved survey projects shall be plotted in the Regional base map/s of each region. Boundaries of provinces and of the region as well as other relevant information that may be available from other sources shall also be plotted thereon.

PROJECTION MAPS

Section 363 - Provisional cadastral maps, also known as projection maps, shall comprise areas within spheroidal quadrangles of one minute of arc in latitude and one minute of arc in longitude and shall be prepared in a scale of 1:4000 by using the length of minutes and seconds of arc of parallel and meridian passing through the BLLM No. 1 of the municipality or locality which is established as the point of reference for all surveys therein.

Section 364 - The extreme west and east meridians and the extreme south and north parallels of each standard projection map shall be full minute of arc.

Section 365 - The latitude and longitude of the point of intersection of the extreme west meridian and the extreme south parallel of each spheroidal quadrangle shall be used to designate the corresponding number of the projection map. If the latitude is 13°51'N and the longitude is 120°51'E corresponding to the said point of intersection, the projection map shall be numbered as follows:

PM 13°51'N - 120°51'E.

Section 366 - All isolated land surveys shall be plotted in pencil on the projection maps prior to its approval by the Regional Technical Director of Land. In the case of cadastrally surveyed municipalities, the cadastral maps shall be used as the projection maps.

Section 367 - When a municipality is surveyed as a cadastral project, its projection maps shall be used as reference in the preparation of the cadastral maps.

Section 368 - For map control purposes, the map assignments per agency and the scales and sizes at which the maps are to be produced are as listed: (DAO 72 series of 1990)

Agency	Maps/Plans	Maps Size	Scale	Remarks
a. Lands Service	Cadastral Maps	54 x 54 cm.	1:4000	Presently being adopted
			1:2000	Sectoral map being adopted
			1:1000	-do-
			1:500	-do-
			1:250	-do-
	Barangay Municipal Index Maps (BBIM, MBIM)	54 x 54 cm.	1:4000 and its derivatives	being adopted
	Isolated Survey Plan	42 x 54 cm.	1:100 and its derivatives	For titling
b. Mines Service	Geologic Map	75 x 55 cm.	1:50000	Presently being adopted
	Mineral Land Survey Map	54 x 54 cm.	1:250000	-do-
	Phil. Mineral Rights Master Maps	60 x 75 cm.	1:250000	-do-
c. Forestry Service	Integrated Social Forestry Maps	54 x 54 cm.	1:4000	-do- except standard size
	Forest License Maps	54 x 54 cm.	1:1000 and its derivatives	-do-
d. NAMRIA	Land Classification	Variable	1:25000	Presently being adopted (previously on scale 1:20000)

e. Parks & Wildlife Service	1. National Park	Variable	1:50000	Presently adopted
	2. Marine Park Map	-do-	-do-	-do-
	3. Marine Reserve Map	-do-	-do-	-do-
	4. Game Refuge and Bird Sanctuary Map	-do-	-do-	-do-
	5. Municipal/ Boundary Tree Park	21 x 33 cm.	1:500	-do-

MAPS AND PLANS FOR REGISTRATION PROCEEDINGS

Section 369 - The cadastral maps on which the results of cadastral surveys are drawn shall be reproduced for cadastral registration purposes.

Section 370 - All plans of isolated surveys which shall be used for administrative or judicial registration purposes shall be drawn on DENR-LMB prescribed format. If, however, the plans were prepared using a computerized method, the Geodetic Engineer must secure authority from LMB.

COORDINATE LINES AND SCALES FOR ISOLATED SURVEYS

Section 371 - Vertical and horizontal center lines of plane coordinates divisible by five shall be accurately drawn on the original plan and inked in red.

Section 372 - The latitude and longitude lines of corner 1 of a lot or any corner 1 of a group of adjoining lots shall be drawn in fine black ink on the original survey plan in the following manner:

(a) The latitude line shall be drawn horizontally from left to the right marginal lines through corner one. The corresponding northings based on BLLM No. 1 shall be written above and along the latitude line from the left hand border line of the plan towards the right; while the geographic latitude shall be indicated below the northing.

(b) The longitude line shall be drawn vertically from the top to the bottom marginal lines through corner 1. The easting based on BLLM No. 1. shall be written on the left side of and along the longitude line from the bottom border line towards the top; while the geographic longitude shall be indicated opposite the easting on the other side of longitude line.

Section 373 - The scale to be used in plotting surveys shall depend on the difference in the northings of the extreme north and south corners or in the eastings of the extreme east and west corners of the lots, whichever is bigger, as follows:

Scale to be Used	Maximum Difference in Coordinates
1 100	0 to 30 meters
1 200	30 to 60 meters
1 300	60 to 90 meters
1 400	90 to 120 meters
1 500	120 to 150 meters
1 600	150 to 180 meters
1 800	180 to 240 meters
1 1000	240 to 300 meters
1 2000	300 to 600 meters
1 3000	600 to 900 meters
1 4000	900 to 1200 meters
1 5000	1200 to 1500 meters
1 6000	1500 to 1800 meters
1 8000	1800 to 2400 meters
1 10000	2400 to 3000 meters

The lot shall be centered and plotted on the plan so that its extreme corners shall not be less than four centimeters from each marginal line when using any of the scale provided above.

Section 374 - When the maximum coordinate difference exceeds three thousand meters, the plan shall be drawn on scales which are exact multiples of 1:4,000, such as 1:12,000, 1:16,000, etc. If any of these scales would make the length of the property lines generally less than one-half centimeter, the survey shall be plotted on more than one sheet using an appropriate scale.

In plotting one whole big parcel on more than one sheet, the parcel shall be divided into convenient portions, each to be centered and plotted on the sheet in accordance with Section 373 noting thereon the numbers of the adjoining sheets.

Section 375 - When a parcel is divided into many small lots, which, if plotted using any one of the largest possible scales mentioned in Section 373 would result in diminutive geometrical figures, the subdivision plan shall be prepared on two or more sheets on a uniform scale with each of its portions centered on the sheet in accordance with Section 374. The numbers of the sheets on which the other portions of the subdivisions are plotted, shall be properly indicated on the plan.

Section 376 - One plan for each parcel, tract or lot in isolated land surveys shall be prepared to a scale in accordance with Section 373.

Section 377 - Long narrow tracts such as highways, railways, canals, etc. may be plotted by dividing the tract into sections and plotting the sections on two or more plans.

DETAILS TO BE SHOWN ON PLANS OF ISOLATED LAND SURVEYS

Section 378 - The plans shall be clearly and neatly drawn in drawing ink and shall show the following:

a) The boundaries of the property in full black ink lines heavier than those of adjoining properties. Permanent walls along boundaries shall be drawn by conventional symbols.

b) The line from the lot corner to the control stations from which side shots were taken, by dotted red ink lines.

c) The relative position of adjoining surveyed properties, indicating by dotted lines the boundaries between them and the names of all adjoining owners and all important improvements, roads, and streams, etc., including the width, in black ink.

d) The corners indicated by small circles two millimeters in diameter drawn in black ink and their respective descriptions noted.

e) The boundary lines with corresponding bearings and distances in black ink.

f) Tie line of corner 1 from reference control point in thin black line with bearing and distance.

g) Horizontal (latitude) and vertical (longitude) lines passing through corner 1 in thin black line and the geographic and cartesian (grid) coordinates in PPCS-TM/PRS 92 indicated in black ink.

Bearings and distances of the survey shall be tabulated on the plan when these are too numerous to be drawn or shown clearly along or near the boundary lines. When there are more than fifty lots on the plans, lot descriptions thereof shall be prepared on LMB authorized forms.

In the case of subdivision or consolidation subdivision surveys, the boundary data of the lot being subdivided, or of the lots being consolidated - subdivided shall be tabulated in black ink in a boxed portion at the upper-left corner.

For uniformity in the preparation of isolated survey plans, only information that cannot be inscribed on the plan shall be indicated on the space provided for "Notes" at the bottom left corner. These are:

1. Description of corners as:

   a) All corners marked "P.S." are cylindrical concrete monuments 15 x 50 centimeters.

   b) All corners not otherwise described are stakes (or pegs, or "X" on boulders, or concrete nail on wall or tree).

2. Adverse claims as:

   a) Lot 2 is claimed by Edgar Barraca

   b) Lot 3 is a portion of Psu-10001 as surveyed for Ivy Reyes.

3. Relation with any cadastral or public land subdivision survey project or reservation (if survey is near a known reservation), as:

   a) This survey is outside Cad 69, Pagsanjan Cadastre.

   b) This is outside the non-Christian reservation.

   c) This is outside Fort Bonifacio reservation.

4. If lot is a portion of undecreed cadastral lot, the cadastral lot number pertaining to said portion, as :

   Lot 7 = Lot 5000, Cad-69

5. Classification of lot as:

   a) For survey inside classified/unclassified forest:

      This survey is within classified/unclassified forest and therefore shall not be the basis for registration or titling purposes.

   b) For original survey:

      This survey is inside the alienable and disposable area, Block 1, Project No. 25, Land Classification Map No. 329 for the Province of Laguna.

      The Survey was approved based on the investigation report submitted by Deputy Public Land Investigator _____(name)_____ dated _____.

   c.) For complex subdivision

      This subdivision survey is in conformity with the approved subdivision scheme.

Section 379 - In all lots of isolated land surveys with areas of one hectare or more, the approximate boundary of the area under cultivation and the nature of its vegetation such as rice, pastures, woods, etc. with a brief description of the topographic features such as plain, rolling, hilly or mountainous shall be indicated in light black dotted lines.

For lots less than one hectare in area, a general classification, such as, "residential lot", "home lot", "rice land", "sugar cane land", "commercial lot" shall be indicated on said plans. For a group of lots shown on one plan in diminutive geometrical figures, a notation on the plan regarding the topographic features and/or general classification for each lot is sufficient in both cases.

Irrespective of the area, permanent structures such as buildings with concrete foundation, stone walls, etc., shall be indicated by dotted black lines on the plans and maps.

Section 380 - Plans of isolated land surveys shall be titled thus:

ORIGINAL SURVEY _____	Surveyed: _____	Approved: _____
Cad/Pls/Gss _____		
Lot No. _____	Patent No. _____	Date _____
Decree No. _____	Date _____	LRC Rec. No. ____
OCT No. _____	Dated _____	Issued to _____
TCT No. _____	Dated _____	Issued to _____

PLAN OF LAND
AS SURVEYED FOR
(Name of Claimant)
SITUATED IN THE

RURBAN CODE _____
BARANGAY OF _____
MUN/CITY OF _____
PROVINCE OF _____
ISLAND OF _____
Containing an area of _____ Sq.M.

PPCS-TM/PRS 92 ZONE NO:
BEARINGS :
SCALE :
(GRAPHICAL SCALE)

I hereby certify that this is a correct plan of the survey made by me personally, or under my direct supervision in conformity with the provisions of applicable laws of the Republic of the Philippines and the rules and regulations of the Department of Environment and Natural Resources.

I further certify that this plan accurately indicates the boundaries of the property as indicated to me on the ground by the survey claimant or his authorized representative and that I assume full responsibility for the technical correctness of the survey and the accuracy of monument setting.

Date of Survey:

Geodetic Engineer
Reg. Cert. No._____ Date _____
Lic. No. _____ Date _____

Republic of the Philippines
Department of Environment and Natural Resources
Lands Management Services
Regional Office ____

_____
(Location of Office)

The survey plotted herein is found to be technically correct, as per submitted survey returns of the Geodetic Engineer and therefore recommended for approval.

CHIEF, REGIONAL SURVEYS DIVISION

APPROVED: _____

(This approved plan, however, shall not be construed as title to the land)

REGIONAL TECHNICAL DIRECTOR
FOR LANDS

_____
(Date Submitted)

DATE RETURNED	REASON	RECEIVED BY:

Printed Name & Signature Date

Position verified by: _____
Plotted on PM _____ N _____ E by _____
Field Notes checked by: _____
Computation checked by: _____
Astronomical/Traverse/Lot Data _____
Plotted/Inked by: _____
Traced by: _____
Checked & verified by: _____

The lettering to be used on all plans shall be simple, uniform, mechanical and not ornamental lettering.(322 as amended by LAO 4-14)

Section 381 - When the meridian of the survey coincides with the vertical axis of the plan, all bearings and distances shall be drawn along the boundary lines and parallel thereto. If the line runs S. W. or N. E., the data shall be written to the north-east; if N. W. or S. E., the data shall be written to the south-east; and if due north and due south or due east and due west, the data shall be written to the north, south and east, respectively.

Section 382 - In general, the lot numbers, corner numbers, corner descriptions, notes, titles, etc. shall be drawn parallel to the horizontal axis of the plan.

Section 383 - Geodetic Engineers and Junior Geodetic Engineers shall submit their original plans properly prepared, the masthead filled up, signed and sealed.

TRACING OF PLANS

Section 384 - A copy on reproducible stable material of the original approved plan shall be prepared by the geodetic engineer concerned for approval of the Regional Technical Director for Lands. In lieu thereof, copy/copies of the approved plans as reproduced by any photochemical processes, such as cloth reproducible, micro-film enlargements, polyethylene diazo film white prints, blue prints, etc. may be prepared at the request of the geodetic engineer but the same shall be duly authenticated by the Regional Technical Director for Lands.

SURVEY SYMBOLS

Section 385 - The survey symbols to designate various kinds of surveys shall be those listed in Appendix I.

Section 386 - The survey symbols used for public land surveys provided for in the preceding section shall also be used for public land surveys made by the geodetic engineers in private practice. In such cases, the letter D shall be suffixed to the corresponding survey symbols for the purpose of identification as follows:

Example: Homestead Application No. (XI-1)

a) If executed by a geodetic engineer in the Bureau of Lands, the survey number and symbol will be H-(XI-1) 2425.

b) If executed by a geodetic engineer in private practice, the survey number and symbol will be H-(XI-1) 2425-D.

Section 387 - The application numbers and not the entry number shall be used to designate the corresponding survey numbers of all public land surveys not otherwise numbered.

Section 388 - For the current instruction on the survey symbols and numbers, Lands Management Bureau Circulars or Bulletins shall be consulted.

TECHNICAL DESCRIPTION OF SURVEYS

Section 389 - The technical descriptions of each lot of a survey to describe and identify a piece of land for administrative and ordinary or cadastral land registration proceedings shall contain the following information:

A. For Numerical Cadastre and Isolated Surveys.

1. Bureau of Lands Survey Number
2. Lot number
3. Name of claimants

4. Location of land

5. Legal authority

6. Name of geodetic engineer

7. Description of each corner as marked on the ground

8. Coordinates of Corner 1 (Northing and Easting)

9. Description of point of reference

10. Bearing and distance from point of reference to point 1 of boundary

11. Bearings and distances of boundary lines in consecutive order

12. Area in square meters more or less

13. Names of adjoining owners

14. Meridian used and if applicable, the zone of the grid system

15. Dates of survey and approval

B. For Photo-Cadastral Mapping

1. Lot number

2. Lands Management Bureau case and cadastral project number

3. Name of applicant

4. Location of land

5. Legal authority

6. Name of geodetic engineer

7. Sketch plan of the cadastral lot drawn to scale showing adjoining lot numbers, their claimant, physical features

8. Description of each point of boundary as marked on the ground

9. Approximate area in square meters

10. Names of adjoining owners

11. Meridian used and if applicable, the zone of the grid system

12. Date of monumenting

13. Date of Photography and by whom

14. Description of camera used

15. Date of approval

Section 390 - The technical descriptions of surveys may be prepared by geodetic engineers from the data of the approved plans or maps or they shall be computer-generated by the Lands Management Services of DENR.

Section 391 - Technical description prepared by geodetic engineer in private practice shall be submitted to the Land Management Services of the concerned Region for approval.

Section 392 - The survey claimant shall be furnished by the geodetic engineer concerned with at least three(3) copies of the technical descriptions, the approved reproducible copy of the plan or reproductions thereof duly authenticated by the Regional Technical Director for Lands, and copies of Geodetic Engineers Certificate.

Section 393 - The technical descriptions of survey may be prepared by the Land Management Services of the DENR Regional Office concerned upon payment of the prescribed fees, provided that the technical descriptions of all housing subdivisions and cadastral surveys for titling shall be computer-generated under the Lot Survey Documentation System (LSDS).

PART II

PROVISIONS GOVERNING ISOLATED LAND SURVEYS

CHAPTER IX - GENERAL PROCEDURE

AUTHORITY AND ORDER TO EXECUTE SURVEYS

Section 394 - The Geodetic Engineers of the Department of Environment and Natural Resources shall undertake isolated and other surveys upon receipt of the order issued by DENR officials, as follows:

a) the Secretary in the case of Land Classification or Delimitation surveys and delimitation surveys of areas proposed for reservations and other surveys not otherwise mentioned in (b), (c), (d) and (e) of this section;

b) the Regional Executive Director (RED) in the case of Integrated Social Forestry (ISF) projects; and public land subdivision and cadastral surveys above 1,500 hectares, relocation/delimitation of proclaimed reservations, and political boundary surveys and settlement of boundary disputes;

c) the Regional Technical Director for Lands (RTD/Lands) in the case of public land subdivision, group settlements, and cadastral surveys up to 1,500 hectares;

d) Regional Director of Mines and Geo-Sciences (RD/Mines) in the case of surveys for mineral claims and quarry permits;

e) Community Environment and Natural Resources Officer (CENR Officer) for isolated surveys and subdivision of cadastral and PLS lots covered by public land applications (DAO 38).

Section 395 - Geodetic Engineers and Junior Geodetic Engineers in private practice shall undertake public land surveys only upon receipt of authority and order for survey issued by the DENR Officials stated in the preceding section.

Section 396 - Geodetic engineers shall undertake surveys of private land claims upon request of the owner/claimants thereof. In this case, the owner or claimant shall be required to execute and submit an affidavit stating his muniments of title to the land or the basis on which private ownership is claimed and the particulars thereof. An authenticated copy of the title shall be submitted with the survey returns. In the case of the original survey of private land claims, affidavit(s) of two (2) disinterested persons residing in the barangay where the land is located attesting to his claim shall be submitted to form part of the survey returns.

Section 397 - No survey of any kind shall be undertaken within the classified or unclassified public forest except with an authority/permit issued by the Regional Executive Director. Returns of original surveys of private claims within such area shall not be accepted for verification and approval without such authority/permit. Survey executed within this area shall not be used as a basis for registration or titling purposes.

Section 398 - Upon receipt of an authority and order for survey from the officials stated in Section 394 or of a request from private land owner or claimant, the geodetic engineer shall proceed to undertake the survey in accordance with the general provisions of PART I and the specific provisions of PART II of this Manual which are applicable to the class of survey authorized and ordered to be undertaken.

INVESTIGATION OF ADJOINING CLAIMS

Section 399 - Before commencing the survey, a reconnaissance and sketch of the tract to be surveyed shall be made. The names and addresses of all persons claiming ownership of a part of the entire tract to be surveyed and of adjoining lands shall be obtained.

Section 400- Inquiry shall be made to ascertain whether or not adjoining properties have been granted patent or decreed. If the adjoining properties have been decreed or titled, the holder of the plans and/or certificate of title shall be requested to show the said papers for the purpose of determining the relative positions of the former surveys with the tract to be surveyed.

Section 401 - Geodetic engineers shall, by legitimate means, try to convince the applicant and the adjoining owners to reduce the number of corners of their boundary lines, simplify the boundaries, reduce the field and office work and minimize the cost of survey.

WHO SHALL BE NOTIFIED OF THE SURVEY

Section 402 - The owners, tenants, actual occupants, adverse claimants, barangay officials and in general, anyone possessing or claiming interest on lands adjoining or included in a tract of land to be surveyed shall be duly notified of the survey.

Section 403 - The provincial treasurer and the Provincial Environment and Natural Resources Officer shall be notified in the case of properties claimed or owned by the provincial or the national government which are included in or adjoin the tract to be surveyed.

Section 404 - The city or municipal mayor or treasurer shall be notified in the case of properties claimed or owned by the city or municipality which are included in or adjoin the tract to be surveyed.

Section 405 - The city or municipal engineer shall be notified when the tract to be surveyed includes or adjoins any proposed or actual city or municipal streets. He shall be requested to indicate the position of center lines and desired width of the proposed or actual streets.

Section 406 - The district highway engineer shall be notified when the tract to be surveyed adjoins existing public highways, such as national or provincial roads and shall be requested to indicate the widths and center lines of the roads as established or desired by the Department of Public Works and Highways.

Section 407 - The owners/claimants of private roads shall be notified to indicate the common boundaries of the private road and the tract to be surveyed.

Section 408 - The railroad company and its local agent shall be notified to indicate the railroad right-of-way boundaries which are common to the tract to be surveyed.

Section 409 - When the tract to be surveyed is near an arroyo, estero, river, or any stream five meters or less in width, or an irrigation ditch, the claimant or claimants of the land on the opposite bank of said arroyo, estero, river, stream or irrigation ditch shall be notified of the survey. The names of the parties, thus notified, and the authorized representative of the Department of Public Works and Highways shall be indicated in the proper place on the plans and/or in the geodetic engineer's certificate.

Section 410 - If the nearby arroyo, estero, river or any stream is more than five meters in width and it appears after a diligent inquiry that it is not claimed by any individual or that it is supposed to be of public ownership, the names of the owners or claimants on the opposite bank of the arroyo, estero, river or stream need not be indicated on the plans.

Section 411 - When the boundary of the tract to be surveyed extends to the arroyo less than 5 meters wide, the claimants, if any, of the parcel on the other bank of said arroyo shall be notified of the survey and their names shall be indicated in the proper place on the authorized L.M.B. plans as prescribed in Section 378 and on the geodetic engineer's certificate.

Section 412 - When the tract to be surveyed adjoins a ditch, an irrigation canal or any other man-made channel, the claimant of said man-made channel shall be indicated on the plan and geodetic engineer's certificate.

Section 413 - The adjoining owners or claimants shall be notified by messenger or by mail, preferably registered, sufficiently in advance of the time of survey to enable them to appear on the ground at the specified time. The notification shall state the date or dates of survey and the time when the party notified shall be present. Prescribed L.M.B. forms shall be used for notification purposes.

LOT SURVEYS

Section 414 - In isolated surveys, the methods prescribed in Sections 119(c), 220 to 237 for tertiary control shall be used except when otherwise specified in the authority and order for survey or when special instructions are issued upon recommendation of the Director of Lands Management Bureau.

Section 415 - Corners which are not occupied and used as stations of the tertiary traverse shall be located by side shots consisting of the azimuths and distances from the stations which shall be part of a circuit or loop traverse.

Section 416 - The azimuths of side shots shall be read from the instrument to the nearest one minute of arc and the distances shall be measured to the nearest centimeter.

Section 417 - The azimuths when reduced to true bearings shall not differ from the magnetic bearings by an amount greater than the known local variation except in cases when local attraction exists. When local attraction is noted, it shall be stated in the field notes with an explanation of its possible cause. In the Philippines, the maximum local variation exceeds three (3) degrees.

Section 418 - The stadia distance and compass bearing shall be used to check the tape distance and azimuth.

Section 419 - Corners may be located by traverse, triangulation in the manner prescribed in Sections 244 to 245 when such corners cannot be located by side shots. The angle at the corner need not be measured.

Section 420 - Corners may also be located in tertiary surveys as follows:

a) From traverse stations by:

(1) Perpendicular offsets from fixed points on traverse lines.

(2) Two distances, preferably from two successive stations, with sketch in the field notes to identify the point.

b) From established corners of previous surveys by:

(1) Fixed distances from at least two unaltered established corners or markers especially in subdivision of urban lots into two or more lots. The data obtained should appear in the field notes.

Section 421 - Control stations shall be placed as close as possible to corners that cannot be occupied. For residential and agricultural lots, side shots shall not exceed fifty (50) and one hundred (100)meters, respectively.

If any of the above lengths in side shots are exceeded, the computed position of the corner shall be checked within five (5), ten (10), and twenty (20) centimeters for residential, agricultural and marshy lands, respectively, by another side shot from another station.

These limitations, however, shall not apply to EDM equipment for which special instructions shall be issued by the Director of Lands.

Section 422 - All important bends along the banks of streams adjoining the tract to be surveyed shall be located.

Section 423 - When there are several tracts to be surveyed for the survey applicant, each tract shall be assigned a lot number which shall be consecutive from one even if there are several sheets of the plan.

The corners of each tract shall be numbered consecutively from one in a clockwise direction. However, no single lot or tract shall be in more than one city or municipality or barangay.

TIE LINES

Section 424 - (a) Tracts to be surveyed shall be tied by a closed circuit traverse to points of reference as provided in Section 38, if these points are still intact on the ground. However, corner markers of the survey itself, if it is a previously approved/decreed/patented survey, may be used as reference, provided a common point pursuant to Section 432 can be established from at least three (3) available corner markers which could be relied upon as to their permanency and stability. In case no corner markers of a previously approved/ decreed/patented survey can be found on the ground, at least three (3) corner markers of nearby approved/decreed/patented survey may be used as reference provided a common point can be established pursuant to Section 441.

(b) The tie point of the previously approved/decreed/patented survey, in case the same shall be the subject of a subsequent subdivision, consolidation-subdivision or amendment, shall be used as the tie point of the resulting lots. In no case shall the resulting lots be tied to a different tie point except when the tie point of the previously approved survey has been obliterated, destroyed, or moved, that the resulting lots of the subsequent survey shall be tied to nearby reference points as enumerated in Section 38; Provided, that the new tie point and the old tie point are in the same system; provided further that the required Report on the Recovery of Reference Point be submitted together with the survey returns to justify the use of another tie point which is near the project.

(c) For original surveys and resurveys tied or connected to approved/decreed/patented surveys as reference other than the established point of references, the tie point of the reference survey, provided that the reference survey has been verified to be correctly located, shall be used as the tie point of the original survey or resurvey.

(d) Reference points shall be within but not beyond two (2) kilometers from the designated corner 1 of the tract in order to minimize linear error of closure. Cadastral lots shall be tied to the nearest BLLM or other boundary monuments of the cadastral project. In all cases, in executing closed circuit traverse, no traverse line shall exceed 500 meters.

Section 425 - In residential areas, data to show the position of the tract with respect to the block and the names and widths of the streets adjoining the block shall be gathered.

COMMON NATURAL BOUNDARIES

Section 426 - When the common boundary between the tracts to be surveyed and previous survey is an arroyo, estero, river or any stream, and the strip shall be excluded as stated in Sections 310 to 312 the actual position of said body of water shall be surveyed and compared with the former position as determined from the previous survey.

Section 427- When the banks of the arroyo, estero, river or any stream as located in the earlier and later surveys of unregistered land differ considerably in position, causing the existence of small lots formed by intersecting banks, the boundaries of the property undergoing survey along the bank shall be made approximately parallel to those of the earlier survey if the area of any of the small lots does not exceed ten square meters in the case of surveys situated in residential sections of cities, one hundred square meters in the case of surveys situated in residential sections of municipalities and one thousand square meters in the case of surveys of agricultural or other lands situated in other parts of municipalities or cities. The provisions of Section 310 to 314 and Section 315 to 319 shall be observed.

Section 428 - If the areas in conflict are greater than those allowed in the preceding section, such areas shall be considered as contested lots and computations and plans thereof shall be prepared, except when the applicant waives his rights thereto in writing. In which case the boundaries along the bank of the survey in progress may be made approximately parallel to those of the previous survey or the bank of the river observing the exclusion of the strip for bank protection as required by law.

Section 429 - The adjustment of boundaries of tracts separated by arroyo, estero, river or any stream shall be made by making their boundaries along the bank approximately parallel to each other, leaving a clear space as required by law for bank protection.

ADVERSE CLAIMS

Section 430 - All adverse claims which lie entirely or partly within a tract undergoing survey shall be carefully sketched and indicated in the field notes and plan of the survey as separate lots when the adverse claimants do not desire a survey of the claims to be made.

Legitimate efforts shall be exerted to convince the adverse claimants to have their claims surveyed.

Section 431 - When the adverse claims have been previously surveyed or are undergoing survey, such adverse claims shall be considered separate lots and computations and plans thereof shall be prepared accordingly.

Section 432 - Connection of surveys. All surveys shall be adequately connected to existing surveys, or the position of the survey shall be determined by a method that will enable the survey to be shown in relation to existing surveys to an accuracy appropriate to the circumstances. The survey shall be adequately connected to permanent reference points existing in close proximity to the survey.

RELATIVE POSITION OF SURVEYS

Section 433 - The relative position between adjoining or nearby previously approved isolated land surveys and the survey in progress shall be determined by a closed circuit traverse. It shall be checked for azimuth through solar observation from a point of reference as defined in Section 38 and connecting at least three well defined and permanently monumented corners of the previous surveys.

Section 434 - In case less than three monumented corners are located, the owner or claimant of the land previously surveyed shall be requested to indicate the position of three or more corners, which, together with the tie point and the monumented corner or corners found in place, shall be located by a closed circuit or traverse loop.

Section 435 - The corners of a previous survey to which connection is made shall be carefully identified on the ground and described in the field notes.

Section 436 - The traverse connecting the corners of the survey in progress with the previous surveys shall be computed and plotted to determine and show the relative position of the earlier and later surveys.

Section 437 - When the previous survey and the survey in progress do not overlap nor adjoin each other, the boundaries of the survey in progress shall be surveyed as indicated by the applicant thereof.

Section 438 - Disclosure of discrepancies. A Geodetic Engineer shall disclose any doubt or discrepancy associated with a survey, include in the survey records sufficient information to assess its accuracy and give clear descriptions of the located survey marks.

Section 439 - A check survey may be made upon instruction of the Regional Executive Director to ensure that a survey has been performed in accordance with these regulations and to the standards of accuracy prescribed by this Manual.

Section 440 - Where two or more geodetic engineers, are unable to agree that a survey has been performed to the standards of accuracy prescribed in this Manual, any geodetic engineer concerned may report the matter to the Lands Management Services and request that an investigation be made.

If the matter is to be investigated, all geodetic engineers concerned shall be informed of the results of the investigation; if necessary, the Regional Technical Director for Lands shall issue directives to the Geodetic Engineer as to what is required to be done so that the survey in question will be brought to the standards of accuracy prescribed by these regulations.

COMMON POINT

Section 441 - When the previous survey and the survey in progress overlap or adjoin each other, a common point shall be selected from among the corners which have been located. The selection of the corner which shall be adopted as a common point shall depend on the following:

(a) The permanency of the monumented corner as found in the place on the ground.

(b) The degree of precision between the computed positions of the monumented corners as found in place on the ground determined from the data of the previous surveys and of the survey in progress.

(c) In general, a living tree, a boulder or any other object of permanent nature used as corner in the previous survey which is identified beyond doubt in the course of the survey in progress and which is not likely to have been removed from its original place shall be selected as a common point in preference to concrete stone or other monuments which may, with comparative ease, be removed from their original location and placed elsewhere.

Section 442 - When monuments of previous surveys appear to have been moved, such monuments shall be located and the fact recorded in the field notes. Such monuments, if well and firmly fixed in the ground, may be used as witness to the true corners.

Section 443 - When the position of a corner of an earlier survey and its position as determined in a later survey differ by ten centimeters or less in residential areas and thirty centimeters or less in agricultural areas, the position as determined in the earlier survey shall be accepted and adopted as the position of such corner in the later survey.

Section 444 - When the discrepancy in position exceeds the limits set forth in the preceding section, the geodetic engineer shall make such verification as may be necessary to check the data of the survey in question. A complete report on the discrepancies and the results of verification shall be made and submitted to the Director of Lands Management Bureau, through the Regional Technical Director for Lands for decision.

Section 445 - If the recovered corner of the previous survey is not identical to its description in the plan, investigation shall be conducted by the geodetic engineer to ascertain the cause thereof and the result of the investigation shall be reported to the Regional Technical Director for Lands/Director of Lands Management Bureau.

OVERLAPPING OR ADJOINING UNTITLED SURVEYS

Section 446- When a tract undergoing survey adjoins a surveyed property not yet patented or decreed, the common boundary line between the earlier and later surveys need not be resurveyed entirely if the applicant of the tract undergoing survey accepts the corners of the previous survey as common to his property.

Section 447- When the applicant of the tract undergoing survey and the owners or claimants of the adjoining properties agree to a common boundary line different from the boundaries as demarcated in the previous survey, an affidavit to that effect shall be required of each of the parties agreeing to the new common boundary lines which shall be monumented and the costs thereof shall be paid by the interested parties. The plan of the property previously surveyed shall be amended accordingly.

Section 448- When the applicant of the property undergoing survey does not accept the corners of the previous survey as common to his property, boundary lines shall be monumented and surveyed on the ground as pointed to by the applicant and the area in conflict shall be indicated as separate lot on the plan of the later survey. The conflict shall also be indicated on the plan of the earlier or previous survey by the Lands Management Services.

OVERLAPPING OR ADJOINING TITLED LANDS

Section 449 - The bearings and distances of the boundary lines of patented, leased or decreed properties common to the tract undergoing survey shall be accepted and adopted as the boundary lines of the survey.

Section 450 - Any area in conflict with patented, leased or decreed properties shall be excluded from the tract undergoing survey.

Section 451 - The discrepancies between the measurement of the later survey and those of the earlier patented, leased or decreed property shall be noted and entered in the field notes of the later survey. Should the discrepancies be sufficiently large to warrant the supposition that the survey of the patented, leased or decreed property was erroneous, an investigation shall be made and the results must be reported to the Regional Technical Director for Lands for appropriate action. If there is no overlapping or discrepancy between the later and the earlier surveys, a certification to that effect shall be made on the prescribed field notes cover.

Section 452 - In cases of properties covered by titles containing no technical descriptions or those with technical descriptions based on magnetic surveys, special instructions shall be secured from the Regional Technical Director for Lands.

ISOLATED LAND SURVEYS WITHIN CADASTRAL PROJECTS

Section 453 - Surveys of tracts situated within cadastral projects in progress may be made by geodetic engineer in accordance with the provisions of this manual.

Section 454 - The survey of cadastral project shall be considered as in progress from the date the survey is ordered by the Regional Executive Director/or Regional Technical Director for Lands until final approval of the survey returns.

Within sixty days from the date of such order, geodetic engineers shall submit to the project chief executing the cadastral survey a list of his survey/s in progress within the project.

Section 455 - After thirty days from the date of order for survey of cadastral project, by geodetic engineers other than those executing the cadastral survey of tracts situated within a cadastral project shall not be made except when the isolated land surveys began prior to the date of the order for the survey of the cadastral project.

Section 456- The field notes, computations and sketches or plans of surveys of tracts situated within a cadastral project shall be submitted to the Land Management Services for verification through the Chief of the cadastral project within four months from the date of inauguration of the project. Surveys submitted after the lapse of four months shall be accompanied with a satisfactory explanation to the Regional Technical Director for Lands who may accept or reject the survey for verification and approval.

Section 457 - When information is desired as to whether or not a particular tract is included within a cadastral project, a written request shall be made by the geodetic engineer to the Regional Technical Director for Lands stating the names of the claimant or owner and the approximate location and area of the tract.

Section 458 - Geodetic engineers may undertake surveys within decreed or titled parcels inside cadastral projects free from the limitations of Sections 454 to 456. A copy of the approved survey plan shall, however, be furnished to the cadastral project chief.

FIELD NOTES

Section 459 - Field notes and field notes cover shall be written on authorized LMB forms and sworn to before a notary public, in case of surveys executed by geodetic engineers in private practice and before an official authorized to subscribe oath in the case of DENR geodetic engineers. The name of the geodetic engineer and the date of survey must be entered on the upper and lower left hand of each page of the field notes. The name of the manufacturer and serial number of the instrument and tape used in the survey as well as the number of certificate of test must appear on the upper right hand page of the said field notes. The full name and address of the geodetic engineer, the full name and address of the applicant, location of the land and date of survey shall be entered on the field notes cover. The geodetic engineer shall sign his name at the space provided thereat.

Section 460 - The field notes shall be clear, legible and easy to understand. Notes that cannot be understood shall not be accepted. Proper names shall be written in full.

Section 461 - All survey notes shall be recorded in the field by the geodetic engineer or his authorized assistant performing the transit work or by a recorder under his personal direction and responsibility.

Section 462 - Original field notes shall be written clearly in hard pencil or in permanent waterproof ink.

Section 463 - Geodetic engineers shall record the starting and closing azimuths or reference azimuths in the field notes. Descriptions of the points or monuments from which the azimuths are derived shall be entered on the right hand page.

Section 464 - Descriptions of stations and corner marks, character of vegetation or cultivation, topographical condition of the land, the name, width and the direction of flow of all arroyos, esteros or rivers, the strip along arroyos, estero, river for bank protection and the names and widths of all highways that border or cross the property undergoing survey and other facts shall be indicated in the field notes. Old monuments which may be found shall likewise be described fully in the field notes referring to the number of survey, if known, and the name of the applicant thereof. Sketches shall be made on the right hand page.

Section 465 - When the field notes of any survey occupy more than one page, the pages shall be properly numbered and the signature of the geodetic engineer, date of survey, names of manufacturer and numbers of the instrument and tape shall be entered on each page of the field notes as required in Section 458. If the field notes contain data for more than one parcel, for the same applicant, full information for each parcel shall be given as required in the preceding section.

Section 466 - Field notes containing erasures of field data shall not be accepted. If erroneous data have been entered and corrections are necessary, the data shall be crossed out with a pencil line so that the information shall still be legible and the correct data written above it with the initial of the geodetic engineer and date of correction.

Section 467 - The original field notes for each survey shall be combined in one field book. The returns of surveys for different claimants that are surveyed in one traverse or in one system of traverses shall be submitted simultaneously for verification and approval.

Section 468 - When the data for any survey depends on original field notes already forwarded to the Lands Management Services, the geodetic engineer shall make proper reference in the field book of the survey where the required data may be found stating the survey number, the name of the claimant, and so on.

Section 469 - Each survey mentioned in Section 466 shall have its own geodetic engineer certificate and field notes cover.

Section 470 - When new corners are established in accordance with the provisions of Section 420 (b), the corner numbers, lot number and survey number of the old corners used as reference points must be entered in the space provided for under sketches in the field notes, together with appropriate sketches showing the relative position of the corners and the directions of the measured distances.

COMPUTATIONS AND PLANS

Section 471 - Computations and plans of isolated land surveys shall be made in accordance with the general provisions of Chapter VII and VIII of this Manual and the specific provisions for each class of survey prescribed in the following chapters.

GEODETIC ENGINEER'S CERTIFICATE

Section 472 - A geodetic engineer's certificate sworn to before a notary public shall be prepared and submitted for each survey made for the same claimant whether such survey contains only one parcel or several parcels. Geodetic engineer's certificate submitted by DENR geodetic engineers shall be sworn to before officials authorized to administer said oath.

Section 473 - Each geodetic engineer's certificate shall include only the parcels located within the same municipalities or city. In the case of parcels located in different provinces, municipalities or cities claimed by the same party, separate survey number shall be assigned and a separate geodetic engineer's certificate shall be prepared for each parcel or group of parcels.

Section 474 - The signature of the geodetic engineer shall conform with the name appearing in his certificate as geodetic engineer. No other signature or name shall be acknowledged as valid on plans, computations and field notes.

TRANSMITTAL OF ISOLATED SURVEYS

Section 475 - Geodetic engineers shall submit the following:

a. Letter of transmittal/ check list on prescribed form; Quality Assurance document.

b. Survey plan: tracing cloth or diazo film showing contour lines in the case of mineral land survey.

c. The survey order or survey authority provided for in Sections 394 - 395; 477, 480, 484, 489, 493, etc.

d. The original field notes completely filled in, paged and dry sealed, and field notes cover duly notarized.

e. The original and duplicate of the complete traverse, topographic surveys (for mineral land surveys) reference and lot data computations duly signed by the computer and Geodetic Engineer; conversion into PPCS-TM/PRS-92.

f. Certified geographic position and grid coordinates of the tie point issued by the agency concerned.

g. The original and duplicate of the complete astronomical observation computations related to the survey.

h. The original plan complete in every detail, signed and sealed by the geodetic engineer and with conformity of the land owner in the case of simple subdivision of the private property.

i. Sketch plan of the survey on tracing paper in the scale of the projection map showing therein the geographic position of corner 1 of the lowest numbered lot.

j. The geodetic engineer's certificate on authorized L.M.B. form as required in Sections 471 to 473 inclusive.

k. In case of the DENR geodetic engineer, an indorsement of the Community Environment and Natural Resources Officer concerned mentioning, among others, the corresponding public land application number.

l. The affidavit required in Section 396.

m. Survey notification letter on prescribed form.

n. In case of surveys of titled properties, the owners duplicate copy of the certificate of title, or a true copy thereof certified by the Register of Deeds concerned or a copy thereof verified by the Chief of the Records Section of the DENR Regional Office concerned.

o. In case the survey includes previously approved surveys, the certification of the Land Registration Authority as to the status of the said surveys whether applied or not for registration or for titling.

p. In case of mineral land surveys, in addition to (a) to (h), (j), (m), the following are required to be submitted:

1) Notarized description and field survey report on mining claim/s in quintuplicate signed and sealed by the Geodetic Engineer;

2) Plans of consolidated claim showing other surveyed claims and traverse stations.

3) Certification by the applicant/representative that he had witnessed the setting of monuments of the corners and/or location posts of the mining claim/s being surveyed.

4) Certification of the Barangay Captain or his duly authorized representative that the survey was conducted in their area by the Geodetic Engineer.

5) Certification by the Administrator of NAMRIA whether or not corresponding boundary plan of mining claim/s is/are within government reservation.

6) Sketch plan of private properties prepared by the Geodetic Engineer concerned together with the corresponding machine copy of the title of the land as registered by the Register of Deeds of the province or city. (MLSR)

Section 476 - Geodetic engineers who submit advance surveys within cadastral projects as stated in Section 454 to 456 shall submit the papers required in isolated land surveys.

Section 477 - Upon completion of the field work the computations and preparation of sketches or plans shall be made with least possible delay and the survey returns shall be submitted to the Land Management Services. Alleged non-payment of survey fees by the survey claimant shall not be accepted as reason for the delay in the submittal.

CHAPTER X - PUBLIC LAND SURVEYS

HOMESTEAD

Section 478 - Upon receipt of authority and order from the DENR officials concerned as stated in Section 394 for the survey of a homestead, the geodetic engineer, unless otherwise provided in the said authority, shall proceed to make the survey, complying strictly with the following requirements:

a) The boundary lines shall form, as much as possible, right angles when adjoining unclaimed, unoccupied public lands. When adjoining natural features such as seas, lakes, rivers, etc. or previously approved surveys, the boundary lines shall be marked on the ground following the provisions of Sections 310 to 314. The forty or twenty meter stream and bank protection shall be excluded from the survey and no patent or title shall be issued on the same.

b) Notation and sketches shall be made in the field notes on the general nature of the land, whether plain, hilly, or mountainous, etc., the vegetation, natural features, improvements made by the applicants, if any, and such other facts which in the opinion of the geodetic engineer should be known to the DENR officials concerned.

Section 479 - A homestead shall be surveyed as a single continuous lot situated entirely on one bank of adjoining arroyos, creeks, rivers or any stream of five meters or more in width. It shall not be divided into two or more lots by such natural features. This, however, is without prejudice to existing regulations on rivers, streams, etc. bank protection.

Section 480- Homestead surveys shall be made prior to the filing of homestead application in the CENRO. The cost of the survey shall be borne by the applicant.

SALES

Section 481 - Upon receipt of authority and order from the DENR officials stated in Section 394 for the survey of a tract applied for sale by an applicant, the geodetic engineer, unless otherwise provided in the said authority, shall proceed to make the survey, complying strictly with the requirements in Section 477.

Section 482 - Surveys shall be made prior to the filing of the sales application in the CENRO.

Section 483 - Whenever practicable, the length of one of the sides of rectangular tracts laid out on the ground shall not exceed five hundred meters, in the case of individual sales application subject, however, to the provisions of Sections 288 and 310 to 314.

Section 484 - The area applied for sales shall be surveyed as stated in Section 477. The cost of the survey shall be borne by the applicant.

LEASES

Section 485 - Upon receipt of authority and order from the DENR officials stated in Section 394, the survey of a tract applied for lease by an applicant, the geodetic engineer, unless otherwise provided in the said authority, shall proceed to make the survey, complying strictly with the requirements as stated in Section 476.

Section 486 - Surveys shall be made prior to the filing of the lease application in the CENRO.

Section 487 - Whenever possible, the length of one of the sides of rectangular lease tracts laid out on the ground shall not exceed five hundred meters as stated in Section 287.

Section 488 - The area applied for lease shall be surveyed as stated in Section 477.

Section 489 - The cost of the survey shall be borne by the applicant.

FREE PATENT

Section 490 - Upon receipt of authority and order from the DENR officials stated in Section 393 for a free patent survey, the geodetic engineer shall proceed to ascertain the following:

(a) The substantial correctness of the statements made by the applicant in his application, copy of which shall be sent to the geodetic engineer together with the order of surveys.

(b) The date of first occupation and cultivation and whether such occupation and cultivation have been continuous since that date. The information may be obtained from the applicant and witnesses in separate interviews.

(c) The area under cultivation, area cleared for cultivation and area remaining to be cleared or which cannot be used for agricultural purposes.

(d) The improvements made by the applicant on or near the tract applied for such as trails, roads, irrigations, ditches, houses, etc.

(e) The nature and merit of adverse claim, if any.

(f) The use of land other than for agricultural purposes, such as for grazing, fish breeding, salt panning, etc. and any other facts which in the opinion of the geodetic engineer should be known to the Lands Management Services.

Section 491 - The surveys shall be made in strict compliance of the requirements as stated in Section 476.

Section 492 - Surveys with previous authority as required in Section 488 shall be made prior to the filing of the free patent application in the CENRO.

Section 493 - The cost of the surveys shall be borne by the applicant.

RECLAIMED LANDS

Section 494 - Upon receipt of authority and order from the Regional Executive Director or Regional Technical Director for Lands for the survey of lands which have been reclaimed from the seas, lakes, rivers, etc. by dredging, filling or any other means, the geodetic engineer shall proceed to:

(a) Secure the conformity of the Public Estate Authority pursuant to P.D. Nos. 1084 and 1085.

(b) Monument the corners and survey the boundaries of the area reclaimed.

(c) Subdivide the area surveyed in accordance with the scheme of subdivision which shall be included in the authority and order for survey issued by the Regional Executive Director or Regional Technical Director for Lands.

(d) Monument all the corners of the subdivision lots.

Section 495 - The plan of subdivision shall, in general, provide for:

(a) Monuments including sub-surface reference points defining the center of streets or the street lines to facilitate the re- establishment of street lines when disturbed by building operation.

(b) The lot shall be of such areas as may be deemed best suited for residential, commercial or other purposes provided that the scheme of subdivisions be approved by the Housing and Land Use Regulatory Board or the Local Planning and Development Board concerned.

(c) In case of lots granted, donated or transferred to a province, city, municipality or branch or subdivision of the government for the purpose deemed by said entities to be conducive to the public interest, the area may be of such size so as to maximize land utilization.

Section 496 - The survey and subdivision of reclaimed lands shall be made by DENR geodetic engineers. However, geodetic engineers in private practice may undertake survey and subdivision of reclaimed lands upon issuance of authority by the RED or RTD. The survey of a parcel of reclaimed land shall be at the expense of the applicant.

Section 497 - Reclaimed land surveys with previous authority as required in Section 493 shall be made prior to the filing of the lease application in the Land Management Bureau/Services.

FORESHORE LANDS

Section 498 - Upon receipt of authority and order from the DENR officials stated in Section 394, for the survey of foreshore lands for lease purposes, the geodetic engineer shall proceed to:

(a) Monument the landward boundary which, in this case, shall be twenty (20) meters from the high tide line along the shore. The monuments shall be connected by means of closed circuit or loop tertiary traverse.

(b) Locate the improvements made on the area applied for such as wharves, canals, jetties, etc.

(c) Locate the streets, structures, etc. if any, which are adjacent to the tract.

(d) Access road to the sea shall always be provided.

Section 498 - The direction of the boundaries of the tracts from the monuments marking the ends of the boundary along the high tide line towards the sea, lake, etc. shall be determined by taking into consideration the improvements of the applicant.

The area shall not exceed forty eight hectares or as may be prescribed by the Secretary of the DENR.

Section 499 - The land granted, donated or transferred to a province, city, municipality or branch of the government shall be the area that is actually needed for the purpose for which it will be used.

Section 500 - The cost of the survey of foreshore lands for lease purposes shall be borne by the applicant.

Section 501 - Foreshore land surveys with previous authority as required in Section 497 may be made at any time prior to the filing of the lease application in the Land Management Services unless the DENR directs otherwise.

MARSHY LANDS

Section 502 - Upon receipt of authority and order from the DENR officials stated in Section 394 for the survey of marshy lands, the geodetic engineer shall proceed to monument and survey the boundaries of the area applied for in accordance with the information furnished by the lease applicant.

Section 503 - As much as or if possible, natural objects in place, such as trees, immovable rocks or boulders, etc. shall be used as corners of the tract.

Section 504 - The area of a marshy land tract applied for shall not exceed forty eight hectares or as may be prescribed by the DENR Secretary. In the case of marshy land granted, donated or transferred to a province, city, municipality or a branch of the government, shall be the area that is actually needed for the purpose for which it will be used.

Section 505 - Strip of at least twenty (20) meters wide of swamplands or mangroves along the shoreline facing oceans, lakes, and other bodies of water shall be excluded from the survey as required by P.D. 705.

Section 506 - The cost of the survey of marshy lands shall be borne by the applicant.

Section 507 - Marshy land surveys with previous authority as required by Section 502 may be made at any time prior to the filing of the lease application in the Lands Management Bureau/Land Management Services unless the DENR Secretary directs otherwise.

OTHER LANDS AVAILABLE FOR RESIDENTIAL, COMMERCIAL OR INDUSTRIAL PURPOSES

Section 508 - Upon receipt of authority and order from the DENR officials as stated in Section 394 for the survey of lands for residential, commercial, industrial or other productive non-agricultural purposes, as classified in Section 58(d) of Commonwealth Act No. 141, the geodetic engineer shall proceed to monument and survey the boundaries of the area applied for in accordance with the information furnished by the applicant.

Section 509 - The area applied for shall not exceed forty eight hectares. However, in the case of productive lands granted, donated or transferred to a province, city, municipality or branch of the government, shall be the area that is actually needed for the purpose for which it will be used.

Section 510 - The cost of the survey shall be borne by the public land applicant.

Section 511 - Surveys with previous authority as required by Section 508 may be made at any time prior to the filing of the lease application in the Land Management Services.

PUBLIC SCHOOL SITES

Section 512 - Upon receipt of authority and order from the DENR officials stated in Section 394, for the survey of lands applied for by a province, city, municipality, or other branch of the government for the establishment of public schools or other educational institutions, the geodetic engineer shall proceed with the survey following these requirements:

(a) The boundaries as described in the application for survey shall be surveyed and monumented. However, if possible, the boundary lines shall form right angles when adjoining unclaimed, unoccupied public lands. When adjoining natural features such as seas, lakes, rivers, etc. or previous surveys, the boundary of the previous surveys, shall be adopted as common to the public school sites surveys, provided, the twenty meter strip for bank protection of rivers and creeks is excluded from the survey.

(b) The area shall not be less than 5,000 square meter in well-drained location that conforms with the requirements prescribed by public school authorities.

Section 513 - All applications for public school sites filed by provinces, cities and municipalities must be approved by the Department of Education, Culture and Sports before the conduct of the survey.

Section 514 - The cost of surveys of public school sites shall be borne by the applicant.

Section 515 - Public school site surveys with previous authority as required by Section 510 may be made at any time prior to the filing of the application for donation, sales, lease, exchange, or any other forms of concession.

PRIVATE SCHOOL SITES

Section 516 - Upon receipt of authority and order from the DENR officials stated in Section 394 for the survey of the lands of the public domain applied for by private individuals or organizations for the establishment of private schools or other educational institution, the geodetic engineer shall proceed to make the survey as prescribed in Section 512.

Section 517 - The cost of survey of private school sites shall be borne by the applicant.

Section 518 - Private school site surveys with previous authority as required in Section 516 may be made at anytime prior to the filing of the application for lease or sale.

SITES FOR PUBLIC CHARITABLE OR OTHER SIMILAR INSTITUTIONS

Section 519 - Upon receipt of authority and order from the DENR official stated in Section 394 for survey of the public domain applied by a province, city, municipality, or other branch or subdivision of the government for charitable, philanthropic, specific, or other similar institutions, or for other similar purposes, the geodetic engineer shall proceed with the survey as prescribed in Sections 512 to 515.

Section 520 - The survey of the sites for charitable purposes shall be executed at the expense of the applicant.

SITES FOR PRIVATE CHARITABLE OR OTHER SIMILAR INSTITUTIONS

Section 521 - Upon receipt of authority and order from the DENR official stated in Section 394 for the survey of public lands applied by a private individual or organization for charitable, philanthropic, scientific or other similar institutions or for other similar purposes, the geodetic engineer shall proceed with the survey as prescribed in Section 512.

Section 522 - The provisions of Sections 512 to 515 shall also be applied to the survey of sites for private charitable or other similar institutions.

TOWNSITE BOUNDARY AND SUBDIVISION

Section 523 - Upon receipt of authority and order from the Regional Executive Director or Regional Technical Director for Lands as stated in Section 394 for the survey of a townsite, the geodetic engineer shall proceed to:

(a) Monument the corners and survey the boundaries of the area to be reserved.

(b) Locate the approximate position of roads, trails, important natural features, etc. within the area to be reserved.

Section 524 - After completion of the boundary survey, a sketch plan, on a scale of one in four thousand (1:4,000) or any multiple thereof, shall be prepared and immediately forwarded to the Regional Technical Director for Lands together with recommendations as may be deemed desirable.

The sketch plan shall accurately show the boundary lines, traverses and the position of the features located as required in the preceding section.

Section 525 - A brief report shall be submitted with the sketch plan stating the location with respect to rivers, harbors, mountains or other natural features, approximate number of people living within the boundaries and the extent of land claimed by them, available sources of water supply, amount and purity, possible system of sewerage disposal and how such disposal may affect other towns or communities.

This report shall be made from personal observation and not from the information furnished by interested parties.

Section 526 - A topographic survey of the area to be reserved shall be made after the boundary survey. Unless otherwise required in the authority and order for survey, the contours shall be located at two meter interval and plotted on a scale of one in two thousand (1:2000).

Section 527 - All private land claims within the area to be reserved shall be surveyed and plotted on the topographic map.

Section 528 - The topographic survey map shall contain all the details, structures and other information which may be of value in preparing the scheme of subdivision.

Section 529 - The scheme of subdivision shall be prepared on an overlay of the topographic survey map which shall conform with the approved land use map and zoning ordinance of the locality.

Section 530 - The scheme of subdivision shall designate certain lots for commercial and industrial uses, for open spaces and public uses and the remainder, as residential lots. The lots owned by private individuals as evidenced by titles, or as possessed or claimed by them as private property shall be identified and indicated thereon. The lots whether public or private, shall be numbered using a general plan or system.

Section 531 - When completed, the topographic map and the scheme or subdivision, together with a report and recommendation, shall be forwarded immediately to the Regional Technical Director for Lands.

Section 532 - The geodetic engineer shall be furnished with a copy of the scheme of subdivision as approved by the Regional Technical Director for Lands in coordination with the local development council.

Section 533 - Whenever circumstances may warrant, residential sites may be established in the project at intervals of about 10 kilometers from each other or from existing towns, barangays or residential sites.

Section 534 - The survey of townsites shall be made by DENR geodetic engineers. In case it is deemed necessary to assign the survey to geodetic engineers in private practice, an invitation to bid for the survey shall be published once a week, for three consecutive weeks, in two or more newspaper in general circulation to give all geodetic engineers an opportunity to present their bids. The requirements of Sections 10 to 14 shall apply.

GROUP SETTLEMENTS

Section 535 - Upon receipt of authority and order from the DENR officials stated in Section 394 for survey of lands to be used for group settlement purposes, the geodetic engineer shall proceed to monument the corners and survey the area to be reserved.

Section 536 - After the survey of the boundary, the geodetic engineer shall prepare the scheme of subdivision under the supervision of the CENR Officer and submit the same for approval of the concerned Regional Technical Director.

Section 537 - The geodetic engineer shall survey the group settlement in accordance with the approved scheme of subdivision.

Section 538 - The cost of the survey of the group settlement shall be borne by the entities concerned.

DELIMITATION AND SUBDIVISION OF PUBLIC LANDS

Section 539 - Extensive areas of public land classified as alienable and disposable shall be delimited and subdivided for disposition, excluding therefrom the following:

(a) Lands reserved for public or quasi-public purposes.

(b) Lands appropriated by the Government.

(c) Land which have been acquired and become private property.

(d) Lands on which private rights, authorized and recognized by Commonwealth Act No. 141 or any other law may be claimed.

Section 540 - Upon receipt of authority and order for survey issued by the DENR officials stated in Section 394, the geodetic engineer shall make a general investigation of the area to be delimited to ascertain the existence, if any, of lands to be excluded as mentioned in the preceding section and to acquire knowledge of the general topography of the area to be delimited and subdivided.

Section 541 - The authority and order for survey shall describe the areas to be surveyed and specific instructions as to the size of lots, the area to be reserved and such other requirements which may be deemed necessary in each particular project.

Section 542 - If the land to be excluded as specified in Section 539 shall be included in the survey as required in the authority and order for survey, the survey shall be made in accordance with the requirements of Part III- Provisions Governing Cadastral Land Surveys - as long as they are applicable and consistent.

Section 543 - When the area to be delimited is practically all public land on which the applicant may not acquire perfect titles until the requirements of law for the issuance of patent shall have been complied with, pairs of location monuments shall be established at intervals of about six kilometers from each other and located by at least a secondary control. The location monuments shall be made stations of the survey control.

Section 544 - The pair of location monuments most centrally located shall be numbered as BLLM Nos. 1 and 2 and the remaining pairs shall be numbered consecutively from 3 and 4 and so on for the entire project.

Section 545 - After the establishment of the location monuments, the entire area shall be subdivided into lots taking into account the actual occupation and the purpose for which such lots shall be disposed of to the applicants. Roads of at least ten meters wide shall be provided, taking into consideration the topography of the land and in such a way that each lot shall adjoin a road. A right of way of sixty meters in width shall be surveyed for any established or proposed national or provincial road passing through the project. The District Highway Engineer shall be consulted as to the location of the center lines of the roads. A strip of land three meters wide in urban areas, twenty meters wide in agricultural areas and forty meters wide in forest areas along the banks of any stream five meters or more in width shall be preserved for bank protection and excluded from the survey. This strip of land shall be demarcated in accordance with Sections 310 to 313, inclusive. The bank and the traverse stations from which the side shots were taken shall be plotted on the plan.

Section 546 -If possible, the boundary lines shall form right angles when adjoining unclaimed, unoccupied public lands. When adjoining previous surveys, the boundary of the adjoining previous surveys shall be adopted as common to the subdivision lot.

Section 547 - Before proceeding with the final survey, a tentative scheme of subdivision plotted on tracing paper shall first be taken up with the District Engineer/s, the Planning and Development Coordinator of the LGU and the local representative of the Philippine Ports Authority, in case the land to be subdivided abuts the sea, to ascertain whether any of the lots inside the subdivision is needed for present or future public improvements, or that its grant under Commonwealth Act 141 may unduly affect any development plan for a town, barangay, port, etc. or obstruct navigation or any water route. The scheme shall conform with the land use plan and zoning ordinance of the locality.

Section 548 - In case some of the lots are needed for future public improvements, the purpose for which these lots will be reserved shall be indicated in the tentative scheme of subdivision and the lots involved shall not be disposed of. After securing the approval of the District Engineer/s, the chief executive officer of the LGU, and the representative of the Philippine Ports Authority, if required, the tentative scheme of subdivision shall be submitted to the Regional Technical Director of Lands for approval. The result of the conference with the District Engineer/s, the Planning and Development Officer of the LGU, and the representative of the Philippine Ports Authority shall be included in the preliminary investigation report to be made for each lot.

Section 549 - The corners of public land subdivision lots shall be marked by standard concrete monuments to be numbered consecutively from 1 to 999 preceded by a letter in alphabetical order starting from A. Thus: A-1, A-999, B-1, B-999, etc.

Section 550 - The survey of public land subdivision may be assigned to geodetic engineers in private practice.

SUBDIVISION OF PUBLIC LANDS WITHIN APPROVED CADASTRAL SURVEY

Section 551 - Upon receipt of authority and order for survey issued by the DENR officials as stated in Section 394, the geodetic engineer shall proceed to make the subdivision of cadastral lots in accordance with the instructions contained therein.

Section 552 - No public land within a cadastral case which is the subject of cadastral registration shall be amended or subdivided except as ordered by the Court.

CHAPTER XI - PRIVATE LAND SURVEYS

ORIGINAL, SUBDIVISION AND/OR CONSOLIDATION SURVEYS

Section 553 - Upon agreement with the owner(s), the geodetic engineer shall proceed to make private land surveys.

Section 554 - Geodetic engineers must certify in their field notes cover whether or not the parcels of land surveyed by them adjoin and/or cover any previously approved surveys or decreed properties.

Section 555 - Geodetic engineers shall comply, at their own expense, with requests from the Land Registration Authority for any amendments or corrections that may be needed on their surveys.

Section 556 - The quality of control to be used in private land surveys shall be as prescribed in Section 121.

Section 557 - The survey of numerous parcels comprising areas of one thousand or more hectares shall be undertaken in accordance with the requirements of Part III - Provision Governing Cadastral Land Surveys.

Section 558 - In the consolidation and/or subdivision lots of decreed properties, the geodetic engineer shall execute a certificate on the field notes cover as follows:

"I hereby certify that the herein consolidation/subdivision of Lot No. __ Survey No. _____ was executed by me with the full knowledge and consent of the owner(s) who signed on the survey plan his/her/their conformity.

_____ (Name(s)of Owner(s))

_____ (Certificate of Title No.)

_____ Signature of Geodetic Engineer

In case of simple or complex residential subdivision, the following certification shall be stated by the geodetic engineer concerned:

"I hereby certify that the herein consolidation/subdivision of (Lot No. _____, Survey No. _____) was undertaken by me with the full knowledge and consent of the owner or developer.

The land owner's conformity on the plan shall apply only to simple subdivision.

Section 559 - A separate Geodetic Engineer's Certificate in triplicate on prescribed LMB form shall accompany each original survey submitted for verification and approval. In the case of consolidation and/or subdivision surveys the oath shall be accomplished on the prescribed field notes cover only.

HOUSING SUBDIVISION SURVEY

Section 560 - Survey returns of housing subdivision surveys of decreed or titled properties submitted to the Land Management Services for verification and approval shall be in accordance with the pertinent provisions of Part II of this Manual and of the implementing rules and regulations governing simple and/or complex subdivisions under Presidential Decree 957 (Subdivision and Condominium Buyer's Protective Decree).

Complex subdivision projects for housing development governed by P.D. 957, Batas Pambansa (BP)220, and other related laws shall be accompanied with a scheme of subdivision or Site Development Plan duly approved by the Local Government Planning and Development Office, or by the Housing and Land Use Regulatory Board (HLURB).

A complex subdivision is defined for the purpose of this Manual as a subdivision of a registered land wherein 30% of the land area are allocated for street, passageway, or open spaces is delineated on the plan.

Section 561 - Licensed geodetic engineers who are commissioned by the owner-developers of a housing project shall relocate the boundary of the whole property to be developed into housing subdivision. All boundary corners shall be relocated strictly using the data of the previous survey. Adjoining property owners shall be notified of the survey and must witness the re-setting of new corner monuments.

Section 562 - The block boundary corners shall be marked with permanent concrete monuments in accordance with Section 272 (d) of this Manual, and the distance between block corners shall preferably be 250 meters. However, if the block length exceeds 250 meters, it should not be more than 400 meters in length and shall be provided by a 3 meter alley at midlength.

Section 563 - Additional reference points with sub-surface markings shall be established within the project/subdivision to facilitate the location of the lots for the benefits of the lot buyers. These reference points shall be plotted on the survey plan and their cartesian coordinates shall be part of the survey records. Subdivision lots forming part of the open space or subdivision road shall not be the subject of subsequent subdivision surveys, otherwise Section 567 shall be observed. These lots should be clearly indicated on the plan.

Section 564 - The individual lot corners may be temporarily marked with stakes to be replaced with permanent concrete monuments upon completion of land filling or grading on the project site. The description of the lot corner markers shall be recorded in the field notes and stated on the plan.(LAO 4-14)

Section 565 - The following documents shall be submitted to the Land Management Services for verification and approval, with the survey returns stated in Section 474:

a. Certified True Copy of Title;

b. Final Subdivision Plan consisting of the Site Development Plan, Subdivision Scheme approved by the Local Government Planning and Development Office or by the HLURB;

c. Copy of Environmental Compliance Certificate (ECC);

d. Conversion Clearance (from Agricultural to Residential), if applicable.

Section 566 - The subdivision plan shall be prepared in accordance with Sections 370 to 385 and carried out in accordance with Sections 553 to 564 of this Manual.

Section 567 - No owner or developer shall change or alter the roads, open spaces, infrastructure, facilities for public use and/or other form of subdivision developments as contained in the approved subdivision plan. Likewise, no amendment survey or subdivision of a lot or lots in the approved subdivision plan shall be accepted for verification and approval without the permission of the Local Government Planning and Development Office or the HLURB and written conformity and consent of the duly organized homeowners association, or in the absence of the latter, by the majority of the lot buyers in the subdivision.

Section 568 - In the subdivision and pursuant to the provisions of RA 1273 and PD 705, the three (3) meter easement or the twenty meter bank protection along the banks of creeks, arroyos, esteros, or rivers which are included in the title, shall be surveyed as a single lot and shall form part of the open space for park and recreational areas and shall be planted to trees or shall become tree park except when permanent improvement such as subdivision perimeter road which cannot be planted to trees as required in Section 2 of P.D. No. 953.

Section 569 - The verification of the socialized housing subdivision shall be focused on the supporting documents, such as:

- the authenticity of the Torrens Title;
- the existence of the original survey as the basis of the original certificate of title;
- the conformance of the boundary data of the lots with the original approved surveys or antecedent surveys;
- the correctness of the traverse and control points;
- the aggregate area as per original approved surveys;
- correctness of the survey plan, conformity of the subdivision with the Final Subdivision Plan approved by offices authorized by law.

The accuracy of the preparation of the survey returns and plan, the correctness of the metes and bounds of the subdivision lots and areas, and other input data shall be the responsibility of the geodetic engineer.

Section 570 - The housing subdivision project shall be subjected to the Lot Surveys Documentation System (LSDS) to check the correctness of the lot data, and shall be encrypted under the Computerized Title Generation (CTGEN) established and installed for the purpose in the Lands Management Bureau/Land Management Services (LMB/LMS) and in the Land Registration Authority/Register of Deeds (LRA/ROD) by the Housing and Urban Development Coordinating Council (HUDCC).

Section 571 - A plan describing the boundaries of land may be made without the performance of a survey in the field particularly the case of subdividing a lot by connecting two old corners provided that the old corners are intact on the ground; the boundaries of the land are defined conspicuously by walls, shrubs and other markers, and where the information and particulars to be shown on the plan are sufficient to satisfy the requirements in this Manual. The survey plan bearing the conformity of the landowner may be submitted for verification and approval with the notarized field notes cover.

SUNDRY PROVISIONS

Section 572 - The survey returns shall be submitted to the Regional Land Management Services together with the prescribed letter of transmittal or similar form.

Full information on the preparation and disposition of white prints, etc. shall be provided on the upper half of the form. The lower half of the form shall be filled out in the Land Management Services and returned to the geodetic engineer as his receipt.

Section 573 - After the approval of the survey, the sepia copy of the survey plan and the original and duplicate of the geodetic engineer certificate shall be released to the concerned geodetic engineer or to the survey claimant. The original plan and other records of the survey shall be retained for file in the Land Management Services. No certified true copy of the plan for the purpose of registration shall be issued except to the survey claimant or his heirs provided that an affidavit stating the whereabouts of the approved tracing cloth plan shall be submitted with the request for another copy.

The city, municipal or provincial assessors shall be furnished with the copies of the approved plan in accordance with the provisions of R. A. No. 7160 otherwise known as the Local Government Code of 1991.

CHAPTER XII - GOVERNMENT LAND SURVEYS

FRIAR LAND ESTATES

Section 574 - Surveys affecting the Friar Land Estates shall be executed by geodetic engineers upon authority and order from the Director of Lands or his duly authorized representative.

Section 575 - The Friar Land Estate are situated and known as follows:

Names of Estates and Provinces	Location	Areas in Hectares
BATAAN:		
1. Orion	Orion, Bataan	935.4741
BULACAN:		
1. Binagbag	Angat, Bulacan	281.8099
2. Dampol	Plaridel, Bulacan	926.4915
3. Guiguinto	Guiguinto, Bulacan	929.9936
4. Lolomboy	Bocaue, Marilao, San Jose del	5,207.8943
5. Malinta	Monte and Sta. Maria, Bulacan	3,514.8021
6. Matamo	Polo, Bulacan	11.7290
7. San Marcos	Malolos, Bulacan	87.3289
8. Sta. Maria de Pandi	Calumpit, Bulacan	10,153.4477
	Angat, Bigaa, Bocaue, Bustos, Sta. Maria & Pandi, Bulacan	
CAVITE		
1. Imus	Imus, Bacoor, Kawit & Dasmarinas,	17,166.3660
2. Naic	Cavite	7,270.5635
3. Sta. Cruz de Malabon	Naic & Indang, Cavite	9,558.6963
4. San Francisco de Malabon	Tanza, Cavite General Trias & Rosario Cavite	11,128.4573
CEBU		
1. Banilad	Cebu City	1,873.8061
2. Talisay Minglanilla	Talisay & Minglanilla, Cebu	8,154.9058
ISABELA		
1. Isabela	Aurora, Antatet, San Mateo, Cabatuan, Isabela	19,506.9267
LAGUNA		
1. Binan	Binan, Laguna	3,563.7339
2. Calamba	Calamba, Laguna	13,364.9758
3. Sta. Rosa	Sta. Rosa, Laguna	5,413.3436

OCCIDENTAL MINDORO		
1. San Jose	San Jose, Occ. Mindoro	22,484.8150
RIZAL		
1. Muntinglupa .	Muntinglupa, Rizal	2,816.9507
2. Piedad	Caloocan City	3,812.5498
3. Tala	Caloocan City	6,991.4314
TOTAL	23 Estates	154,976.4930

NATIONAL GOVERNMENT LANDS

Section 576 - The National Government Lands are the following:

(a) Lands forfeited for non-payment of taxes.

(b) Lands adjudicated to the government through foreclosure proceedings.

(c) Lands acquired by the national government through forfeiture of bonds in criminal cases or as a result of execution of judgment in civil actions.

(d) Lands acquired through expropriation proceedings, donations, purchase or exchange when no longer devoted public uses.

(e) Lands where old structures formerly used as fortifications and known as "cotas", "baluartes", etc. are built or situated.

(f) All other private properties of the national government acquired or held in whatever form when not needed for public purposes.

Section 577 - The survey of national government lands shall be made by geodetic engineers upon receipt of authority and order from the Regional Executive Director and/or the Regional Technical Director for Lands.

Section 578 - Geodetic engineer hired by applicants of national government lands shall inform the Regional Executive Director of the proposed survey, stating the name of the applicant, location of the land applied for, and such data which may facilitate action by the Land Management Services.

Section 579 - The authority and order for survey to be issued to the geodetic engineers shall be accompanied by necessary data, sketches, and instructions for making the survey.

Section 580 - The geodetic engineer shall bring with him to the field his notes, information or plans given by the Regional Technical Director for Lands. From such information and the evidence of the occupants, adjoining claimants and government officials, he shall try to relocate the boundaries of the land in question as originally laid out and occupied. In case the boundaries as given in the information from the Land Management Services do not conform with the testimony of the occupants or adjoining owners, diligent search for old boundary marks and evidence in support thereof shall be made.

Section 581 - The survey shall indicate the boundary lines as claimed by the occupant or adjoining owners, and as deduced from the evidence given by the Land Management Services or the information obtained from disinterested persons.

Section 582 - The survey shall also indicate the accurate location of the foundation of all buildings or ruins found on the tract.

Section 583 - In case there are buildings of strong materials on the land, measurement thereof shall be taken. The front and side elevations and floor plans shall be sketched, indicating thereon the materials used in the construction.

Section 584 - The names and addresses of persons giving information and the gist of evidence shall be taken. Likewise, the names and addresses of all adjoining owners or claimants and occupants of the land shall be obtained.

Section 585 - An investigation shall be made to ascertain other facts as may be desired and full report thereon shall be submitted together with the survey returns.

Section 586 - The plans shall be drawn at a scale that will show all essential details. The location of all buildings shall be approximately plotted and numbered. In no case shall the plan exceed the size of a cadastral map sheet as prescribed in Section 351.

Section 587 - All notes, information and plans given to the geodetic engineer by the Lands Management Bureau/Services or acquired during the investigation shall be submitted immediately, together with the survey returns and required report, upon the completion of the work.

Section 588 - The survey of private lands to be purchased, expropriated or acquired in any other manner by the national government or local government units shall be made in accordance with the requirements of Chapter XI.

PROVINCIAL GOVERNMENT LANDS

Section 589 - The survey for registration proceedings or other purposes of lands belonging to or claimed as private property by provincial government or of private lands acquired by said government through purchase, grant, donation or in any other manner from individuals, partnerships, associations, corporation or any other forms of organization shall be conducted by geodetic engineers.

Section 590 - The survey of areas for school sites acquired from individuals, partnership, associations, corporations or any other form of organization shall be as in accordance with the regulations of the Department of Education, Culture and Sports.

Section 591 - The survey of the provincial government lands referred to in Section 590 shall be undertaken in accordance with the applicable provisions of Chapter XI.

Section 592 - The survey of lands of the public domain to be acquired by the provincial government from the national government shall be made by geodetic engineers.

Section 593 - The costs of surveys of provincial government land shall be borne by the concerned provincial government.

Section 594 - Surveys of lands for sub-provincial governments shall be made following the same methods for provincial government lands surveys.

CITY AND MUNICIPAL GOVERNMENT LANDS

Section 595 - The provisions of Sections 590 to 592 of this Manual shall be applicable to the survey of city or municipal government lands.

Section 596 - The cost of the city or municipal government land surveys shall be borne by the concerned city or municipal government.

Section 597 - All land surveys for local governments which are not organized as cities or municipalities shall be surveyed as in the case of the regular city or municipal government.

CONVERSION SURVEYS

Section 598 - Surveys for the conversion of graphical cadastral lots to numerical cadastral lots shall be made in accordance with the special instructions to be issued by the Regional Technical Director for Lands.

CHAPTER XIII - OTHER LAND SURVEYS

PROVINCIAL BOUNDARIES

Section 599 - The boundaries of provinces and sub-provinces shall be surveyed in accordance with the specific instructions which shall accompany the authority and order for survey issued by the Regional Executive Director.

Section 600 - The authorities of the provinces separated by the boundaries to be surveyed and of the respective adjoining municipalities shall be consulted and requested to indicate on the ground the common boundaries. The boundaries as defined by law or executive order creating the province shall be located on the ground.

Section 601 - All corners accepted as common by the authorities of the adjoining provinces and respective municipalities shall be defined by monuments specified in Section 272(a).

Section 602 - In the case of disputed boundaries, the corners shall be temporarily defined by hard wood post or monuments.

Section 603 - The lots included within the disputed area shall be located using transit, tape, theodolite, and/or EDM. The lot owners thereof shall be requested to provide information as to the municipalities in which their lots have been declared for taxation purposes.

Section 604 - A sketch plan of the disputed area shall be prepared containing the following information:

(a) Each lot and corresponding lot number.

(b) Name and address of each lot owner or claimant.

(c) Municipality in which each lot has been declared for taxation purposes. Care shall be taken to determine whether or not disputed areas are declared in two or more municipalities.

(d) The boundaries as claimed by each province.

Section 605 - The claims of one province shall be indicated by heavy dotted lines and of the other province by heavy dash lines. A heavy full line shall mark the division between municipalities as indicated by tax declarations. Lot lines shall be indicated by ordinary full lines. All topographical information such as rivers, mountains, etc. that will assist the authorities in their decision shall be shown.

Section 606 - The local authorities shall be given opportunities to arrive at an agreement in accordance with the Local Government Code, R.A. 7160 before a report on the dispute is forwarded to the Regional Executive Director and the Director of Lands Management Bureau.

Section 607 - After the final decision of proper authorities, the adopted provincial or sub-provincial boundaries shall be monumented with standard provincial boundary monuments and the temporary markers referred to in Section 602 shall be removed.

Section 608 - The cost of the survey of disputed boundaries between provinces shall be borne by the concerned provinces.

MUNICIPAL BOUNDARIES

Section 609 - The authorities of the municipalities separated by the boundary to be surveyed shall be consulted and requested to indicate on the ground the common boundaries. The boundaries as defined by law or executive order creating the municipality shall, as much as possible, be located on the ground.

Section 610 - All corners accepted as common by the authorities of the adjoining municipalities shall be defined by monuments as specified in Section 272(a).

Section 611 - In the case of disputed municipal boundaries, the procedure outlined in Sections 602 to 607 shall be followed.

Section 612 - In cadastral projects the lots within the disputed area shall be surveyed and the area shall be made as a cadastral case.

Section 613 - When the areas in dispute are claimed by municipalities situated in different provinces, the provincial authorities concerned shall be requested to settle the dispute.

Section 614 - If the dispute is not settled by proper authorities, the matter shall be reported to the Regional Executive Director and the Director of Lands Management Bureau.

Section 615 - After the final decision of proper authorities, the adopted municipal boundaries shall be monumented with standard municipal boundary monuments as specified in Section 272 (a) and the monuments temporarily marking the disputed boundaries shall be removed.

BARANGAY BOUNDARIES

Section 616 - The survey of barangay boundaries shall be made after consultation with the barangay and municipal authorities concerned who shall be requested to indicate the barangay boundaries.

Section 617 - All corners accepted as common by the authorities of the adjoining barangays shall be defined by monuments as specified in Section 272(b).

Section 618 - In the case of disputed barangay boundaries, the procedure outlined in Section 602 to 607 shall be followed.

Section 619 - In case the dispute is not settled by proper authorities, the matter shall be reported to the Regional Executive Director and the Director of Lands Management Bureau.

Section 620 - After the final decision of proper authorities, the adopted barangay boundaries shall be monumented with standard barangay boundary monuments and the monuments temporarily marking the disputed boundaries shall be removed.

VERIFICATION SURVEYS

Section 621 - Whenever any approved survey is reported to be erroneous, or when titled lands are reported to overlap or where occupancy is reported to encroach in another property, a verification survey shall be made only by a Geodetic Engineer in accordance with the order of the Regional Executive Director or Regional Technical Director for Lands. The field verification shall, among others,

a) ascertain the position and descriptions of the existing survey monuments or marker, buildings, fences, walls, and other permanent improvements, which are used to provide evidence of original boundaries;

b) give primary consideration to original survey marks, except where other evidence, including original measurements, position of improvements, or statements by occupants, suggests that the original markers were incorrectly placed or have been disturbed;

c) ascertain the positions of buildings, fences, walls or other permanent improvements adversely affected by the determination of the boundaries;

d) inform the parties concerned of the effect of the determination of the boundaries and secure a statement from the parties that they have been informed of these findings.

Section 622 - When gross errors or discrepancies in adjoining surveys are discovered, an explicit statement of the lines found to be erroneous and other discrepancies shall be recorded in the field notes. It shall be the responsibility of the Geodetic Engineer to disclose any doubt or discrepancy associated with the survey.

Section 623 - The geodetic engineer whose survey is reported to be erroneous shall be required to make a thorough examination of the premises and to report his findings under oath. In case he finds his survey in error, he shall report in detail all discrepancies between the new survey and the original survey and submit an explanation as to the cause thereof. If on the contrary, he finds his survey correct, a joint survey with the geodetic engineer who reported the error shall be ordered to settle the differences in findings.

Section 624 - All survey work undertaken to check boundary lines and position of corners and to obtain common points, etc., of surveys previously approved by the Director of Lands/Regional Technical Director for Lands shall be designated as verification surveys (Vs). The number of the survey to be verified shall be given in the order for survey.

Section 625 - The provisions of Sections 621 to 624 shall apply to verification surveys of isolated surveys and cadastral lots.

AMENDMENT SURVEYS

Section 626 - An amendment survey shall be made for the purpose of changing the boundary lines by increasing or reducing the number of corners of previously survey or consolidating and/or subdividing the area without including any new area or any area already included in other surveys previously approved by the Director of Lands/Regional Technical Director for Lands.

Section 627 - The amendment survey for the consolidation and/or subdivision into various lots, for registration proceedings of the area of an original survey, may be made following the same methods prescribed for original surveys.

Section 628 - A full explanation in writing of the reason for requesting the amendment shall be submitted, giving the authority therefor, either as desired by the owner or as directed by the court.

Section 629 - If the person requesting the amendment is not the owner or claimant of the land, he shall be required to submit satisfactory proof that the owner or claimant thereof desires the amendment.

Section 630 - If amendment is desired to conform to adjoining previous surveys, the numbers of said surveys or the Land Registration Authority (LRA) survey numbers shall be stated. Certified copies or survey plans approved by the LRA shall be submitted with the survey returns.

Section 631 - Amendment/subdivision of cadastral lots pending judicial registration shall be made only upon order of the Court if the case has been filed for compulsory registration; otherwise, the survey shall be made upon authority and order issued by the Regional Executive Director.

Section 632 - Returns of amendment surveys submitted to the Land Management Services for verification and approval shall include, among others, the tracing plan, order of the court, sketch plan showing the stations occupied, the control survey and the original field notes.

SEGREGATION SURVEYS

Section 633 - Segregation surveys are surveys for the purpose of segregating twenty (20) per cent or less of the area of previously surveyed large tract of public land.

Section 634 - Segregation surveys shall be made in accordance with applicable provisions of Sections 394 to 452. The remaining area of the mother lot shall be reflected in the footnote of the plan.

LEASED, PATENTED AND DECREED LAND SURVEYS

Section 635 - The subdivision survey of leased, patented, or decreed properties shall be made using the bearings, distances and areas in the original survey approved by the Director of Lands or Regional Director of the Land Management Service and/or in the antecedent subdivision survey approved by the Land Registration Authority (LRA), Lands Management Bureau (formerly Bureau of Lands) or Lands Management Services, or that appearing in the lease or title. In case of discrepancy the data in the approved survey shall prevail. The discrepancy shall be reported for reference in administrative or judicial correction of the title.

Section 636 - Discrepancies between the survey data of leased, patented or decreed properties and those of the later survey of an adjoining land shall be carefully investigated and reported to the Regional Technical Director for Lands.

Section 637 - The subdivision plan or plans of leased, patented or decreed properties shall show the entire boundary of the original lot or lots and each subdivision shall be treated as a separate parcel. Original lots not subdivided shall not be shown on the plan, or if shown at all, it shall be in fine dotted lines. Subdivision lots shall be numbered by repeating the old number followed by the letter of the alphabet: Provided, that if the subdivision is made in blocks, the blocks and the lots in each block shall be numbered consecutively from 1. A subdivision plan shall contain the subdivision of one lot only and to be assigned as distinct subdivision survey number.

Section 638 - All improvements, especially those described in the title or patent, shall be plotted on the plan of each lot of the subdivision. In the absence of such improvements, the words "No Improvement" shall be noted correspondingly on the plan.

Section 639 - Lot descriptions shall be prepared on the prescribed Lot Descriptions form in case they cannot be shown on the plan.

Section 640 - Surveys made under Sections 621 to 639 shall be carefully investigated. The convergency of meridians of the different surveys shall be considered.

REINSTATEMENT/RELOCATION SURVEYS

Section 641 - Lot corners of a previously surveyed land, patented, decreed and titled shall be reinstated or relocated only by a qualified and experienced Geodetic Engineer who is knowledgeable of the laws on property, land registration, public lands and natural resources and who shall be able to explain his survey to the satisfaction of the approving officials and to the courts in case land conflicts are finally submitted for judicial settlement.

Section 642 - The relocation of corners or re-establishment of boundary lines shall be made using the bearings, distances, and area stated in the survey approved by the Director of Lands Management Bureau or the Regional Technical Director for Lands or written in the lease or Torrens Title.

Section 643 - The geodetic engineer as required in verification surveys, shall:

(a) Ascertain the positions and descriptions of the existing survey monuments, buildings, fences, walls, and other permanent improvements, which are used to provide evidence of original boundaries;

(b) Give primary consideration to original survey marks, except where other evidence, including original measurements, position of improvements, or statement of occupants suggests that the original marks were incorrectly placed or have been disturbed;

(c) When it is positively established that a boundary survey mark has not been placed as originally intended, re-set the mark after having recorded the position of the mark that is to be re-set;

d) Ascertain the positions of buildings, fences, walls and other permanent improvements adversely affected by the determination of the boundaries and indicate the same on the plan;

(e) Inform any owner affected by the determination of the boundaries and obtain a statement from the owner that he has been informed;

(f) Record any encroachment caused by the differences between the positions of boundaries as determined in reinstatement/ relocation survey and the original or earlier surveys.

Section 644 - The data used in monumenting or relocating corners of approved surveys shall be submitted to the Land Management Services for verification and approval. New corner marks set on the ground shall be accurately described in the field notes and indicated on the original plans on file in the Land Management Services.

Section 645 - The relocation of corners, re-establishment of boundary lines, etc. of magnetic surveys, upon which valid land titles have been based, shall be the subject of special instructions to be issued in each case.

RESURVEYS

Section 646 - A reserve is a survey made of a previously surveyed tract of land for the purpose of voiding the original approved but undecreed survey due to failure to include all the areas claimed by the applicant.

Section 647 - Survey returns of a resurvey shall be accepted for verification and approval only upon surrender for cancellation of the approved plan, technical descriptions and geodetic engineer's certificate of the original survey. An affidavit of loss and a satisfactory proof that the plan is not the subject of any public land application or registration proceedings shall be submitted in lieu of the approved plan.

Section 648 - It shall also be applied to the survey of a tract of land, decreed or titled, whose technical descriptions are not inscribed in the title or are no longer available in the Lands Management Bureau or the Land Registration Authority. The corners as indicated by the landowner and the adjoining landowners shall be surveyed. The survey shall conform to adjoining decreed or titled properties.

Section 649 - The new survey returns shall be accompanied by a detailed explanation why the resurvey was necessary.

Section 650 - In cases of previously decreed magnetic surveys or of surveys whose technical descriptions cannot be reconstructed, the geodetic engineer shall make a complete resurvey of the property as pointed out by the applicant and described in the certificate of title, trying to relocate as many old corners as possible of the previous survey. The survey returns shall include the plan, geodetic engineer's certificate and a report of findings.

TOPOGRAPHIC SURVEYS

Section 651 - The topographic survey of cadastral projects, irrigation projects, estates, mineral land claims, etc. shall be made in accordance with special instructions to be issued for the purpose.

The primary and secondary control stations, and political boundary monuments shall be used to control the topographic survey of cadastral projects.

Section 652 - The elevation of the BLLM No. 1 of the municipality or cadastral project may be determined approximately by altimeter in case the elevation cannot be obtained by more accurate methods.

Section 653 - The elevation of all primary and secondary control stations and of the political boundary monuments shall be determined by leveling starting from and closing at the BLLM No. 1 of the municipality or project.

Section 654 - The topographic survey shall be made with transit and stadia or by plane table or by photogrammetry or any comparable method.

Section 655 - Topographic survey shall be made in accordance with the procedures described in standard surveying textbooks and the specifications for the survey.

SPECIAL SURVEYS

Section 656 - Surveys for geographic and scientific investigations, experiments and all other surveys not otherwise mentioned in this Manual shall be made in accordance with special instructions which may be issued for the purpose. This shall be designated as "Special Work Order" (SWO) which can not be a subject of titling and must be clearly stated on the plan.

Section 657 - Hydrographic surveys of canals, esteros, rivers, lakes, bays, and other bodies of water, shall be the subject of special instructions which shall be issued by the CGSD/NAMRIA for each case.

Section 658 - In all other surveys, detailed reports shall be submitted, in addition to the field notes, sketches and plans, stating in full the methods of work, difficulties and local conditions encountered and other pertinent information.

LAND CLASSIFICATION AND DELIMITATION SURVEY

Section 659 - Upon receipt of the authority and order from the DENR Secretary, the Forest Management Bureau (FMB), in coordination with the National Mapping and Resource Information Authority (NAMRIA), shall determine and prescribe the criteria, guidelines and methods for the proper classification and survey of the public forest delimiting the alienable and disposable areas from the forest reserves when Congress shall have determined by law the specific limits of the public domain.

Section 660 - Sub-classification categories. The land uses for which sub-classification shall be carried out within the inalienable lands of the public domain classified as forestlands, mineral lands, and national parks under Article XII, Section 3 of the New Constitution and as defined by the New Constitution, P.D. 704, P.D. 705, R.A. No. 7586 (NIPAS Act), LOI 1262 and other applicable laws shall be as follows:

1. for forestlands: agricultural, industrial or commercial, residential, resettlement, ancestral lands, grazing, protection, production, agro-forest, fishfarm;

2. for national parks: natural park, strict nature reserve, natural monument, wildlife sanctuary, protected landscapes and seascapes, resource reserve, natural biotic areas; and

3. other categories established by law, conventions or international agreements which the Philippine Government is a signatory.

Section 661 - Classification and sub-classification shall be done by NAMRIA, in coordination with FMB, through the Regional Land Evaluation Parties (LEPs). This can be done by interpretation and analysis of the most recent aerial photos, satellite data as well as legal references of the subject area, supplemented by data/information gathered from the field.

Section 662 - Exact boundaries of the permanent or forest reserves and public forest shall be laid out and monumented on the ground at not more than 500 meters between monuments and constructed in accordance with Section 272(e). Wooden post 30 x 30 x 200 centimeters, buried 50 centimeters into the ground, with chiseled markings in accordance with Land Classification marking system may be used to mark intermediate corners established conspicuously at every 100 meters. Markers shall also be established at the perimeter of the buffer zone at every fifty (50) meters intervals in addition to the permanent markers or concrete monuments (PD 705, DAO 13, S-1992).

Section 663 - The positions in the PPCS-TM/PRS 92 of the boundary monuments or markers shall be established by NAMRIA using GPS receivers and/or conventional surveying methods. This delimitation survey shall be plotted on a Land Classification (LC) Map at the scale of 1:50,000 using the standard topographic map as the base map. If this scale is not practical, other scales as may be determined by NAMRIA, may be used.

The layout and other information to be indicated on the map shall be determined by NAMRIA. However, the international cartographic symbols for the features such as roads, bridges, railroads, etc., shall be used. Witness marker and other vital information that may serve as guide in future relocation of boundary markers shall be described in the field notes.

Section 664 - **The Land Classification Map shall be prepared by NAMRIA and** checked for its technical accuracy. The Land Classification Map together with the corresponding draft DENR Administrative Order, shall be submitted through the FMB and proper channels for approval of the DENR Secretary.

The Land Classification Map shall indicate, among others, the corner number, geographic and cartesian coordinates in PPCS-TM/PRS 92 of corner 1, and cartesian coordinates of the other corners, description and markings of the corner monument or markers.

Section 665 - If the land, as classified and delimited, falls within the territorial jurisdiction of two or more municipalities, the portion falling in each municipality shall be designated as separate parcels (Parcel A, B, C, etc.), respectively, and the corresponding areas are determined.

Section 666 - After the approval of the map by the DENR Secretary, copies shall be given to the Regional Office, CENRO, PENRO, the Forest Management Bureau, the Lands Management Bureau, and the Lands Management Services.

Section 667 - The NAMRIA shall be the repository of Land Classification records which include fieldnotes, computations, and land classification maps and other related documents.

BUFFER ZONES WITHIN FORESTLANDS

Section 668 - Buffer Zone: Definition - As used herein, a buffer zone refers to a strip of land with natural or established vegetation which provides an added layer of protection to the natural forests including mangrove forests.

Buffer zones shall be located and established in the following area (DAO 13, S-1992):

a) Twenty-meter strips of land along the edge of normal high waterline on rivers and streams with channels of at least five (5) meters wide or even less than five (5) meters if the water is continuously flowing;

b) Strips of land at least fifty (50) meters in width fronting the sea, ocean or other bodies of water and 20 meters on both sides of river channels/banks maintained and developed to enhance the protective capability of mangrove against strong currents, winds and high waves;

c) In storm-prone areas, mangrove forest strips 100 meters wide inward along shoreline fronting the seas, oceans and other bodies of water and 50 meters strip river bank protection;

d) Twenty-meter strips of land outside the boundaries and immediately adjacent to designated protected areas;

e) Twenty-meter strips of forest land adjoining ISF projects;

f) Twenty-meter strips of land along the boundaries of reforestation projects adjacent to private/alienable or disposable lands; and

g) A buffer zone of about 100 meters of residual forest shall be established immediately surrounding the old growth forest stands. However, when the old growth forest stand is adjacent to natural ground features such as waterways (rivers, streams, creeks), gullies, or ridges tops, these shall be used as boundaries. (DAO 13, S-1992).

Section 669 - The CENROs and PENROs shall identify, with the aid of the latest Forest Resources Condition Maps, aerial photographs and/or technical references, potential areas as buffer zones. Areas identified shall be demarcated on the ground by markers at every fifty (50) meter intervals at the perimeter of the buffer zones. These shall be indicated on a buffer zone map at the scale of 1:50,000 with the standard topographic maps as the base maps and in PPCS-TM/PRS-92.

Section 670 - Once the boundaries of these buffer zones are identified and marked on the ground, the perimeter survey may be done through compass survey method or using Forestry transit and tape. However, it should be tied to a nearby GPS station in the PPCS-TM/PRS- 92 for positional location. If there is no PRS-92 nearby, the assistance of CGSD/NAMRIA shall be sought to establish the position of the buffer zone in the PPCS-TM/PRS-92. The compass survey shall be checked for its accuracy and polygon closure but need not be approved.

Section 671 - The CENRO concerned shall prepare an Administrative Order establishing the area as a buffer zone which shall be submitted to the DENR Secretary through proper channels, together with the map and development plan of the area, for approval.

Section 672 - The CENRO, PENRO, Forest Management Services, Forest Management Bureau, Lands Management Bureau, and CGSD/NAMRIA shall be furnished with copies of buffer zone maps and approved administrative order. The Land Management Services (LMS) shall be the repository of the map and survey records. The LMS shall project the buffer zones in its Property Surveys Control Maps. Established buffer zones shall not be the subject of application for lease or permit or any other form of alienation (DAO 13, S- 1992).

DELIMITATION OF RESERVATIONS, PARKS AND OTHER PROTECTED AREAS

Section 673 - Upon receipt of the authority and order issued by the DENR officials as stated in Section 394 for the survey of lands reserved or proclaimed as National Parks and other Protected Areas, etc., NAMRIA shall proceed to monument the corners, with the assistance of the Regional Land Evaluation Party and the Forester assigned to the project, based on the technical descriptions contained in the proclamation. The consecutive boundary corners shall be inter-visible and not to exceed 500 meters from each other. The positions of the corners shall be determined using, preferably, GPS receivers and the metes and bounds shall be computed.

Section 674 - The political boundary of local government units as established by law or executive order shall be located in the area. If the area falls within the territorial jurisdictions of two or more municipalities as established by law, the portion falling in each municipality shall be designated as Parcel A, B, C, etc., respectively. Then the corresponding area of these parcels are determined. The survey should also be based on the evaluation report, inventory and sketching of the said area by the Regional Land Evaluation Party and personnel of the Protected Areas and Wildlife Bureau (PAWB). (D.a.l, DAO 72-1, S.1990; C.2, DAO 47, S.1990).

Section 675- If the delimitation survey is done by authorized private geodetic engineers capable of undertaking GPS surveys, the observed GPS data shall be submitted to the CGSD/NAMRIA for processing, adjustment and determination of the geographic and cartesian coordinates in PPCS-TM/PRS-92. Thereafter, the geodetic engineer shall submit the isolated survey returns as stated in Section 474 to the Lands Management Services for verification and approval of the plan.

Section 676 - If the delimitation survey is done by the geodetic engineer using conventional surveying method and instruments, the complete survey returns as stated in Section 474 shall be submitted to the Lands Management Services for verification and approval.

Section 677 - If the proclaimed area is in conflict with previously approved surveys or decreed properties, the survey in that particular portion shall be made to conform with the technical descriptions of the approved survey. (C.2, DAO 47, S.1990).

Section 678 - The survey shall be computed; the metes and bounds determined and plotted on a suitable map size, preferably 100 centimeters by 120 centimeters, at a scale of 1:50,000.

Section 679 - Previously approved surveys inside the area shall be reflected in the plan by light full lines indicating therein the survey numbers. The unsurveyed claims shall be sketched and reflected on the plan in dotted lines. The actual land uses and permanent improvements in these private claims shall be indicated on the plan. (C.5, DAO 47, S.1990).

Section 680 - All corners of the boundary shall be marked conspicuously in the ground with concrete monuments 15 x 15 x 50 centimeters in accordance with Section 272(f).

Section 681 - After the plan has been approved in accordance with Sections 675 and 676, a copy thereof together with the numerical data of the metes and bounds, descriptions and geographic location of the corners shall be given to the Lands Management Bureau, Forest Management Bureau, the CENROs, and PENROs concerned. Copies of the GPS survey plan approved by CGSD/NAMRIA shall be furnished to the Regional Lands Management Services for plotting in its Survey Control Map, and the Forest and Lands Management Bureaus, the CENROs and PENROs concerned.

DELIMITATION SURVEY OF FOREST RESERVES

Section 682 - Upon receipt of authority and order from the DENR officials as stated in Section 394 for the survey of areas declared as permanent forest reserves, NAMRIA, with the assistance of a Forestry Officer assigned to the project, shall proceed to monument the corners and the boundaries based on the sketch map prepared by the Land Evaluation Parties and on the technical information and references sourced and/or gathered from the following:

a. Technical data contained in the proclamation.

b. Photo maps or enlarged rectified aerial photographs;

c. Latest available maps and references derived from satellite images;

d. Base information supplied by the CENRO, PENRO and DENR Regional Office;

e. Cadastral maps, latest LC Maps, and other sources of data and information relevant for the purpose.

Section 683 - Permanent or forest reserves shall mean the mass of land of the public domain which have been the subject of the present system of classification and determined to be needed for forest purposes.

Section 684 - Sections 414 to 424 shall be followed in the perimeter survey of areas delimited as forest reserves, if done using conventional survey method and equipment. If the survey is done using GPS receivers to establish the positions of the corners, NAMRIA shall determine the survey design and execute the GPS Survey. If done by authorized private geodetic engineer using GPS receivers, Section 675 shall be followed.

Section 685 - All corners of the boundary shall be monumented in accordance with Section 272(f). Marking of corners may also be done following the procedures under Sections 659 to 667, Land Classification and Delimitation Survey.

Section 686 - All boundaries between permanent forest reserves and alienable and disposable lands shall be clearly marked and maintained on the ground. The corners shall be marked with concrete monuments at interval of one hundred (100) meters but not to exceed 500 meters. Infrastructure or roads which will serve as buffer zone shall not exceed two (2) meters in width, exclusive of shoulders and drainage ditches. In cases wherein the permanent forest boundary is adjacent to natural ground features such as waterways (river, streams, creeks), gullies, or ridge tops, these shall be used as buffer zone. Otherwise, buffer zones shall be established in accordance with Sections 688 to 672 (Buffer Zones within forest lands).

Section 687 - The survey shall be computed and plotted in accordance with Sections 326 to 335, 341 to 343, and 371 to 386. The survey symbol shall be Frb (Forest Reserve Boundary). The complete survey returns shall be submitted to the Lands Management Services for verification and approval. However, survey using GPS receivers shall be submitted to CGSD/NAMRIA for verification and approval as stated in Section 675.

Section 688 - Maps of classified forest reserves shall be prepared at a uniform scale of 1:50,000, using standard topographic maps as base maps or as may be determined by CGSD/NAMRIA. The maps shall indicate the PPCS-TM/PRS 92 grid lines. The PPCS-TM (1965) grids may be indicated by tick marks. The Forest Management Bureau, Lands Management Bureau, the PENRO and CENRO concerned, and the Lands Management Services in the case of the GPS Surveys processed by NAMRIA shall be furnished with copies of the map and boundary data.

Section 689 - When the forest reserves transcends two or more municipalities, the portion within the boundary of each local government unit shall be plotted on the map and designated as separate Parcels A, B, C, etc., respectively. The corresponding areas are determined.

Section 690 - Upon receipt of authority or order from the Regional Executive Director for the perimeter survey of ISF areas, the designated geodetic engineer, with the assistance of the Forestry Officer assigned by the RED to the project, shall proceed to monument all corners or corners of the prominent turns of the boundaries based on the sketches prepared by the Land Evaluation Parties. However, the distance between two succeeding monuments shall not exceed 500 meters and their construction shall be in accordance with Section 272(e). (B.3, DAO 72 S. 1990; Sec. 17, PD 705, S. 1975)

The perimeter survey of ISF projects shall be done in accordance with these rules and regulations and with an accuracy of fourth order as prescribed in Section 55.

Section 691 - The survey shall be tied to a point of known geographic positions in the PPCS-TM/PRS 92 by a closed traverse of tertiary precision or a system of triangulation/trilateration using Theodolite and EDM or Total Station Systems. Actual observations using GPS Receivers may be made on the monumented corners and on inter-visible monumented corners for azimuth orientation. (B.4, DAO 72 S. 1990)

Section 692 - In the case of on-going cadastral projects, the perimeter survey of ISF areas shall be surveyed concurrently with the lot boundary surveys in A and D areas. The ISF areas inside forestland or public forest shall be depicted on a Social Forestry Map (SFM) and the parcels, if non-contiguous, shall be indicated as separate Parcels A, B, C, etc., respectively.(72 DAO 72 Amd.)

The lots within the alienable and disposable areas shall be assigned cardinal numbers (lot 1, 2, etc.) and prepared on a cadastral map (CM).

Section 693 - A strip of at least twenty (20) meters along the boundary line of ISF areas and within the forest land shall be delineated as buffer zone between the ISF areas and forestlands. These should be marked "X" on immovable or fixed hard rocks or boulders with exposed surfaces of more than one meter in diameter or trees belonging to the first group or indigenous or living edible fruit trees. In any case, the distance between the two succeeding marks should not exceed five hundred (500) meters. No improvements shall be introduced within the zone except for dirt roads connecting the ISF areas and the outside areas.

Section 694 - The parcellary sketching of the individual ISF awards within the ISF areas shall be done by Administration through tachimetry methods or by compass survey. These parcellary sketches of the individual award to each ISF beneficiary shall be approved by the CENRO or PENRO.

Section 695 - The position of roads, trails, existing structures, important natural features, etc., within the ISF areas and in the public forest shall be approximately located by transit and stadia or by other approximate method.

Section 696 - After the completion of perimeter survey of the ISF area and parcellary sketching of the farmlots cultivated by upland farmers in cadastrally surveyed municipalities, a sketch plan shall be prepared on authorized LMB Forms. The survey symbol shall be "SFCM - Region Code Number - survey number". In municipalities that are not yet cadastrally surveyed, the survey symbol shall be "SFM-Region Code Number - survey number". The sketch plan in both cases shall show the boundary lines, traverses, monuments and the position of the features mentioned in the preceding section.(B.7.1, DAO 72, S. 1990, amd)

Section 697 - In the case of the on-going cadastral survey, an overlay of the cadastral map segregating the forestland and public forest shall be prepared. This overlay shall be prepared similar to the cadastral map in all aspects but shall be called Forestry Cadastral Map (FCM) instead of CM.

For ISF surveys independent of cadastral survey, the map shall be called Social Forestry Map (SFM). The perimeter survey of the ISF parcels shall be plotted on these maps and numbered consecutively from ISF-Parcel A, ISF-Parcel B, etc. for areas outside a cadastral survey and ISFC-Parcel A, ISFC- Parcel B, etc. in cadastrally surveyed areas. No single parcel should fall in two or more Cadastral projects or municipalities.(B.7.2, DAO 72, S. 1990)

Section 698 - The plan and other survey returns shall be submitted to the DENR Land Management Services for verification and certification. The plan shall be marked **"NOT FOR REGISTRATION PURPOSES"** in order that this can not be used for titling by the awardee.

Section 699 - A comprehensive report together with the survey returns shall be submitted stating the location of the ISF areas with respect to the bodies of water, natural features such as mountains, existing virgin forests, nearest communities, man-made features such as dams and highways, and the approximate population of persons living in the area. These data shall be based on the personal observation of the survey party and not of the occupants.

CHAPTER XIV - MINERAL LAND SURVEYS

Section 700 - Mineral land surveys are surveys of mining claims, quarry applications, sand and gravel applications, and other mineral lands except coal and petroleum, executed for lease, permit, license or for other purposes pursuant to the provision of the mining laws of the Republic of the Philippines.(MLSRR)

LODE PATENT AND LEASE SURVEYS

Section 701 - Mining claims located and registered before November 15, 1935 may be surveyed for lease purposes at the option of the applicant, provided that in the case of the former, there must have been spent not less than One Thousand Pesos (P1,000.00) for labor and improvements for the development of each claim. Mining claims located and registered on or after November 15, 1935 shall be surveyed for lease purposes any time within four (4) years from the date of the registration thereof, or thereafter provided that a lease application has been filed during the said period.(MLSRR)

Section 702 - Claims located and registered under Act No. 137 which were existing and in force since January 1, 1942, and whose owners thereof filed lease applications on or before October 28, 1950 in accordance with the provisions of Sec. 1 (b) of Rep. Act No. 81, as amended by Act No. 215, may also be surveyed for lease purposes.(MLSRR)

Section 703 - The position of corners, location posts Nos. 1 and 2, and of the discovery post, shall be verified on the ground and compared with the description and sketch given in the declaration of locations. All corners and location posts shall be marked in accordance with Section 73 (g).(MLSRR)

Section 704 - The distance between location posts Nos. 1 and 2 shall not exceed three hundred (300) meters. When the distance exceeds 300 meters, location post No. 2 shall be moved to a position on the location line at a distance of distance 300 meters from location post No. 1. When the distance between location posts No. 1 and 2 is less than three hundred (300) meters, location post No. 2 shall not be moved from its place and the positions of these posts shall govern the position of the claim.(MLSRR)

Section 705 - All boundary lines shall be run when possible. If it is impossible to run the boundary, closed traverse lines and/or triangulation/trilateration system may be run for control and the corners shall be set by side shots from the stations of said control.

Section 706 - When a corner is inaccessible, its position shall be defined by two witness corners which shall be placed along the boundary lines and as near as possible to the inaccessible point. These shall be considered as intermediate corners of the mining claim and/shall bear numbers with the suffixes a, b, c, etc.

In case of fractional lode claims, at least one of the boundary lines shall be as near as possible parallel to the location line.(MLSRR)

Section 707 - After the survey, the original plan of the claim shall be prepared complete with all the details. The title of the plan shall show the following: name of the claim; kind of minerals contained therein; purpose of the survey; name of the owner or holder of the claim; location, area in hectares; date of registration of the original declaration of location; date of registration of deed of assignment; date of registration of amended declaration of location, if there are any; dates of issuance of the survey order and submission of survey returns; lease application number and date filed; and survey number. (MLSRR)

Section 708 - The reference point of the claim, as indicated on the declaration of location or the tie point of the group of claims to which the claim under survey is a part, should be connected with the survey and indicated on the field notes, computations and on the working sheet plan, if possible.

Any discrepancy found on the ground relative to the reference point shall be stated on the descriptive report and shown on the working sheet plan that accompanies the survey returns.(MLSRR)

Section 709 - National, provincial, and municipal roads, passing through a lode or placer claim under patent or lease shall be surveyed and their actual positions shall be shown on the plan.(MLSRR)

INVESTIGATION OF DEVELOPMENT WORK AND IMPROVEMENTS

Section 710 - The improvements upon each mining claim shall be numbered consecutively. The dimensions and character value of each improvement shall be specified in the descriptive field report which shall be prepared and made a part of the survey returns.(MLSRR)

GENERAL PROVISIONS FOR PATENT: PERMIT/LICENSE AND LEASE SURVEYS

Section 711 - All mineral land surveys shall be executed by licensed and duly bonded deputized Geodetic Engineers or by the DENR Geodetic Engineers only upon receipt of an order of survey from the DENR officials as stated in Section 394 (d).(MLSRR)

Section 712 - Before a survey order is issued, the applicant should file within the prescribed period, an application for order of survey in the Mines and Geo-Sciences Regional Office on the proper form prescribed for the purpose. The application shall be accompanied by the following:

(1) Two (2) sets of carbon copies of the original declaration of location or two (2) certified copies of the same declaration of location issued by the Mines Regional Recorder.

(2) Pertinent documents such as deed of assignment and power-of-attorney duly registered with the Mines Regional Recorder, and in the case of partnership or corporation, a copy of the articles of partnership or incorporation duly registered with the Securities and Exchange Commission.

(3) A notarized survey service contract executed by and between the applicant and the deputized geodetic engineer, except when the deputized geodetic engineer is employed by the claimant and/or company interested in the survey provided that proof of employment of the deputized geodetic engineer is submitted. Such service contract shall stipulate, among others, the following:

i. The name of the contracting parties;

ii. The names of the mining claims or identification of areas sought to be surveyed;

iii. The consideration or contract price and mode of payment of the same; and

iv. The date of the submission of the survey returns thereof through the Regional Technical Director for Mines.

(4) Affidavit of the deputized geodetic engineer concerned, stating that he can execute the survey of the claims and submit the returns thereof to the Regional Technical Director for Lands through the Regional Director for Mines and Geo-Sciences within one (1) year after receipt of survey order. Failure to submit the survey returns within said period is sufficient cause for cancellation of the geodetic engineer's bond and/or cancellation of the survey order. No extension of period within which to submit the survey returns shall be allowed unless for reasons of force majeure, admitting payment by the applicant of not less than 20% but not more than 50% of the agreed professional fee advanced in consideration of such representation: Provided, that this provision on payment of the professional fee shall not apply if the deputized geodetic engineer is an employee of the applicant and/or company interested in the survey. No mineral land survey returns shall be accepted by the Land Management Services without the endorsement of the Regional Director for Mines and Geo-Sciences.

(5) A surety bond in the amount currently set by existing regulations per application for order of survey for the approval of the Regional Executive Director. This bond shall be forfeited for failure to execute the survey and/or comply with the obligations as required by existing rules and regulations. However, for survey of mining claims to be executed by the geodetic engineers of DENR, the aforesaid requirements as enumerated in items 3, 4, and 5 shall not be required. The corresponding survey fees as required shall be deposited with the DENR Regional Office at the time the application for order of survey is filed.(MLSRR)

Section 713 - Before executing a mineral land survey, the deputized geodetic engineer or the DENR geodetic engineer shall require the applicant or his authorized representative to show the reference point, location posts and corners of the claim particularly for those claims registered under Commonwealth Act 137. The survey shall not be executed until after the claim is properly identified.

Section 714 - In case the area shown to the Geodetic Engineer is other than the area described in the declaration of location, the applicant should be advised to file a declaration of location for a new mining claim. After the registration of the new mining claim, a carbon copy or a certified copy of the new declaration of location shall be forwarded to the Regional Executive Director concerned with a request for the amendment of the survey order. (MLSR)

Section 715 - Before starting the survey, the geodetic engineer shall notify the DENR Regional Office concerned, the people in the region through the Mayor of the municipality or the Chairman of the barangay where the claim/application is located, of the date of the executive of the survey. The notice shall contain, among others, pertinent information, an advice to any interested person to present his opposition to the geodetic engineer and show the corners of his mining claim/application, if there is any.(MLSR)

Section 716 - In mineral land surveys, all computations, plans, and maps to be submitted to the Lands Management Services through the Mines and Geo-Sciences for verification and approval shall be prepared in the Philippine Plane Coordinate System-Transverse Mercator/Philippine Reference System 1992, using surveying instruments duly tested and certified in accordance with Sections 15 - 37 of this Manual.

Section 717 - Tie line survey shall either be a closed traverse or a system of the triangulation/trilateration from a point of known geographic positions in the PRS 92. The relative position between the claim undergoing survey and other surveyed claims within one hundred fifty (150) meters of the survey in progress, shall be determined by a closed traverse to at least two (2) existing well defined and permanently marked corners of the former and later surveys and should not exceed thirty (30) centimeters in the northings or eastings. Conflicts of mining locations should also be indicated on the plan and their corners or posts should be surveyed as much as possible. (MLSRR)

Section 718 - The numbering of the corners shall be in the clockwise direction. If additional corners are necessary between the corners described in the declaration of location, these should be considered as intermediate corners with the suffixes a, b, c, etc.(MLSRR)

Section 719 - The corners of the mining claims shall be marked with the corresponding corner and survey number used in the computations. For claims registered under U.S. Congress of July 1, 1902 or under CA 137, if the numbering of the corners on the declaration of location is counterclockwise, the mark on the monuments should either be in accordance with: the preceding statement or with the corresponding corner numbers on the declaration of location with the name of the mineral claim. In the latter case, the deputized geodetic engineer should submit necessary explanation which should be form part of the report. For claims/applications registered/filed under P.D. 463, corners of mining claims/applications shall be defined by monuments placed at intervals of not more than four hundred (400) meters. When the boundary lines of the claim pass across mountains or rolling terrain, the intermediate monuments between corners shall be established on ridges, and whenever possible, consecutive monuments shall be inter-visible. (MLSRR Amd)

Section 720 - The corners of the mining claim shall be concrete monuments or cement patch on boulder, centered with a hole, spike, pipe or nail and marked with the corresponding corner number and survey number as indicated in the declaration of location and in the order of survey.(MLSRR)

Section 721 - When the mining claim undergoing survey adjoins submerged land, a witness corner monument along the boundary leading to the shoreline shall be set on the ground to witness the boundary or point or corner of the claim at the low tide level of the sea or lake. Concrete monuments, galvanized iron pipes, fixed rocks, boulders or stakes and other monuments shall be set to define the corners of the claim along the shoreline at low tide level.(MLSRR)

Section 722 - When the survey covers mining claims or leases with previously approved survey plans, an actual survey and verification of the existence of the corners of the old survey should be undertaken. The actual surface occupants and improvements should be verified and indicated on the plan. Any missing corner should be relocated and monumented. The field notes and computations should be submitted together with the survey returns. (MLSRR)

Section 723 - Mineral reserves, which have been proclaimed closed to mining location and other reservations established prior to the registration of the mining claim shall be excluded from the surveys for lease, permit or license. (MLSRR)

Section 724 - Boundaries of claims under survey should be indicated as public lands or private lands with the name of the owners, surveyed mineral claims with corresponding survey numbers, roads, and/or natural boundaries. (MLSRR)

Section 725 - When a scheme of triangulation or trilateration is used for establishing points of control, the position of stations should be selected so that well-conditioned triangle are used. By well- conditioned triangle it means that no angle thereof shall be less than twenty (20) degrees. (MLSRR)

Section 726 - Amendment surveys shall be executed only when ordered by the Regional Executive Director. This order shall contain specifically the conditions and objects sought in the required amendment.(MLSRR)

Section 727 - All field notes, computations, reports of the survey and plans of all mineral land surveys shall be submitted to the CENRO for plotting in the CENRO Index Map of Surveys. These shall then be forwarded to the Regional Director for Mines and Geo-Sciences.

The Regional Director for Mines and Geo-Sciences shall retain the other documents related to the mining application and forward the survey returns to the Regional Technical Director for Land Management Services for verification and approval. (DAO 72, S- 1990; DAO 35, S-1993)

Section 728 - The previously approved surface surveys and other occupancies shall be plotted in dashes on the mineral land survey plans by the Regional Surveys Division. The Regional Surveys Division shall also plot the mineral land surveys on the cadastral map or Property Surveys Index Map.

Section 729 - The applicant for survey of permit or lease of mineral lands, shall furnish the Deputized Geodetic Engineer all maps showing the location of the survey and underground workings which shall be submitted as part of the survey returns and for use of the Mines and Geo-Sciences. (MLSRR)

Section 730 - The survey returns should be submitted within one year from the date of receipt of the survey order. These shall include the documents stated in Section 466.

In addition, the following shall also be submitted:

a) Elevation and topographic survey computations

b) Descriptions and field investigation report on the mining claim in quintuplicate signed by the Geodetic Engineer and duly notarized.

c) A consolidated plan at a scale of 1:4,000 showing the relative positions of the surveyed mining claim(s) and other claims with existing rights at time of the survey.

d) Other documents pertinent to the survey of mining claim.

e) Original copy of the survey order.

The survey returns without the field notes, computations, plans and the above stated documents shall not be accepted.

Except for reasons of force majeure, failure to submit the survey returns within one year from receipt of survey order is sufficient cause for cancellation of the surveyor's surety bond and/or cancellation of the survey order pursuant to Section 32 of P. D. No. 463.(MLSRR)

TOPOGRAPHIC AND UNDERGROUND ELEVATION SURVEYS

Section 731 - Survey of the surface and underground workings of mineral lands shall be made to ascertain whether or not said workings have been extended beyond the mines/quarry boundaries of the claim or application defined by imaginary vertical claims passing along the surface boundaries.

Section 732 - Topographic surveys as well as underground elevation surveys shall be done following the procedures and computations found in surveying textbooks.

Section 733 - The following contour intervals shall be adopted to suit the topographical conditions of the area undergoing survey.

Difference of Maximum & Minimum Elevations	Contour Intervals
99 meters or less	5 meters
100 meters and above	10 meters

Section 734 - In surveying claim which adjoins previously approved mining surveys, the topography of the former should conform with the topography of the latter at common boundary and the contours should match with each other. In case they differ, the differences should be carefully investigated and the error of the new survey shall be corrected. However, if the error is within the approved survey, no correction shall be made, instead a report shall be submitted together with the survey returns. Necessary corrections may be ordered by the Director of Mines and Geo- Sciences according to the nature of the work and the amount of error found.(MLSRR)

Section 735 - The field notes, computations and plans of topographic and underground elevation surveys shall be submitted as part of the survey returns. (MLSRR)

PREPARATION OF MINERAL LAND SURVEY PLANS

Section 736 - Plans of mining claims shall be drawn on the isolated survey form designed for mineral land surveys using the Philippine Reference System of 1992 (PPCS-TM/PRS 92).

Section 737 - The plan shall be clearly and neatly drawn in drawing ink prepared in accordance with Sections 371 to 374. The following shall be shown on the plan:

a) The boundaries of the claim shall be shown in full black ink heavier than those of adjoining surveys. Stone or other permanent walls along boundaries shall also be shown.

b) All bearings and distances in black ink.

c) Contour lines in brown ink.

d) Rivers, creeks and waterlines in blue with their respective widths.

e) Surveyed private claims and public lands, mining claims, surface ownerships inside the mining claim being surveyed shall be indicated by dotted lines and the boundaries between them in broken black lines. Widths of roads, trails, streams shall be indicated.

f) Latitude and longitude of corner 1 of plans for lode, placer, sand and gravel; latitude and longitude of all corners of mining and quarry application claims, registered under P.D. 463.

g) The improvements and their descriptions and their extent.(MLSRR)

Section 738 - Bearings and distances shall be tabulated on the plan when they are too numerous to be shown clearly along or near the boundary lines.

Section 739 - All plans shall show a statement certifying whether or not a protest was raised during the survey. The format and text of the plan shall be as prescribed by the DENR.

Section 740 - The approved original plan shall be returned to the Regional Director for Mines and Geo- Sciences. Copies shall be retained by the Regional Surveys Division for official file. The CENRO and PENRO concerned shall be furnished with the copies of the approved original plan.

Section 741 - Symbols to be used for mineral land surveys are found in the appendix.

PART III

PROVISIONS GOVERNING CADASTRAL LAND SURVEYS

CHAPTER XV - FIELDWORK ON CADASTRAL PROJECTS

GENERAL STATEMENT

Section 742 - Cadastral surveys of municipalities or portions thereof and of other extensive areas as classified in Section 3, authorized by the President of the Philippines, shall be made by geodetic engineers upon orders of the Regional Technical Director for Lands or Regional Executive Director pursuant to Section 394.

Section 743 - Cadastral surveys may be assigned by the Regional Executive Director to geodetic engineers in private practice whenever such assignment is necessary for the prompt adjudication of titles.

Section 744 - Geodetic engineers who wants to enter into any contract or negotiation with the land owners and local authorities of any municipality or province to undertake the cadastral survey thereof shall first obtain a written authority or permission from the Regional Technical Director for Lands or the Regional Executive Director.

Section 745 - The technical men, field and office methods, the equipment and supplies to be used by the said geodetic engineers in the survey of cadastral projects shall be subject to pre-approval and strict supervision and inspection by the authorized representatives of the Land Management Services and the CENRO. The representative shall see to it that the requirements of this manual and of the terms and condition of the assignment and/or contract are fully complied with.

Section 746 - Representatives of the Land Management Bureau/Services shall check and verify the accuracy and completeness of the work on each assigned projects to ensure that reasonable diligence and care are exercised in the survey. A final inspection shall be made by the CENRO and LMS before the transmittal of the survey records to the Land Management Services.

Section 747 - For information and record purposes, the personnel employed by the geodetic engineer shall be reported to the Regional Executive Director, copy furnished the Director of Lands Management Bureau as soon as said employee was employed in any assigned project. The personnel includes the geodetic engineer's aides, cartographers, surveymen, linemen, tapemen, computers, and other persons he or she may employ. No substitution of technical personnel or reduction of personnel and equipment per Cadastral Survey Management Plan shall be made without prior approval of the RED.

Section 748 - The unit of survey shall be the city or municipality or portion thereof or area designated in the authority and order for survey. Cadastral survey project number shall be secured from the Land Management Bureau. The boundary survey shall follow the limit as defined in the law or the executive order creating the local government unit.

PRELIMINARY OPERATIONS

DATA OF THE SURVEY

Section 749 - The following shall be secured by the geodetic engineer from the Lands Management Services, whenever available, in connection with the order for the survey:

(a) Copies of projection maps on a scale of 1:4000 and/or enlargements thereof covering the entire area of the project;

(b) Prints or tracings of approved plans and copy of computations of all previous surveys within the project;

(c) Progress map of each adjoining cadastral project, in progress and completed;

(d) Approved horizontal angles, distances and other data on main control stations of adjoining projects;

(e) Approved data on provincial and municipal boundary monuments and lot corners along the boundaries of adjoining projects; and

(f) List of approved surveys, surveys filed for registration and their status such as decreed, pending, dismissed, etc.

Section 750 - The cost of preparing the data described in the preceding section shall be charged to the project in the case of surveys by DENR geodetic engineers and to geodetic engineers in private practice in the case of surveys assigned to them.

SCHEME OF WORK

Section 751 - The following scheme of work on a cadastral survey project is suggested:

(a) Post and distribute notices of survey in English, Spanish, and Filipino languages and in the local dialect.

(b) Locate the main control lines, monument its stations and run the preliminary survey in accordance with Section 132.

(c) Start the manufacture of standard concrete corner monuments.

(d) Prepare the progress and project control map from the preliminary survey and sketch thereon the boundary of the project, locating areas in dispute between municipalities, provinces, etc. See Sections 915 to 920.

(e) Take astronomical observations for azimuth as required to establish the base meridian. Start the measurement of the azimuths and distances of the main and subsidiary controls.

(f) Submit the main and subsidiary controls for verification and approval.

(g) Prepare the sketch sheets noting thereon the previous surveys and start sketching of lots claimed. Start monumenting of the property corners and of political boundaries.

(h) Post the "30-day notices". Notify owners or claimants to appear on the ground, verify and approve boundaries as monumented.

(i) Start survey of lots and other details after approval of main and subsidiary controls.

(j) Plot on the cadastral maps the corners as located from control stations, connecting the corners in accordance with the sketch of the survey. Transform previously approved surveys to PPCS/Grid-PRS 92 system.

(k) Number the lot corners in the cadastral maps according to the field notes.

(l) Prepare lot data computations.

(m) At the expiration of the 30-day notice, make a tracing of the cadastral maps and verify same in the field, correcting all errors found. Post copies of the cadastral maps in the Barangay Hall.

(n) Make a final check to verify discrepancies. The work shall be scheduled in such a way that the work in localities of difficult access will be performed during favorable weather.

(o) Complete and ink the cadastral maps.

(p) Prepare the barangay/case boundary of index maps and complete the progress map.

(q) Prepare the municipal/project boundary and index map.

(r) Prepare the complete survey returns of the project.

All phases of work may be done simultaneously in different parts of the project.

NOTIFICATION OF SURVEY

Section 752 - Copies of the general notice of the survey in Filipino, English and Spanish languages and in the local dialect, stating the area involved and the date of beginning, shall be distributed and posted in conspicuous places in the barangay being surveyed and the municipal building of the municipality in which the lands or any portion thereof are located. Copies of the notice shall also be sent to the barangay, municipal and provincial authorities.

The general notice of survey in English is as follows:

Republic of the Philippines
Department of Environment and Natural Resources
Land Management Services, Region ____

CADASTRAL SURVEY PROJECT)
:
NO._____) SUBJECT: Cadastral Project No._____
Cadastral Survey of the
Municipality of _____,
Province of _____

1. Pursuant to the provisions of Section 1851 of the Administrative Code (Act No. 2711 as amended), notice is hereby given to all persons claiming interest therein and to the general public that on the _____, 19___ in the municipality of _____, province of _____ a cadastral survey of all lands situated within the boundaries of the said municipality will be commenced by the _____.

2. In accordance with Section 1853 of the said Code, the geodetic engineers and other employees of the _____ shall have full authority of law to enter upon the above mentioned lands for the purpose of making the survey and placing monuments thereon; and it is the duty of all persons claiming said lands or interest therein to fully inform the said geodetic engineers and other employees concerning the boundaries of their respective land claims.

3. Any person who shall willfully refuse to give such information or shall in any manner interfere with the survey and placing of the monuments, or shall alter the location of the same, or shall deface, destroy or remove the said monuments, or remove notice of survey posted upon the lands shall be liable to prosecution under the provision of Section 2753 of the Administrative Code, as amended by Act no. 3077.

4. Practicing geodetic engineers are hereby requested to submit to the Land management Services, within sixty (60) days from _____ 19____, a list of the isolated surveys being made within the aforementioned cadastral project and another list of contracts for isolated surveys entered into in good faith by them prior to _____. Isolated surveys not listed as herein required will not be accepted for verification and approval.

5. Upon the completion of this cadastral survey, a petition for the settlement and adjudication of the titles to the lands included in the said survey in favor of all persons entitled thereto under the law will be filed by the Regional Technical Director for Lands in the Regional Trial Court of _____.

6. The full cooperation of all land owners and others interested in the welfare of the community is desired and requested. This cooperation may be expressed in the form of facilities given to the geodetic engineers engaged in the work by furnishing all desired information concerning property boundaries, cutting lines, helping in transporting and planting monuments and by providing such other means as may be found appropriate and feasible in each case.

_____
Regional Executive Director

Section 753 - The following certificate shall be attached to one copy of the notice in each language and local dialect:

"I hereby certify that on this date, _____, 19_____, in accordance with the provisions of Section 1, Act 2259, as amended, I posted a copy of the attached notice of survey at the following described points: _____ and on the principal building in the Barangay of _____, Municipality of _____, Province of _____."

_____
Chief, _____ Cadastre
Cad- _____

This signed certificate with one copy of the notice in each language and local dialect shall be returned promptly to the Land Management Services upon completion of the posting.

CONTROL OF THE PROJECT

Section 754 - The provisions of Sections 117 to 228, 238 to 241 and 242 to 246, shall govern the establishment of primary, secondary and tertiary controls of cadastral projects.

POLITICAL BOUNDARIES

Section 755 - Political boundaries in the cadastral projects as defined in the Laws or Executive Orders creating the municipalities shall be located, monumented and surveyed. These political boundaries are:

(a) Provincial or city boundaries

(b) Municipal boundaries

(c) Barangay boundaries

Section 756 - The requirements of Sections 559 to 620 on the establishment of political boundaries shall be also applicable to cadastral projects.

Section 757 - The political boundary as defined by the law or executive order creating the political unit shall be established on the ground. The position of political boundary shall be determined by primary or secondary control.

Section 758 - Political boundary monuments shall be established at the prominent turns or angles of the boundaries and where they cross roads or large streams. Where these boundary lines follow roads, streams or other natural features, a monument shall be placed near their junction points. Intermediate points along said road or natural boundary need not be monumented but marked with other acceptable markers.

Section 759 - Municipal and barangay boundary monuments shall be established along straight municipal and barangay boundaries at intervals at nor more than one kilometer except when the boundary passes through forest lands.

Section 760 - Barangay, municipal and city boundary monuments shall be numbered consecutively from one (1) for each municipality/city. The numbers of the barangay, municipal, city and provincial boundary monuments shall be inscribed or chiseled under the name of the respective barangay, municipality, city or province.

Section 761 - In case a municipal boundary monument is common to two or more municipalities, the monument number for each municipality shall be chiseled or inscribed on the respective faces of the monument fronting the corresponding municipality.

Section 762 - The corner of the municipal boundary already defined by a provincial boundary monument shall be given its equivalent municipal boundary monument number without altering the inscription on the monument and shall be indicated in the sketches, field notes and maps.

Section 763 - The corner of the barangay boundary already defined by a provincial or a municipal boundary monument shall be assigned its equivalent barangay boundary monument number without altering the inscriptions on the monument and indicated in the sketches, field notes and maps.

Section 764 - In the case of boundary dispute, the disputed area shall be drawn on the sketch sheets and a report shall be forwarded to the Regional Executive Director, copy furnished the Lands Management Bureau, the barangay, municipal or city and provincial authorities concerned.

Section 765 - The report required in the preceding section shall include a tracing of the disputed area as indicated on the sketch and shall show the general claims of each municipality or province. The municipality in which each of the affected lots are declared for taxation shall be indicated on the sketch sheet by its initial letters. Contested areas declared in two or more municipalities shall be determined and indicated on the sketch sheets accordingly. The information shall be drawn on the sketch sheets in black ink to facilitate reproduction.

Section 766 - In case the boundary dispute is not settled before the completion of the field work of the cadastral project, the disputed area with all the lots contained therein shall be surveyed and treated as separate cadastral case.

Section 767 - In case of boundary disputes, the procedure outlined in Sections 602 to 607, 611 to 615, 618 to 620 of this Manual and Section 118 of RA 7160 shall be followed.

NOTIFICATION TO LOT CLAIMANTS

Section 768 - The following notice shall be prepared in the local dialect, for posting and general distribution, by the sketching party at the time the work of defining and sketching of lot boundaries is commenced in each barangay.

PUBLIC NOTICE

_____ ,_____

TO ALL PROPERTY CLAIMANTS IN THE_____
of _____ , Municipality of _____ , Province of _____, Philippines.

You are hereby advised that the President of the Philippines has ordered the survey and registration of all lands in the _____ of _____, Municipality of _____ Province of _____ and that the Regional Executive Director has given due notice of the date on which such survey shall begin, all in accordance with the provisions of Section 1 of Act No. 2259, entitled " The Cadastral Act " as amended by section 1850 of the Revised Administrative Code, Act 2711. You are therefore notified in accordance with section 2 of said act as amended by section 1852 of the Revised Administrative Code, Act 2711, that the undersigned will begin the survey of the lands in the vicinity of the barangay of _____ on _____ ,19___ .

You are further notified in accordance with Section 4 of said Act as amended by section 1854 of the Revised Administrative Code, Act 2711, that: "It shall be the duty of every person claiming interest in the lands to be surveyed, or in any parcel thereof, to communicate to the geodetic engineer in charge upon his request therefor all information possessed by such person concerning the boundary lines of any lands to which he claims title or in which he claims any interest."

Section 4 of said Act, as amended by section 9 of Act 3077 further provides that: "Any person who shall interfere with the making of the survey undertaken by the Bureau of Lands, or shall interfere with the placing of any monument in connection with any such survey, or shall deface, destroy, or remove any monument so placed, or shall alter the location of any such monument, or shall destroy or remove any notice of survey posted on the land pursuant to law, shall be punished by a fine of not more than P= 100.00 or by imprisonment for not more than thirty days or both."

_____

Chief, Cadastral Survey Party No._____

Section 769 - Copies of this notice shall be posted in prominent and public places and each claimant shall be furnished with a copy of the notice in the local dialect. A copy thereof with translation in Filipino, English, and Spanish languages shall also be posted on the main municipal and barangay buildings at the time that the general delivery and posting is made in each barangay. One copy in the local dialect and in Filipino, English, and Spanish shall be transmitted to the Land Management Services with following certificate attached thereto:

I certify that on this date _____ ,19__ in accordance with the provisions of section 2 of Act 2259, as amended, I have caused copies of the foregoing notice in the local dialect to be distributed to the local claimants of lands located in the barangay of _____ ,municipality of _____ , Province of _____ and have caused copies of said notice to be posted in prominent and public places in the district and copies of said notice in the English, Spanish, and Filipino languages and the local dialect were also posted in the municipal and barangay buildings of said municipality.

_____

Chief,_____ Cadastral Survey Party

Cad - _____

LOT SKETCHES

Section 770 - Sketch sheets on any mapping paper shall be prepared in the same standard size as the cadastral maps in the scale of 1:4000.

Section 771 - Sketch sheets on a scale larger than 1:4000 may be prepared for sections of the project in which the lots are too small to be shown in the standard scale.

Section 772 - All previously approved surveys shall be drawn in pencil and all new monuments and control stations shall be inked on the sketch sheets.

Section 773 - Each sketch sheet shall be given the corresponding cadastral map number or sectional cadastral map number.

Section 774 - Sketching parties shall secure the services of guides who are familiar with lot boundaries and the claimants after consultation with officials of the local government unit (LGU).

Section 775 - Lot corners, roads, rivers, streams, lakes, ponds, pools, irrigation canals or ditches, political boundaries, railroads, etc., shall be plotted on the sketch sheets and their local name indicated.

Section 776 - Lot corner marks and boundaries such as stone walls, trees, stakes or monuments shall be indicated on the sketch.

Section 777 - Sketches shall be made in the field using plane table and alidade, stadia rod or on aerial photographs. Where competent sketchmen are available, sketches may be made by the free hand method. The boundaries along borders of the adjoining sheets shall be carefully compared and checked in order to avoid omitting or duplicating side shots during the lot survey. All data secured shall be indicated by using the conventional symbols and signs as prescribed for cadastral maps. The corners sketched shall be marked temporarily by stakes until verified and monumented in the presence of claimants. Trees shall be marked on the side opposite the lot in which they are claimed.

Section 778 - The lots shall be formed such that no single lot shall fall in more than one barangay.

Section 779 - The name of the claimant of each lot shall be written on the sketch sheet. In case lots or portions of lots are claimed by two or more persons, the areas in dispute shall be sketched as separate lot and the names of all claimants shall be noted therein.

Section 780 - Streams five meters or more in width, streams less than five meters in width through which water flows continuously and irrigation ditches or canals shall be excluded from the lot. The property lines shall extend only to the banks thereof excluding the mandatory bank protection and easement as stated in Section 310 to 312. These waterways shall be indicated by their local names as rivers, esteros, arroyos, creeks, canals or ditches as the case maybe on the sketch sheets. The direction of flow of the water shall be indicated by an arrow.

Section 781 - Foreshore lands shall be sketched as a separate cadastral lot and clearly indicated on the sketches and fieldnotes as foreshore lands. The corners that fall into the sea shall not be monumented but shall be indicated on the sketches by appropriate survey symbols.

Section 782 - Portions of lots which fall within the right-of- way of roads as determined by the District Engineer shall be sketched and numbered as separate lots when claimed as private property. Such claims, however, should be discouraged.

Section 783 - Sketches must be prepared with care especially with regard to lots and spelling of all proper names. The name of the municipality, cadastral survey number, scale and sketch sheet number shall be shown in ink on the lower right hand border. The sketches shall be dated and signed by the sketchmen.

Section 784 - As soon as sketching is finished and before final lot numbers are assigned to each lot, the project shall be divided into cadastral cases which shall be co-extensive with the barangay. Lots shall be numbered consecutively in each cadastral case/barangay.

SKETCHING OF PREVIOUSLY SURVEYED OR PATENTED, LEASED AND DECREED PROPERTIES

Section 785 - Sketchmen shall carry to the field the tracings of patented, leased, decreed and previously approved surveys. All corner markers shall be located and definitely identified as the original monuments.

Section 786 - All previous surveys contained in one sketch sheet shall be drawn in a sheet of tracing paper. The sketchmen shall compare the plan of the previous survey with the actual boundaries of the land as found on the ground. Diligent search shall be made for old monuments.

Section 787 - In case of minor difference between the plan of the previous survey and the actual boundaries thereof, the latter maybe accepted provided the adjoining owners agree thereto and the adjoining lots are not yet decreed/titled. In case it is evident that areas claimed are clearly outside the boundaries as registered and not the result of errors of measurement in the original survey, such areas shall be sketched, surveyed and numbered as separate lots.

Section 788 - Claims inside patented or decreed properties shall be disregarded unless supported by an order from the Regional Trial Court for each specific claim.

In case of leased untitled properties, the adverse claim must be supported by written authority from the Regional Technical Director for Lands or an order from the Regional Trial Court for each specific claim before it is considered.

Section 789 - The corners of patented, leased, or decreed properties, or of previous surveys common to two or more adjoining lots shall be monumented in case the corners were not monumented in the previous survey or in case the monuments were not found in place. However, this requirement shall not apply to adjoining approved cadastral projects or to corners of previous surveys that were not required to be monumented. Corners common to only one adjoining lot maybe monumented if the owner pays for the cost of relocating and monumenting the said corners.

Portions of patented, leased, or decreed or previous surveys which form part of river, estero, arroyo, creek and the mandatory stream bank protection as stated in Sections 310 to 312 shall be sketched, and later surveyed, as separate lots and indicated as such in the cadastral maps.

CONFLICTING CLAIMS

Section 790 - In case of disputed ownership, the sketching party shall try to bring the claimants to an agreement in the field in order to reduce the number of such conflicting claims. The adverse claimants shall be advised that the Court will require them to establish their muniment of title to such disputed area.

SKETCH AND SURVEY RECORD CARD

Section 791 - Sketching parties shall carry to the field sketch and survey record cards. One card for each lot shall be prepared by the sketch party and filled out with the information as required thereon. The spelling of the claimant's name, his age and community tax certificate number shall be carefully verified by the sketchman.

Section 792 - A provisional number shall be assigned by the sketchman to each lot and indicated on the sketch and survey record card. It will be convenient to assign for the use of one sketchman number 1 to 1,000; to another, number 1001 to 2000; and so on.

Section 793 - The date the lot was sketched, the name of the sketchman, the date of appearance of applicant or agent, etc. must be entered on the sketch card by the sketchman at the time of sketching. The applicant or his agent shall be required to sign the certificate relative to sketching on the back of the card, crossing out the word "survey" in the certificate.

Section 794 - Information pertaining to public, government or mineral land applications and previous surveys shall be noted in red ink.

Section 795 - As the sketching progresses, the municipal engineer shall be requested to indicate the centerlines and widths of all streets and roads other than provincial roads. The corner at the points of intersection of the road and lot boundary lines shall be monumented.

Section 796 - The District Engineer shall be notified before provincial roads are monumented. Plans of railroad right-of-way or data on the width thereof may be secured from the railroad company.

Section 797 - Curves of right-of-way of railways and highways shall be laid out and monumented as required in Section 300 (a). For other curves of short radii such as those of streets, circular plazas, etc., the laying out and monumenting shall depend upon the plans of layout, if any, of the local authorities.

Section 798 - These sketch and survey record cards shall, after completion, be placed in the alphabetical file.

Section 799 - These cards shall be duplicated and the duplicate card shall be placed in the numerical file. The geodetic engineer shall carry the duplicate cards for completion during the lot survey.

Section 800 - Both cards shall contain the class of land, whether urban or rural; home lots; agricultural; nature of cultivation such as riceland, copra, vegetables, etc. the nature of claim, whether titled/patented or public land; and the prevailing land use in accordance with Lands Management Bureau prescribed classification scheme.

Section 801 - The claimants of parcels adjoining the project boundaries shall be notified of the survey and shall be requested to sign the sketch and survey record cards for their adjoining parcels during the sketching and survey. The adjoining parcels shall be assigned adjoining lot numbers as prescribed in Section 923.

Section 802 - A set of index cards to be known as "A" lot cards shall be prepared for adjoining parcels (A-lots) described in the preceding section indicating thereon the A-lot number, the names and addresses of the claimant and his agent and the survey number, if any, of the A-lot.

MONUMENTING OF LOTS

Section 803 - All lot claimants shall be informed of the importance of monumenting as a far reaching single feature of the cadastral project. The value and usefulness of the surveys depend upon the permanency of the work.

Section 804 - Concrete monuments shall be indicated upon the sketch by a circle; stakes by the points of intersection of the boundaries. Other markers shall be designated by names and dimensions such as "mango tree, thirty centimeters in diameter," etc.

Section 805 - Standard concrete monuments shall be manufactured under the direction of the geodetic engineer in charge of the cadastral project following the provisions of Sections 272(d) and 282.

Section 806 - Standard concrete monuments defining and marking the boundaries of cadastral lots shall be numbered consecutively from 1 to 999 preceded by a letter in alphabetical order starting from A: thus A-1, A-999; B-999; etc.

Section 807 - The requirements of Sections 269 to 304 shall govern the monumenting of lots within cadastral projects.

THE FINAL SURVEY

NOTIFICATION OF LOT CLAIMANTS PRIOR TO THE FINAL SURVEY

Section 808 - After the lots had been sketched and monumented and before final lot surveys are inaugurated in a barangay, each lot claimant shall be notified by survey notification card to appear at the premises on the stated date of interview for the purpose of verifying the boundaries of his property as sketched and monumented. The notification card containing the name of the claimant, the lot number, the location of lot by barangay and the sketch sheet number shall be delivered, preferably, by members of the party or by mail.

Section 809- A sketch of the lot showing the adjoining lot numbers and their claimants and the concrete monument numbers shall be drawn in ink on the survey notification card. The lot owner/claimant shall be advised that no answer shall be verified during the court hearings for any lot without the corresponding survey notification card unless sufficient reason is given for its absence. He shall likewise be advised that in case of any transfer of ownership the card must be transferred as an integral part of the document of transfer.

Section 810 - If claimants are notified by mail they shall be given at least fifteen days advance notice. The sketches must be available for their examination on the dates stated in the notification. Checks shall be made to avoid mistakes in names and boundaries. The geodetic engineer or his representative shall accompany the claimant to his land and show the monumented boundaries. The claimant shall be encouraged to indicate his claim/s. Controversies shall be settled if possible at this stage. The claimant or his representative shall be requested to sign the duplicate sketch and survey record card for the lot surveyed.

Section 811 - Before the survey notification card is served to the claimant, the date and manner of notification shall be entered on the corresponding sketch and survey record card for the lot in question.

Section 812 - In case a lot number is changed after the claimant has received his survey notification card, he shall be advised and a new card indicating the new lot number shall be issued in exchange for the old one.

Section 813 - After the claimants or his authorized representatives have appeared and approved the lots as monumented, the following notices in English, Spanish, Filipino and local dialect shall be posted in conspicuous places throughout the locality and on the municipal building. The notice shall be referred to as the "30-day notice."

PUBLIC NOTICE

All persons claiming land within the barangay of _____ municipality of _____, who have not filed claim to such parcels of lands in connection with the cadastral survey, are hereby notified to do so at the office of the cadastral survey party within 30 days from the date hereof and to give notice or enter such protests as the case may require to protect their rights as claimants, or to protect against any action of the geodetic engineer or survey made by him, in default wherefore, it shall be understood that there are no further claims or pending protests.

_____

Chief of Party _____ Cadastre
Cad - _____

Section 814 - Upon completion of the cadastral survey, one copy of the notice in each language and in the local dialect shall be forwarded with the survey returns to the Land Management Services accompanied by the following certificate:

"I hereby certify that copies of the attached notices were posted in conspicuous places in the barangay of _____ on _____, 19____ and on the municipal building of _____.

_____

Chief of Party,_____ Cadastre
Cad - _____

LOT SURVEYS

Section 815 - Upon approval of the main and subsidiary controls and the completion of lot sketching, monumenting and notification to claimants as required in Sections 768 to 813, the survey of the individual lots therein shall be made by conventional ground survey or photogrammetric methods of at least tertiary precision.

Section 816 - If tertiary traverses are used to locate the lot corners, they shall be run as required in Sections 220 to 228.

Section 817 - Tertiary stations for each cadastral project shall be numbered consecutively from one. The numbers 1-1000 may be assigned to one geodetic engineer for his use; the numbers 1001 to 2000, to a second; the numbers 2001 to 3000, to a third; and so forth. The unused numbers need not be accounted for.

Section 818 - The sketches shall be carried into the field by the transit party for the purpose of identifying lots and lot corners. A careful check of all information thereon must be made.

Section 819 - The adjoining sketches shall be compared before the survey is made and duplicate corners checked off. Corners outside the margin of both sketches shall be included in only one sketch, by a semicircle in ink, to avoid missing corners and duplication of work. Lot surveys shall be confined to the interior limits of each sketch which shall be absolutely complete.

Section 820 - A sketchman shall accompany the lot survey party for the purpose of assisting in the prompt location of lot corners.

Section 821 - Whenever possible, corners shall be located by using them as stations of tertiary controls.

Section 822 - The provisions of Sections 409 to 420 shall be followed, whenever applicable, in locating corners of lots.

Section 823 - The side shot need not be assigned a final lot corner number at a time it is recorded. In lieu thereof, a provisional system of numbers may be assigned to side shots and entered on the sketch, the chain book and the extreme left margin of the field book. The provisional series shall be consecutive from one for each days work.

Section 824 - The sketchman shall indicate the tertiary control on the sketch sheet. Side shots shall be indicated by radial lines from control stations to corners, numbering shots consecutively as provided for in the preceding section.

Section 825 - The markings of corners on the ground, i.e., by monuments (old and new), trees, stakes, etc. must be carefully verified and entered in the field book. The number, if any, and the size of the monument must be entered in the field book and indicated on the map. If all monuments used are of standard size, a notation to that effect shall be made on the first page of each field book giving the dimensions thereof. Old monuments or marks found in place shall be concisely described indicating clearly and definitely the point to which the measurement was made.

Section 826 - In case an entry in the field notes is cancelled a notation shall be made to indicate where the new data will be found. Field notes must be clear and distinct and full details must be recorded.

Section 827 - The date, name of geodetic engineer and number of the corresponding tape book shall be noted at the top of the first and last pages of the field notes for each day's work.

Section 828 - The tapeman shall record taping notes on authorized L.M.B. form. Before leaving the station from which the distances were measured he shall furnished the geodetic engineer with the measured distances for entry in the field notes.

Section 829 - The geodetic engineer shall take with him to the field the numerical sketch and survey record card. He shall verify with the lot claimant the data entered on the card. After completion of the survey, the name of the geodetic engineer, the name of the claimant or his agent who appeared, the date of appearance and the date of survey shall be noted on the card. The signature of claimant or his duly authorized agent must be affixed on the certificate at the back of the card.

Section 830 - After the lots are surveyed and plotted on the cadastral maps, a tracing or white prints of each cadastral map shall be made. This shall be used for verification of lot boundaries and corner marking and posting in the barangay hall where the land is located. Land owners shall be given thirty (30) days from the date of posting to report any error or mistake noted on the white prints or tracings. Any error found in the map shall be corrected accordingly. Whenever possible, the distances of the lot lines shall be measured directly.

SURVEY AND REPORT ON PREVIOUSLY APPROVED SURVEYS

Section 831 - The geodetic engineer undertaking the cadastral project shall secure the data of all previously approved surveys in the cadastral project and of adjoining properties from the Land Management Services, the Land Registration Authority, the Registry of Deeds of the province or city, the landowners who may have the approved tracing cloth plan, the geodetic engineers and surveying companies. These surveys, including their subdivisions, shall be indicated in the cadastral survey records.

Section 832 - Tracings or sketches and lot data computations of these surveys shall be made.

Section 833 - The landowner/claimant or his authorized representative shall be requested to indicate on the ground the corners and boundaries of the surveyed property claimed by him.

Section 834 - If the boundaries of the property as pointed by the owner/claimant or his authorized representative conform with the boundaries as described in the survey or differ slightly therefrom, the previously approved survey shall be accepted in accordance with Section 787 and adjusted accordingly in the cadastral survey.

Section 835 - If the boundaries differ substantially and the owner or claimant is actually claiming additional land, the additional area shall be made as a separate cadastral lot in accordance with Section 787.

Section 836 - In case the land previously surveyed has not be titled and the claimant wants to combine the surveyed area and the additional unsurveyed area in one cadastral lot, he shall be required to surrender the approved tracing cloth plan of the survey together with an affidavit requesting the Regional Technical Director for Lands for the cancellation of the plan. If the approved tracing cloth plan is lost, he shall be required to submit an affidavit to that effect and certification of the Land Registration Authority or the Clerk of Court of the province that the land covered by the said survey plan has not been the subject of registration proceedings.

Section 837 - If the claimant voluntarily excludes portion or portions of the previous survey, the excluded area shall be numbered as separate cadastral lot. In the case of titled or leased properties, the land owner shall be made to execute an affidavit relative to the excluded area.

Section 838 - Titled and leased properties without technical descriptions; with technical descriptions but do not form closed polygons; and with technical descriptions from magnetic surveys shall be resurveyed. The resurvey shall relocate the corners and boundaries of the property at the same places where they were originally surveyed on the basis of the data and the best evidence available.

Section 839 - Claims inside previously approved surveys not yet titled shall be made as separate lots. Claims inside titled or leased properties shall be disregarded unless supported by an order from the Regional Trial Court or by written authority from the Regional Technical Director for Lands, for each claim in accordance with Section 788.

Section 840 - In case it has been established that there is a definite overlapping between previously approved surveys, the following procedures shall be followed:

a. When the overlap is between surveys not yet titled or leased, the area in conflict shall be made as separate cadastral lot;

b. When the overlap is between titled or leased properties, the area in conflict shall also be made as a separate cadastral lot; and

c. When the overlap is between a titled or leased property and a property not yet leased or titled, the latter shall be amended to exclude therefrom the portion in conflict, except when there is a court order or an order from the Regional Executive Director in case of the leased property, directing the showing of the conflicted area as a separate cadastral lot.

Section 841 - Roads and streams included within previously approved surveys shall be located and assigned separate cadastral lot numbers.

Section 842 - In case the owner or claimant of a property covered by a previously approved survey within a cadastral project desires changes or subdivision, he shall secure the authority from the Regional Technical Director for Lands for each changes.

Section 843 - Common points with previously patented, leased or decreed surveys situated within cadastral projects shall be located. The area given in the lease, patent or title shall be accepted as final. The bearings should be reduced to cadastral bearings either from actual shots on the ground or by applying correction for convergency. Three or more monumented corners of the previously approved surveys shall be located for use in comparing and reducing the system of coordinates of old survey to the cadastral survey. After reducing the old survey coordinates, the old survey as reduced shall be adopted in all computations. The provisions of Section 789 shall be complied with.

Section 844 - The tie line of the old survey shall be reduced to the grid system and checked on the cadastral map. However, this tie line need not fix the location of corner one of the survey unless it can not be otherwise identified. Existing monuments, marks occupation or agreement of the owner and adjoining claimants shall be given preference in determining the location of this point and other points of the boundary. An old survey shall be considered adjusted in the cadastral survey if its corners and boundaries are located in the cadastral system at the same places where they were originally surveyed.

Section 845 - A report in duplicate on previous survey shall be submitted with the returns of the cadastral survey. The report shall be accompanied by tracing plans showing the relation between the previous survey and the corresponding cadastral lot or lots. Discrepancies found in previously approved surveys of undecreed lots shall be mentioned in the report and indicated in red ink on the lot data computation of the cadastral lot or lots.

Section 846 - This report shall be in the following form:

REPORT ON PREVIOUS SURVEYS

B.L. SURVEY..... L.R.C. NO. _____
Lots ..... Surveyed for _____
Lots ..... Claimed by _____

Corners ..... recovered. Additional land claimed along lines ..... or land excluded along lines .....
all other corners practically relocated. Tie line checked.

_____
Chief of Party, _____ Cadastre

Section 847 - The report on adjoining cadastre shall be made as follows:(712)

REPORT ON ADJOINING CADASTRE

Cad-_____, Case_____
Corner Nos. _____
recovered. Corner Nos. _____ data found erroneous and subdivision made to include portion of Lot No. _____of Case No. _____ in Cad-_____ etc.

Section 848 - The adjustment/transformation of the boundaries of adjoining cadastre shall be made in accordance with instructions to be issued by the Director of Lands Management Bureau and/or the RTD for Lands.

Section 849 - Each report shall be signed by the Chief of the cadastral project. The duplicate computations and report must be clear and complete. This shall be given to the geodetic engineer assigned to assist the Court at the hearing of the cadastral case.

Section 850 - Computations of previous surveys located within a cadastral project which were furnished to the survey party must be preserved without erasures, corrections or other notations thereon and must be returned to the Land Management Services together with the returns of the cadastral survey.

Section 851 - Prints or tracings of previously approved surveys shall be marked in red ink to indicate changes in the boundaries thereof as agreed upon by the owners/claimants.

PUBLIC LANDS WITHIN CADASTRAL PROJECTS

Section 852 - All public land claims within a cadastral project shall be surveyed subject to the limitations as prescribed in Chapter X, Part II of this Manual, for each class of claim, such as homestead, lease, sale, etc., as the case may be.

Foreshore lands, whether covered or not by appropriate public applications shall be sketched, monumented, and surveyed as separate cadastral lots.

Section 853 - Public land claims for which final inspection has been made and approved shall be monumented and surveyed.

Section 854 - Information relative to illegal or unauthorized occupation or claim on public land shall be gathered.

Section 855 - Chiefs of cadastral projects must make special reconnaissance work to determine the extent of public lands within their projects.

Section 856 - In case private claims extend beyond the limit of cultivation and occupation, investigation shall be made to determine the nature of the claims. Report thereon shall be submitted to the Regional Technical Director for Lands. A brief of the report shall be noted on the back of the sketch and survey record card for the corresponding lot.

Section 857 - Claimants/occupants of lands of the public domain classified as alienable and disposable shall be advised to file the appropriate public land applications. In any case, the land shall be surveyed.

Section 858 - Claimants/occupants of lands of the public domain which are classified as alienable and disposable may obtain advance plans of cadastral lots upon payment of cadastral cost and related fees for use in voluntary judicial registration. Advance plan shall be issued only after approval of the cadastral survey or the particular case where the lot is located. The name of the original cadastral lot or survey claimant shall be maintained in the advance plan and it must faithfully reflect the cadastral records. No advance plan shall be issued for one or more lots of the many lots of an original isolated survey as all the lots shall be the subject of one registration case.

Section 859 - Upon completion of each cadastral project, a report, including a list of lots applied for under the provisions of the Public Land Act in numerical order, the names and addresses of the applicants and the kinds of numbers of their applications shall be submitted to the Regional Technical Director for Lands. Another report on the lots claimed as private property within the public land area, giving the names of the claimants, the nature of their claims, and the improvements made by them shall be submitted. All relevant information tending to prove that the land is of the public domain and the names and addresses of witnesses who can testify to this effect must be gathered and submitted to the Regional Technical Director for Lands.

Section 860 - Private claims inside unclassified areas also called public forest shall not be surveyed except with written authority from the Regional Executive Director.

Section 861 - In case a lot claimant agrees to file an appropriate public land application, he shall be furnished the necessary blank form which may be obtained from the Community Environment and Natural Resources Office (CENRO) and assisted in accomplishing the same. The application shall show the cadastral lot number applied for and the nature of the application shall be noted on the sketch and survey record card of the lot.

Section 862 - If the claimant is disqualified to file an application because of restrictions imposed by the law or regulation, but insists on his claim of private ownership, the boundaries as claimed shall be sketched, monumented and surveyed if covered with a written authority as provided in Section 860. The geodetic engineer shall indicate on the sketch plan the nature of the vegetation such as virgin forest, second growth timber, cogon etc., and the location and nature of cultivation on any portion thereof. The information shall be placed on the cadastral map and on the supplementary index cards as provided for in the following section.

Section 863 - A supplementary index card shall be prepared and the required information shall be secured from the claimants and entered thereon.

Section 864 - The following form for a supplementary card is suggested:

REPORT OF OCCUPATION OF PUBLIC LANDS

Survey No. _____,_____
Province, Lot No._____Claimant_____
Area cultivated to _____ Has., Forest _____ Has.,
Second growth_____ Has., Cogon_____ Has.
Occupied since_____ Cultivated since_____ Has.
Claims Title by_____ Muniments of Title_____
Remarks:

_____
Chief of Party,_____ Cadastre
Cad-_____

Other pertinent information may be included in the report.

Section 865 - The names and addresses of the adjoining owners and their testimonies on the occupation and cultivation shall be written on the reverse side of the card. The card shall be submitted to the Land Management Services.

A list of "Claims of Doubtful Validity" shall also be prepared showing parcel numbers and names of the claimants. This list shall be signed by the chief of survey party and submitted together with the survey returns.

Section 866 - A numerical list on foreshore land sketched, monumented and surveyed as required in Section 852 indicating the areas, application numbers and cadastral map numbers shall be prepared in triplicate and submitted together with the survey returns for the cadastral case.

Upon completion of the sketching of the occupied lands within the cadastre, a report on public lands suitable for agriculture that may be applied for in the near future and on public lands which are very mountainous or otherwise not adopted for agricultural purposes shall be submitted to Regional Technical Director for Lands.

Section 867 - A graphical representation of these areas shall be made on the progress map similar to those map illustrating the area sketched and surveyed.

Section 868 - Public lands within cadastral projects may be subdivided for distribution to interested applicants in accordance with special instructions, provided, the applicants are qualified under the Public Land Act.

Section 869 - The subdivision shall be made to form rectangular lots and shall have as few corners as possible. All corners shall be monumented.

Section 870 - Public lands not desired to be subdivided shall be sketched, monumented and surveyed as a single cadastral lot.

GOVERNMENT LANDS WITHIN CADASTRAL PROJECTS

Section 871 - All government lands included within cadastral projects shall be sketched, monumented and surveyed and assigned cadastral lot numbers.

Section 872 - Information on national, provincial or municipal government lands within a cadastral project shall be secured from the officials concerned.

Section 873 - A list of national, provincial and municipal government lands within the project shall be prepared and submitted together with the survey returns of the project. This list shall be arranged in numerical order of cadastral lot numbers assigned to government land, indicating the name of the owner or claimants such as "National Government" or "Provincial Government" or "Municipal Government".

MINERAL LANDS WITHIN CADASTRAL PROJECTS

Section 874 - All patented mineral lands within a cadastral project shall be surveyed as regular lots of the project in accordance with the plan of each survey as approved. All other mineral land surveys shall be projected by their tie lines or by coordinates and indicated on the cadastral maps by dotted line.

Section 875 - A list of cadastral lots equivalent to patented mineral land surveys and another list of other mineral land surveys within the project shall be prepared in numerical order and submitted together with the survey returns of the project. These lists shall indicate the mineral land survey numbers and the owners or claimants thereof.

PUBLIC LAND SUBDIVISION AND GROUP SETTLEMENT SURVEYS WITHIN THE CADASTRAL PROJECT

Section 876 - The main control of the cadastral project shall traverse public land subdivision (Pls) or group settlement surveys (Gss) within the cadastral project. Recoverable BLLMs, boundary monuments (MBMs and BBMs) shall be made part of the cadastral main control. When there are no recovered BLLMs or boundary monuments in the Pls or Gss, main control points shall be established in these areas and BLLMs are established in accordance with Sections 117 and 122.

Section 877 - The Pls or Gss shall be plotted on the cadastral map as one big lot. For this purpose, the Pls or Gss boundary data shall be transformed into the system of the cadastre.

Section 878 - Unless otherwise required in the survey order, such as in the transformation into the PPCS-TM/PRS 92, the individual lots of the public land subdivision or of the Gss shall not be plotted on the cadastral maps.

PHYSIOGRAPHIC FEATURES

Section 879 - The provisions of Chapter VI on Physiographic Features, shall be strictly followed in cadastral surveys.

ADVANCE SURVEYS

Section 880 - Advance survey of a lot pertains to the preparation of the isolated survey returns of cadastral lots that are not yet verified and approved or its field survey, if not yet surveyed; provided the project controls have been approved. Chiefs of cadastral survey parties must discourage requests for advance surveys of parcels located within the project unless the need of the claimant for such survey is sufficiently urgent and the applicant is willing to bear the expenses, in which case, the following procedure shall be adopted.

The survey of the property in question shall be made after the primary and secondary controls of the project have been completed, verified and approved. Said property and all contiguous properties shall be plotted on the cadastral maps. Tracings shall be made from the cadastral maps showing adjoining owners, markings of all corners and the tie lines. Geodetic engineer's certificate shall be prepared from the sketch and survey record card and signed by the chief of project. Lot data computations, in duplicate, shall be prepared and checked.

Section 881 - Advance surveys shall be made only after a written authority has been granted by the Regional Executive Director upon recommendation of the Regional Technical Director for Lands.

Section 882 - The cost of the advance survey computed in accordance with the authorized charges for isolated land surveys shall be deposited with the DENR Regional Cashier before each survey is made.

Section 883 - The project chief shall indicate the class and survey number assigned to the advance survey on the cadastral maps, lot data computation sheets, sketch and survey record card.

Section 884 - Each contested area of parcel shall be made a separate lot.

Section 885 - In case of cadastral projects assigned to and undertaken by geodetic engineers in private practice, advance surveys may be authorized subject to the terms and conditions agreed upon by the interested parties and the geodetic engineers. However, if the project is covered by a contract with the DENR, the cost of the advance survey shall be paid to the DENR Regional Office. The requirement of Section 739 shall be strictly complied. The survey returns shall be submitted to the Land Management Services for verification and approval.

Section 886 - In case the survey returns of the cadastral case of the project are already submitted for verification and approval, in compliance with the requirements of Sections 740 and 741, the advance survey shall be prepared and submitted based on the certified extra copies of the submitted survey.

CHAPTER XVI - CADASTRAL COMPUTATIONS AND MAPS

ASTRONOMICAL OBSERVATIONS

Section 887 - All computations of azimuths, time, latitude, etc. shall be made in accordance with the provisions of Sections 77 to 109 and 326 to 335.

POINTS OF CONTROL

Section 888 - The computations of primary, secondary and tertiary controls shall be made in accordance with the provisions of Sections 189 to 204, 215 to 219, 238 to 241, 326 to 340, 344 to 348. Only approved survey controls computations shall be used for lot data computations.

CADASTRAL LOT NUMBERS

Section 889 - The lots situated within each city, municipality or settlement shall be numbered consecutively from one, preferably in a clockwise direction for each project.

Section 890 - When the cadastral project comprises only a portion of a city or municipality, the numbering shall begin consecutively from one to the last number for the project.

Section 891 - When the cadastral survey of the remaining unsurveyed portions of the city or municipality is made, the cadastral lot number shall begin from the number next to the highest lot number of the previously surveyed portions.

Section 892 - When portions of a completed project are transferred by law to the jurisdiction of an adjoining city or municipality, the numbers assigned to the lots comprised within the transferred portion shall not be used in the other remaining portion of the cadastral survey of the city or municipality.

Section 893 - In the case of coal leases, coal revocable permits or petroleum leases, lot numbers shall be assigned only when the tract is not within any public or private land claims.

LOT DATA COMPUTATIONS

Section 894 - The chief of the cadastral survey party or his Geodetic engineers shall prepare lot data computations in two copies on the prescribed Lands Management Bureau forms as stated in Section 341. Corners of each lot shall be numbered consecutively from one in a clockwise direction. The description and coordinates of the tie point shall be indicated thereon.

Section 895 - When one or more small lots are entirely inside a big lot and the boundaries of the former do not coincide with the boundaries of the latter, the corners of the big lot shall be numbered in such a way that in computing the area of the big lot the areas of the small lots shall automatically be excluded. The big lot may, however, be divided into smaller lots so that no lot will be inside another lot.

Section 896 - In the preparation of lot data sheets for cadastral surveys, when previously executed surveys are accepted and cadastral lots are made equivalent thereto, the corners of the cadastral lot which are equivalent to the corners of the previous survey shall be referred to the previous survey, giving the corner and survey number. Corners of lots of a lower cadastral number that are common or equivalent to the corners of surveys mentioned herein shall be referred to the cadastral lot and not to the previously executed survey. The survey number of the previous survey, shall in all cases, be noted in red ink on the lot data computation sheet.

Section 897 - In all cases, except as stated earlier, lots having higher cadastral lot numbers shall be referred to those lots having lower cadastral lot numbers bearing the original data when equivalent corners are given on the lot data sheet.

Section 898 - To save time in copying data of previously approved surveys and transforming their coordinates to the system of the cadastral survey, the method outlined below may be followed:

Example:

If corners 1 and 2, Lot 927 are equivalent to corners 3 and 4 of Lot 3, II-1224, corners 1 and 2 of the former shall be referred directly and made equivalent to corners 3 and 4 of the latter. Assuming that line 1 to 2 of Lot 927 is common to line 2 to 1 Lot 923, corners 2 and 1 of the latter shall be made equivalent to corners 1 and 2 of the former, instead of corners 3 and 4 of Lot 3, II-1224.

Section 899 - The nearest provincial, municipal, or barangay boundary monument; BLLM or BLBM, or Global Positioning System-PRS 92 station, shall be used as the tie point to corner one of each lot. No tie line should exceed one thousand (1,000) meters in length.

The kind of reference point used, its number, and grid coordinates shall be placed in the proper column of the lot data computation sheet or lot description sheet. The bearings and distances of the tie lines shall be computed and doubly checked.

Section 900 - Lot data computation sheets shall be plainly marked with their respective lot numbers and bound in consecutive order in books of not more than 100 lots.

Section 901 - The computed grid coordinates of each lot corner shall be checked against its plat on the cadastral maps to verify the accuracy of computations, plotting and numbering of lot corners.

Section 902 - All intersections of property lines with the boundaries of the project and with titled or leased properties shall be computed, coordinated and monumented.

Section 903 - If the areas of lots covered by public land applications are within the prescribed maximum, the exact areas thereon shall be computed.

Section 904 - Any excess area may either be included in the adjoining lot provided the maximum area for such lot is not exceeded or be considered as a separate lot available for disposition. In the latter case, the portions to be excluded shall be those which have not been improved or those which have the least improvement.

Section 905 - A brief description of the corner marks such as "Tree", "P.S.", "Stone", "Rock", etc. and the concrete monument number corresponding to each corner shall be indicated at the proper column of the lot data computation sheet.

Section 906 - A case or barangay boundary computation in duplicate shall be prepared for each cadastral case as required in Section 784.

Section 907 - A project or municipal boundary computation in duplicate shall be prepared from all the barangay boundary computations of the project.

MAPS

PROJECT CONTROL MAP

Section 908 - The project control map of the cadastral project shall be prepared on a reproducible material of stable base such as drafting film 0.003 inch with polyester or mylar base. This map shall be submitted to the Lands Management Bureau together with the approved survey control returns of the project.

Section 909 - The project control map shall be prepared at any appropriate scale that will allow the plotting of the entire municipality/project on a 54 x 54 centimeters with marginal lines of 50 x 50 centimeters. This shall show/contain the following:

(a) BCGS and BL triangulation stations; GPS-PRS 92 stations

(b) Primary control stations

(c) Secondary control stations

(d) BL Location Monuments

(e) Astronomical observation stations

(f) Other recoverable points of reference in the project

(g) Grid lines and plane coordinates; scale

(h) Graticule lines and tick marks and geographic coordinates

(i) Adjoining political subdivisions and survey projects

Section 910 - The project control map shall be titled as follows:

PROJECT CONTROL MAP OF
CAD _____

Municipality of _____
Province of _____
Island of _____
Scale 1: _____
(Graphical Scale)

PPCS-PTM/PRS 92 Zone No.

Surveyed : From _____ to _____

_____
Project Chief

POLITICAL BOUNDARY CONTROL MAP

Section 911 - The political boundary control map of the cadastral project shall be prepared on a reproducible material of stable base as stated in Section 908 approved for official use by the Lands Management Bureau. This map shall be submitted to the Land Management Services together with the approved political boundary control computations. A copy of this map shall be forwarded to the Lands Management Bureau.

Section 912 - The political boundary control map shall be prepared at any appropriate scale that will allow the plotting of the entire municipality/project on 54 x 54 centimeters with marginal lines of 50 x 50 centimeters. This shall show/contain the following information:

(a) BCGS and BL triangulation stations, GPS-PRS 92 stations

(b) Primary control stations

(c) Secondary control stations

(d) BL Location Monuments

(e) Other recoverable points of reference in the project

(f) Grid lines and plane coordinates

(g) Graticule lines and geographic coordinates; scale

(h) Political subdivisions (Barangay) of the project and monuments

(i) Important streams, rivers, lakes, roads, and railroad lines

(j) Forest lands and marshy lands

(k) Large tracts of lands such as haciendas and reservations, parks and other protected areas

(l) Bounded project area and aggregate areas of numbered cadastral lots.

Section 913 - The political boundary control map shall be titled in the same manner as prescribed in Section 910 except that instead of Project Control Map Political Boundary Control Map shall be used. All other information remain the same.

Section 914 - When the political boundary control survey returns together with the project control survey returns are to be submitted to the Land Management Services, for verification and approval, the political subdivisions and corresponding monument numbers may be projected on the project control map. This shall be titled as Project and Political Boundary Control Map. All the other information as prescribed in Sections 909 and 912 shall likewise be shown. Otherwise, a separate political boundary control map as prescribed in Section 912 shall be prepared.

PROGRESS MAP

Section 915 - The progress map based on the control survey of the project shall be made on reproducible material of stable base approved for use by the Land Management Bureau. A white print copy of the progress map shall be submitted once every three months to the Land Management Services together with the periodic report for information on the progress of the survey. The progress map for the cadastral survey of a portion of the municipality shall have a location plan drawn to an appropriate scale. It shall indicated the approximate distance of the project from the poblacion of the municipality or center of the city and shall show the nearest place or point accessible to transportation.

Section 916 - The progress map shall be prepared at a scale that will permit the plotting of the entire municipality or project on 104 x 104 centimeters, with marginal lines of 100 x 100 centimeters, and shall show the following:

(a) BCGS and BL triangulation stations

(b) Primary control stations

(c) Secondary control stations

(d) BL Location Monuments

(e) Astronomical observation stations

(f) Other recoverable points of reference in the project

(g) Grid lines and plane coordinates, scale

(h) Graticule lines and geographic coordinates

(i) Political subdivisions of the project and monuments

(j) Important streams, rivers, lakes, roads, and railroad lines

(k) Forest lands and marshy lands

(l) Large tracts as haciendas and reservations

(m) Adjoining political subdivisions and survey projects

(n) Other pertinent information

Section 917 - The progress map shall contain a table showing the totals for each class of work accomplished for each month.

Section 918 - The monthly progress of sketching, monumenting and lot surveys shall be shown separately on the progress map by miniature sketches.

Section 919 - The progress map shall be titled in a manner similar to that prescribed in Section 910 except that instead of Project Control Map the title Progress Map shall be used.

Section 920 - The progress map shall be prepared in accordance with the prescribed form and layout.

CADASTRAL MAPS

Section 921 - Cadastral lots and other details of the cadastral survey shall be plotted on cadastral maps on reproducible materials of stable base approved for use by the Lands Management Bureau on 54 x 54 centimeters with marginal lines of 50 x 50 centimeters prepared in accordance with the Philippine Plane Coordinate System-Transverse Mercator/Philippine Reference System 1992.

Section 922 - The names of claimants, the numbers of the concrete monument and the description of lot corners shall be indicated on the cadastral map except when space limitation does not permit it. The respective lot numbers shall, in every case, be indicated thereon as nearly as possible in consecutive and regular order.

Section 923 - Cadastral maps shall show the names of all claimants adjoining the project boundaries as well as the lines between the adjoining claims which shall be drawn in dash line. Adjoining unsurveyed parcels shall be assigned consecutive numbers beginning from 1 in a clockwise direction. These numbers shall be preceded by the letter "A", as A- 1, A-2, etc. Adjoining approved surveys shall be indicated by the lot and corresponding survey number and name of claimant.

Section 924 - When a cadastral lot covers an area previously patented, leased or surveyed, the relationship of the lot to the previous survey shall be indicated on the cadastral map as follows:

(a) When the cadastral lot is equivalent to a previously approved survey, both the cadastral number and the number of the previously approved survey shall be shown.

(b) If the previous survey has been subdivided, the plat of the corresponding subdivision lots shall bear the cadastral numbers and words "Portion of Lot _____ Survey No. _____L.R.C. Case No. _____."

(c) When the accepted boundaries of the cadastral lot cause rejection of the former survey of untitled property, the cadastral plat of such lot bear the notation.

"Resurveyed, Lot _____, Survey No. _____"

(d) The Land Registration Case (L.R.C.) number shall be noted on the plat for all lots previously registered or for which application for registration has been made when the numbers of the case can be positively determined.

Section 925 - The local names of natural features such as mountains and all bodies of water, rivers, esteros, arroyos, shall be ascertained, the spelling verified and their names indicated on the progress and cadastral maps. The names of barangays shall be indicated within their respective boundaries.

Section 926 - Control stations shall be plotted by coordinates and side shots therefrom, by protractor and scale or by drafting machine, if available.

Section 927 - When two adjoining cadastral projects are in progress at the same time, the cadastral maps showing their common boundaries shall be plotted first. Each survey party shall trace the data plotted on the cadastral maps of the other survey party. These tracings shall be submitted together with the survey returns of the cadastral project.

LOT AND CASE/BARANGAY BOUNDARY DESCRIPTIONS

Section 928 - Lot and Case/Barangay Boundary Descriptions in prescribed LMB form shall be prepared for all lots and case/boundary of each cadastral case after final verification of the corresponding lot data and case/barangay boundary computations.

CASE/BARANGAY BOUNDARY AND INDEX MAPS

Section 929 - For each cadastral case formed in Section 784, a case/barangay boundary and index map shall be prepared from the case/barangay boundary computation as required in Section 906 and from the pertinent cadastral, sectional cadastral and contiguous cadastral maps. This shall be drawn at a convenient scale on drafting film or other stable transparent material approved for use by Land Management Bureau in the same size as cadastral map of 54 x 54 centimeters with marginal lines of 50 x 50 centimeters.

Section 930 - The case/barangay boundary and index map shall show the following:

a) Lands Management Bureau survey number.

b) Cadastral case number.

c) Location of the land.

d) Aggregate area and number of parcels in the alienable and disposable and the forest lands of the case; case boundary area

e) Scale (numerical and graphical).

f) Date of survey.

g) Legal authority.

h) Name and signature of the project chief; Professional GE License No.

i) Date of approval.

j) Names and signatures of recommending and approving Land Management Services Officials.

k) PPCS-PTM/PRS 92 zone number and point of origin

l) Tie point and tie line

m) Bearings and distances of the boundary lines except when too numerous to be tabulated on the map.

n) Description of each corner as marked on the ground.

o) Adjoining properties, surveys and names of claimants or owners of adjoining properties.

p) Adjoining political subdivisions.

q) Grid lines and plane coordinates.

r) Graticule lines and geographic coordinates.

s) Cadastral map sheet number, sectional and contiguous cadastral map numbers

t) Important streams, rivers, lakes, roads, and railroad lines.

u) Political boundaries and monuments.

v) Location monuments and geodetic control station

w) Residential sites and settlements.

x) Large tracts such as haciendas, forest lands, marshy lands and reservations, protected areas, ancestral claims.

y) Pertinent notes.

The bearing and distance of the tie line of the case/barangay boundary shall originate from BLLM No. 1 of the project to corner 1 of the case/barangay.

Section 931 - The corners of the case/barangay boundary shall be indicated by circles one (1) millimeter in diameter except corners defined by political boundary monuments. Appropriate survey symbols shall be used.

Section 932 - The technical descriptions of the case or barangay boundary shall be prepared and submitted after the approval by the Regional Technical Director for Lands of the cadastral maps and the case or barangay boundary and index map.

PROJECT/MUNICIPAL BOUNDARY AND INDEX MAPS

Section 933 - After the completion of all the case/boundary and index maps of the project, a project or municipal boundary and index map shall be prepared. This shall be based on the data of the regular progress map, the case/boundary and index map, and the project or municipal boundary computation required in Section 907. This shall be drawn at a convenient scale on a stable material in the same size of cadastral map 54 x 54 centimeters with marginal lines of 50 x 50 centimeters.

Section 934 - The project/municipal boundary and index map shall serve as an index of case/barangay boundary index maps. It shall define the boundary of the project/municipality and shall show the following:

a) Lands Management Bureau survey number.

b) Location of the project.

c) Aggregate area and number of parcels in the alienable and disposable and the forest lands in the project/ municipality; case boundary area

d) Scale (numerical and graphical).

e) Date of survey

f) Legal authority.

g) Name and signatures of the Chief of Party; Professional GE License number

h) Date of approval of the project survey.

i) Names and signatures of the recommending and approving officials.

j) PPCS-PTM/PRS 92 zone number and point of origin.

k) Tie point and tie line.

l) Bearings and distances of the boundary lines except when too numerous to be tabulated on the map.

m) Description of each corner and the tie point.

n) Adjoining surveys and political subdivisions.

o) Case number and name of barangay.

p) Grid lines and plane coordinates.

q) Graticule lines and geographic coordinates.

r) Mountain ranges and peaks.

s) Important streams, rivers, lakes, roads and rail roads.

t) Political boundary lines and monuments and numbers.

u) Location monuments and geographic control stations.

v) Residential sites and settlements.

w) Large tracts such as hacienda, forest lands, marshy lands and reservations, ancestral claims, protected areas

x) Pertinent notes

The bearing and distance of the tie line shall be determined from BLLM No. 1 to corner 1 of the project/municipality. The boundary lines of the project/municipality shall be included in the lot descriptions of the last case/barangay if the same cannot be tabulated on the map.

Section 935 - Corners of the project /municipal boundary shall be indicated by circles one (1) millimeter in diameter except corners defined by political boundary monuments. Appropriate survey symbols shall be used.

Section 936 - In all of the foregoing maps mentioned in Section 908 to 934 prescribed survey symbols shall be used. The correct numbers of all points of reference shall be properly indicated.

CHAPTER XVII - PROJECT RECORDS AND REPORTS

FIELD BOOKS

Section 937 - The following groups of field notes shall contain all the records of the different phases of the survey work. These field notes shall be grouped as follows:

(a) Astronomical observation books.

(b) Primary angle book/s.

(c) Primary distance book/s.

(d) Secondary azimuth book/s.

(e) Secondary distance book/s.

(f) Reference book for primary stations, location monuments and political boundary monuments.

(g) Certification of geographic positions of GPS/PRS92 stations used in the survey.

(h) Lot survey books.

Section 938 - Field notes shall be bound in hard field book cover made on prescribed cardboard material for records preservation and shelf filing. The number and name of the survey and the number of the field book shall be indicated on the cover. The pages of each book shall be numbered consecutively from one to not more than 150 pages which shall be written on the upper right hand corner of the right face of the fieldnotes. The date when the data were observed and recorded, the names of the observer and recorder shall be entered on each page of the field book and all other blanks shall be filled up accordingly. The field notes cover mentioned in Section 459 shall be completely accomplished and notarized and included as the preface of each field book.

COMPUTATION BOOKS

Section 939 - All computations shall be grouped into two sets of books. One set shall consist of all original and the other set shall consist of all duplicate computations. Each set shall consist of the following books:

(a) Main and subsidiary control computation books of

1. Astronomical observations
2. Primary controls
3. Secondary controls
4. Location monuments

(b) Political boundary controls

(c) Tertiary control computation books

(d) Intersection and other reference computation books

(e) Lot data computation books

(f) Old survey computation books - one copy

Each book shall be bound in hard cloth book cover made on prescribed cardboard material for shelf filing. It shall be properly labelled, indicating original or duplicate as the case may be, the book number, survey number, and name of project, and project chief/contractor.

MONUMENT DESCRIPTION BOOK

Section 940 - Monument description book shall be prepared on the prescribed L.M.B. form. It shall describe all recovered triangulation stations, BLLM's, primary control stations and political boundary monuments and all recovered points of reference as prescribed in Section 38. Each class of monuments shall be entered separately in their numerical order.

Section 941 - Each monument shall be fully described, indicating the markings, dimensions, general location (municipality and barangay) and the surrounding features such as rivers, roads, hills, houses, streets, etc. The coordinates as determined in the cadastral survey, the cadastral map on which each monument falls and the grid azimuths and distances to the nearest reference monuments or other objects and control stations shall be indicated. Each kind of point of reference shall be grouped together and arranged in increasing numerical order.

Section 942 - The page and field book number where the azimuths and distances are entered to determine the location of the monument shall be indicated on the form. All data shall be entered in black drawing ink and checked and initialed by the chief of project.

GEODETIC ENGINEER CERTIFICATE

Section 943 - A geodetic engineer's certificate, prepared on LMB prescribed form, each bearing original signatures shall be prepared for each case/barangay, signed by the chief of party, dry sealed, and duly notarized and submitted as part of the survey returns. The certificate shall contain the names of claimants of adjoining parcels (A- lots) listed in numerical order of said adjoining parcels. The manner and date of notification relative to contested lots shall be noted in the certificate.

FINAL REPORT ON THE PROJECT

Section 944 - A final report shall be prepared in the manner of a technical report writing after the completion of each cadastral project. The final report shall be in three hardbound copies made on standard size bond paper and double spaced. Two copies shall be for the LMB Library and the third copy for the LMS.

Section 945 - The final report on the project shall include the following:

CHAPTER I - THE PROJECT PROFILE

(a) Geographical location - Name of locality, important natural features such as rivers, lakes, mountains, etc. with their local names

(b) Demography - Approximate number of inhabitants, statistics on births and deaths, natives and foreigners, local dialects, religions, schools, etc.

(c) Local history - Important historical events, places, monuments, etc.

(d) Government - Organization of local government, names of local officials.

(e) Commerce and industry - Industrial and commercial enterprises

CHAPTER II - INAUGURATION OF SURVEY

(a) Authority and order of survey, dialogues with local and other national officials, establishment of field office, general mobilization of personnel, equipment and other resources, posting of notices, formal inauguration ceremonies showing the attendance and participation of local officials and the public.

CHAPTER III - THE SURVEY

(a) Describe local conditions, difficulties, etc., encountered in establishing base meridian, primary and secondary controls and sketching, monumenting and lot surveys, etc.

(b) Describe methods of work which had been devised to meet local conditions.

(c) Analyze results of the work; describe conditions which may have influenced final results in surveying operations, etc.

(d) Describe in general matters regarding political boundary questions, conflicts, etc.

CHAPTER IV - LAND QUESTIONS

(a) Describe conditions of land ownership; tenural structure, impact of land reform.

(b) Describe the situation with regards to public, government and mineral lands, general or special problems or questions affecting administration or the land resources.

CHAPTER V - PARTY ADMINISTRATION

(a) Organization/staffing

(b) List of all officials and employees engaged in the work including tapeman, sketchman and surveymen.

(c) Methods of work, field and office.

(d) Equipment, supplies and appropriations.

(e) Summary of statistics of the survey such as the number of barangays, total number of lots, aggregate area, number of lots and area in each case/barangay and others listed in item (d) of Section 930; inclusive dates of survey; personnel turnover

(f) Project cost data

(g) Project management plan and other matters which may be deemed worthy of mention.

PRELIMINARY EXAMINATION

Section 946 - Before transmitting the survey records to the Regional Technical Director for Lands, the verification required in Section 839 must be performed.

The following shall also be checked:

1. COMPUTATIONS

   Original versus duplicate

   (a) Astronomical observations

   (b) Lot data preparation for new lots and adjusted computations for previously approved surveys

   (c) Tie lines and grid coordinates of tie points

   (d) Tertiary controls

2. SURVEY CARDS

   (a) Names of barangay or districts and cadastral map numbers versus data in the cadastral maps.

   (b) Original versus duplicate sketch and survey record cards.

   (c) Data on cards versus data on lot data computations.

3. DRAFTING

   (a) Connections of corners of lots in accordance with the results obtained from the verification required in Section 830

   (b) Lot corners on cadastral maps as plotted by coordinates versus by drafting machine or by scale and protractor

   (c) Previous surveys versus cadastral lots

TRANSMITTAL OF SURVEY RECORDS

Section 947 - The survey returns of the main and subsidiary controls consisting of the project control/map, field books, computation books, and other miscellaneous records shall be submitted ahead to the Regional Technical Director for Lands for verification and approval.

After the completion of the cadastral survey, the following survey records shall be carefully packed, labelled and submitted to the Regional Technical Director for Lands:

1. FIELD NOTES AND COMPUTATIONS

   (a) All the field books as grouped in Section 937.

   (b) All the computation books mentioned in Section 939.

   (c) Duplicate computations of all previous surveys.

2. MAPS

   (a) Progress map

   (b) Cadastral maps

   (c) Political Boundary Control Map

   (d) Case/barangay boundary and index map

   (e) Project/municipal boundary and index map

   (f) Set of prints of cadastral maps used to verify the work as required in Section 830

   (g) Tracing or prints of previous surveys

3. SURVEY CARDS

   (a) Numerical and alphabetical set of sketch and survey record cards

   (b) One set of " A " lot cards, required in Section 802.

4. REPORTS, LISTS AND OTHER PAPERS

   (a) Certification of public notices

   (b) Sheets of "30-day" notice in duplicate

   (c) Reports in duplicate on all previous surveys

(d) Reports in triplicate on all public, government and mineral land applications and corresponding cadastral lot numbers

(e) Geodetic engineer's certificate in quadruplicate required in Section 943

(f) List in duplicate of previous surveys equal to cadastral lots, accepted and amended

(g) List in triplicate of unclaimed lots within the project and of doubtful claims to be opposed by the National Government during registration

(h) List in triplicate of all public, government and mineral land claims within the project

(i) List in triplicate of foreshore lands

(j) Monument description book mentioned in Section 940 to 942

(k) Project cost book (as for administration projects)

(l) Final report on the project in triplicate with hard book cover

(m) Boundary descriptions of lots, case/barangay and project/ municipality

(n) Technical descriptions of the case/barangay boundary in quadruplicate

(o) Two (2) sets of alphabetical and numerical list of claimants in quadruplicate

Section 948 - Cadastral survey returns shall be forwarded to the Land Management Services of the concerned DENR-Regional Office. If the delivery is by freight, two shipments must be made. The shipment must be under two different bills of lading, on different dates and must be properly insured.

Section 949 - The first shipment shall contain the field notes, maps, original computations, reports and one set of sketch and survey record cards. The second shipment shall contain the sketches, duplicate computations and remaining papers or records of the project. Personal submittal is encouraged for security.

COMPLETION OF CADASTRAL SKETCHING AND GRAPHICAL CADASTRE

Section 950 - Cadastral sketching and graphical cadastral projects may be converted into, or completed as, numerical cadastral projects by performing the remaining phases of each cadastral operation.

Section 951 - The completion/conversion survey shall be undertaken upon issuance of a survey order by the Regional Executive Director/Regional Technical Director for Lands. The original cadastral survey number assigned to the cadastral sketching or graphical cadastre shall be retained minus the letters "P" , "M" or "S", as the case may be.

Section 952 - In the conversion of cadastral sketching and cadastral or photo cadastral mapping projects to numerical cadastral surveys, specific instructions shall be issued by the Regional Executive Director. The phases of work to be done such as monumenting of lot corners, lot survey, ground coordinates determination from rectified photographs/photomaps, as the case may be, adjustment of previously approved surveys, computations and preparation of required maps, etc., shall be specified. The required project records and corresponding survey returns shall be submitted to the Regional Technical Director for Lands for verification and approval.

CHAPTER XVIII - CADASTRAL COURT HEARINGS

WHO SHALL ATTEND THE COURT HEARINGS

Section 953 - Geodetic engineers shall be assigned by the Regional Executive Director to attend court hearings for the adjudication of titles to lands within cadastral projects.

Section 954 - Geodetic engineers in private practice may attend court hearings on behalf of their clients, subject to, and governed by, the provisions of this chapter. They shall submit their work to the Regional Executive Director through the DENR geodetic engineers assigned to attend the hearings.

DATA TO BE FURNISHED

Section 955 - The geodetic engineer assigned to attend cadastral court hearings shall be furnished by the Lands Management Services with the following papers:

(a) Two sets of numerical and alphabetical list of claimants for each case.

(b) Two sets of prints of plans/maps.

(c) Two sets of list of areas of all lots in each case.

(d) The report of the Land Registration Authority concerning the status of all lots included in the registration cases if filed in the Regional Trial Court.

(e) Prints and tracings showing discrepancies between the previous surveys and the cadastral survey. These prints and tracings are those mentioned in Section 845.

(f) List and copy of reports on public, government and mineral land lots situated within each cadastral project case.

(g) Prints or tracings of plans of all patented, sold, leased or decreed properties situated within each cadastral project during or after the completion of the cadastral survey.

(h) Cards of lot claimants, arranged alphabetically for each cadastral project case.

(i) Lot descriptions showing the numerical list of lot claimants.

(j) Other papers and records which may be necessary in each case.

Section 956 - A statement of all amendments and changes made in the cadastral maps before the date of hearing shall be furnished the geodetic engineer who shall call the attention of the Court thereto.

LOCATION OF OFFICE

Section 957 - The geodetic engineer assigned to attend the court hearings shall request the Clerk of Court to provide him with accommodations in the building where the hearings are to be held.

Section 958 - When the Judge sets the hearing of cadastral cases in a city or municipality other than the place where the court is permanently stationed, the geodetic engineer shall request for a reasonably spacious room to be used as office, preferably within the building where the court will hold its session from the concerned City or Municipal Mayor.

Section 959 - The geodetic engineer assigned to attend the court hearing shall transfer his office to the municipality where the hearing will take place at least thirty days prior to the date set for the hearing of the cadastral case.

Section 960 - The geodetic engineer shall coordinate with the City or Municipal Mayor on all matters requiring mutual action relative to the hearings. He shall request that all the claimants in the barangay within each cadastral project case be notified to appear at the office of the geodetic engineer and to file their answers with the Clerk of Court. Prescribed forms may be obtained from the Clerk of Court.

GENERAL PROCEDURE OF WORK

Section 961 - Immediately upon receipt of the records mentioned in Section 955, the geodetic engineer shall indicate, on one set of prints in red ink, the name or names of the claimant or claimants of each lot corresponding to the numerical list of claimants for facility in checking the answers filed by each claimant.

Section 962 - The marked prints, together with the lists and computations furnished by the geodetic engineer, shall be used for checking the answers filed by the claimants.

Section 963 - The print copies on which the names of claimants are not indicated shall be made available to the claimants, agents or attorneys by posting these in conspicuous places, for information and identification of the numbers and location of lots being claimed. The geodetic engineer or his assistants shall keep these prints for future use in connection with contested claims.

Section 964 - Before the date of the hearing of each cadastral case, the geodetic engineer shall confer with the provincial, city and municipal treasurer concerned to get information regarding the parcels that have been forfeited for non-payment of taxes. These parcels must be identified on the cadastral maps and reported to. A list of the location of the lands, the names of claimants, the tax declaration numbers and the cadastral lot numbers shall be prepared. The fiscal or the attorney representing the government shall be furnished with a copy of the list with the information that said lots may be claimed as property of the national government. A copy of the report shall be forwarded to the Regional Technical Director for Lands for record purposes.

Section 965 - The lot number, the names of the claimants and the adjoining owners in each answer shall be carefully verified and checked against the prints and the list of claimants.

Section 966 - The tax declaration number given in the answer shall be checked against the list of tax delinquents to see whether or not the land has been forfeited for non-payment of taxes. The geodetic engineer shall examine the muniment of title. If the claim is based on purchase, he shall also examine the basis/claim of ownership of the vendor.

Section 967 - Discrepancies between the answers and the maps and the list of claimants shall be carefully investigated and verified. In case it is necessary to amend or correct the answers, the interested parties shall be requested to make the necessary correction. The geodetic engineer or his authorized assistant shall verify and approve all answers before they are filed with the Clerk of Court. Notation shall be made in red ink on all answers for lots contested by the government.

Section 968 - All changes in the names of the claimants as given in the answers after verification is made shall be entered in the cadastral lists.

Section 969 - When two or more claimants filed an answer for the same lot, the names of those not shown in the cadastral lists shall be entered therein and reported to the court.

Section 970 - The geodetic engineer shall ascertain the nature of each lot. A list of all lots claimed as public, mineral or government lands shall be given to the lawyer representing the government and the Regional Technical Director for Lands. This list shall contain all available information regarding the nature or basis of the claim of the government.

Section 971 - The geodetic engineer shall advise the claimants to prepare their answers based on the data obtained from the ground or from actual facts existing at the time of the filing of the answers.

MEMORANDUM OF HEARINGS AND REPORTS

Section 972 - The "Memorandum of Hearings and Operations" shall be prepared in duplicate by filling out the different columns as the court hearings progresses. The most salient incidents that have taken place during the hearing of a cadastral lot and the status of the lot as reported by the geodetic engineer to the lawyer representing the government or to the court shall be entered on the column headed "Memoranda".

Section 973 - The date of the hearing of any cadastral lot and all the orders of the court for corrections, subdivisions or investigations on any lot shall be recorded on the corresponding column of the prescribed form.

Section 974 - A monthly report showing the progress of the court hearings shall be submitted on the prescribed form. This shall be prepared in black drafting ink to facilitate printing.

Section 975 - When there are two or more cadastral cases in a municipality, the total in columns 7 to 11 for that municipality shall be shown.

Section 976 - The information in columns 1,2,3,4 and 5 shall be obtained from the maps furnished by the geodetic engineer. Information in columns 6, 7, 8, 9, 10, 11, 12 and 16 shall be obtained from the memoranda required in Section 972, the copies of the claims filed by the Director of Lands Management Bureau and from the records of the PENRO. Information in columns 4 and 13 shall be obtained from the clerk of court.

SUBDIVISION OF CADASTRAL LOTS

Section 977 - When the hearings so require, or for any reason the judge so desires, the geodetic engineer or at least one of his authorized assistants shall be present at the court sessions. He shall, in addition to his other duties, receive from the court or from the clerk thereof, all orders for subdivisions or investigations of cadastral lots under hearing.

Section 978 - No cadastral lot pending registration shall be amended or subdivided by the geodetic engineer without written order from the court.

Section 979 - When an order of the court for the subdivision of a cadastral lot is received, the geodetic engineer shall ascertain whether or not part of the lot to be subdivided is included in previously patented or decreed lots.

Section 980 - When the Court orders the segregation of previously patented or decreed tracts from a cadastral lot, the cost of the subdivision shall be charged to the corresponding cadastral case.

Section 981 - When the lot to be subdivided is patented or decreed, the cost of subdivision shall be borne by the applicants who shall be requested to make a deposit with the court before any work is undertaken.

Section 982 - If the deposit is not sufficient to cover the cost of the subdivision, additional deposit shall be made by the claimants.

Section 983 - In case the claimants fail to deposit the required additional amount, the court shall be informed that the subdivision work has not been completed, stating the reasons thereon. The expenses already incurred shall not be refunded to the claimants.

Section 984 - In case the lot to be subdivided is not patented or decreed, it shall be ascertained if the subdivision survey is necessary and if the reason is due to the negligence or fault of the interested parties. If the work to be done is requested for the sole benefit and convenience of negligent claimants requesting the subdivision, the cost of subdivision shall be charged against said claimants.

Section 985 - The subdivision shall be made in accordance with the agreement of the interested parties who shall be required to make the necessary deposit to defray the cost of the survey.

Section 986 - When a lot is claimed by two or more persons and the court finds it necessary to subdivide the said lot into portions to be adjudicated to the claimants who have not been at fault, the cost thereof shall be charged against the proper cadastral case.

Section 987 - The claimants shall be advised that no technical descriptions or tracing plan will be furnished to them unless the proportionate cost of the cadastral survey is paid.

Section 988 - When a subdivision or correction is necessary as a result of incorrect survey by the party who executed the cadastral survey through no fault of the claimants, the cost thereof shall be charged against the cadastral project case.

Section 989 - Consolidations and/or subdivisions which are necessary for public interest or requested for the direct benefit of a municipality, province, city, or the national government, or ordered by the court, shall also be made and the cost thereof shall be charged against cadastral case.

Section 990 - In the event that the claimants required to defray the cost of the consolidation and/or subdivision surveys ordered by the court fail to make the necessary deposit, the geodetic engineer shall report the matter in writing to the court with the recommendation that the case be dismissed or the claimants be ordered to make the deposit.

Section 991 - In the subdivisions of cadastral lots, subdivision corners along the original cadastral lot boundary lines shall be located as pointed out and agreed upon by the interested parties. The geodetic engineer shall submit a written report to the court attaching copy of the approved subdivision survey of the lot.

Section 992 - The grid azimuth of these subdivision surveys shall be derived from the lot corner monuments in place on the ground. In cases where two monuments are not inter-visible, a circuit traverse, of which three or more monuments shall be occupied as traverse stations, may be run using an assumed azimuth. The traverse shall be computed and the azimuths and distances between the monuments shall be determined and compared with a similar determination between the same monuments from the cadastral data to determine the correction to be applied to the assumed azimuth. In general, monuments as far as the condition of the work will allow, shall be occupied as stations.

Section 993 - Astronomical observations for azimuth may be used but the azimuth shall be corrected for the convergency of meridians between the central meridian of the zone and the place of observation to reduce the astronomical azimuths to grid azimuths.

Section 994 - In consolidation and/or subdivision surveys of cadastral lots, no geodetic engineer certificate shall be submitted with the survey returns.

ORDER OF THE COURT

Section 995 - Upon receipt of the cadastral records, the geodetic engineer assigned to attend the court hearings shall prepare the lists of lot reported by the Administrator of the Land Registration Authority and those amended by the cadastral survey in three groups as follows:

(a) Cadastral lots that are subdivision of patented, leased or decreed parcels of lands,

(b) Cadastral lots that differ slightly from the old survey,

(c) Cadastral lots that are portions of patented, leased or decreed parcels subdivided by case/ barangay boundaries.

Section 996 - Cadastral lots that include portions of registered and unregistered land shall be divided in accordance with the order of the court.

Section 997 - The tracing referred to in Section 845 shall be consulted to see to it that points of the previous surveys that have been recovered are identical to the corresponding points in the cadastral survey.

Section 998 - Beds of streams included in previous surveys shall be made separate lot or lots for the purpose of providing bases of action for the adjudication of such tracts to the national government.

Section 999 - In areas where the value of the land is comparatively high, as in the poblacion or highly developed barangays, any linear error exceeding 10 centimeters in the position of the corner between the previously patented, leased or decreed survey and the cadastral survey, shall be carefully investigated on the ground. This is to ascertain whether or not a subdivision, correction or amendment of the cadastral lot must be undertaken.

Section 1000 - All orders of the Court, including the assignment of lot numbers to the subdivision lots, shall be strictly followed. The final subdivision lot numbers shall be assigned by the regional office concerned to be confirmed later by the Court.

Section 1001- If in the course of the subdivision survey, it is found that additional amendment is necessary, the matter shall be immediately reported to the Court. The survey returns shall not be transmitted to the Regional Technical Director for Lands without the written order of the Court for the new survey. The survey shall be made in a manner that the technical description of the adjoining lots will not be affected.

Section 1002 - If an amendment of the survey of the adjoining lot is necessary, the interested parties shall request the Court for the said amendment. In case decision on the adjoining lots had already been rendered, the Court shall be requested to modify the decision accordingly.

REPORTS AND OTHER PAPERS

Section 1003 - All reports to be submitted to the Court shall be made in triplicate, two copies to be given to the Court and the third, together with the other papers of the cadastral case, shall be retained by the geodetic engineer to be transmitted to the Land Management Services upon the termination of the court hearings.

Section 1004 - All reports on subdivisions or amendments of cadastral lots shall be accompanied by sketches of the lots subdivided or amended.

Section 1005 - The survey returns of the subdivisions or amendments of cadastral lots shall consist of a copy of the order or the decision of the court, field notes, computations, sketch plans of the lots subdivided and a copy of the report of the geodetic engineer to the court after the surveys were made.

Section 1006 - At the termination of the cadastral hearings a final report of all the changes made in the lots of the cadastral case shall be submitted to the court.

Section 1007 - The form of final report shall be as follows:

IN THE REGIONAL TRIAL COURT OF _____
CADASTRAL CASE NO. _____
L.R.C. RECORD NO. _____ CADASTRE NO. _____

THE REPUBLIC OF THE PHILIPPINES, applicant

FINAL REPORT

TO THE HONORABLE COURT:

The undersigned geodetic engineer has the honor to submit the following changes made in the lots of the above numbered cadastral case as ordered by the court, viz:

CAD LOT NOS.	CHANGES MADE	RESULTING LOT NUMBERS	NAME OF CLAIMANTS	REMARKS
17	Subdivision	17-A	Bienvenido Cruz	
		17-B	Ariel Reyes	
205	-do-	205-A	Shirley Nejal	Decreed in LRC No. 1456
		205-B	Ivy Reyes	Under Cadastral Act
306	-do-	306-A	Warlito Quirimit	Decreed in LRC No. 4432
505	-do-	505-A	Arnel Padua	Decreed in LRC No. 2023
		505-B	Ramon Mendoza	Decreed in LRC No. 2334
804		804-B	Public Land	Under Cadastral Act
		804-C	Marlea Muñez	

Manila, Philippines, November 24, 1994.

Privadi J.G. Dalire
Geodetic Engineer
Assigned to attend the Court

Section 1008 - Upon completion of the necessary survey work on cadastral lot/s, the following records shall be immediately forwarded to the Regional Technical Director for Lands:

(a) Field notes, sketches and computations of the subdivisions or amendments.

(b) A copy of the court order for subdivision, amendment or investigation with the corresponding reports and sketches.

(c) A copy of the final report to the court as required in the preceding section.

Section 1009 - After the termination of court hearings on a cadastral case, one set of "Memorandum of Hearings and Operation" duly accomplished and the report of the Land Registration Authority shall be forwarded to the Lands Management Bureau. Duplicates shall be retained in the Regional Lands Management Services.

Section 1010 - All records not mentioned in the preceding section shall be retained as permanent records of the concerned Provincial Environment and Natural Resources Office (PENRO).

COST OF COURT HEARINGS

Section 1011 - The geodetic engineer assigned to attend the court hearings shall keep a record of costs as required by regulations.

PART IV

MISCELLANEA

CHAPTER XIX - LEGISLATION AND REGULATION

LAWS

Section 1012 - The laws and decrees involving land questions, surveys and geodetic engineers are the following:

(a) The Cadastral Act No. 2259 as amended.

(b) Act No. 3240 as amended.

(c) Act No. 3327 as amended.

(d) Revised Administrative Code, Act No. 2711, as amended.

(e) The Public Land Act, C.A. No. 141, as amended.

(f) The geodetic engineering Law, R.A. No. 4374, as amended by P.D. 202 and P.D. 335.

(g) The Agricultural Land Reform Code, R.A. No. 3384 as amended.

(h) Mineral Resources Development Decree of 1974, P.D. 463.

(i) The Forestry Reform Code, P.D. 705.

(j) The Subdivision and Condominium Buyers' Protective Decree, P.D. 957.

(k) Urban Land Reform Decree, P.D. 1517.

(l) The Philippine Water Code, P.D. 1067.

(m) The Property Registration Decree, P.D. 1529.

(n) The Comprehensive Agrarian Reform Law, R.A. 6657.

(o) The Local Government Code; R.A. 7160

(p) Batas Pambansa Bilang 220

(q) R.A. 1273, P.D. 953

REPEAL OF REGULATIONS

Section 1013 - The Manual for Land Surveys in the Philippines issued under Lands Administrative No. 4 series of 1980 as it is hereby revised and all previous Manual of Instructions, Circular Letters, Office Circulars, and other regulations, numbered or unnumbered, inconsistent with this revised Manual of Land Surveying Regulations in the Philippines are hereby repealed.

DUTIES AND RESPONSIBILITIES OF GEODETIC ENGINEERS AND JUNIOR GEODETIC ENGINEERS

Section 1014 - A Geodetic Engineer or Junior Geodetic Engineer engaged in survey work shall:

a) ensure that the survey is performed in accordance with provisions of laws, these Regulations, and to the standards or accuracy prescribed;

b) ensure that any part of a survey not performed by the Geodetic Engineer personally is performed by Junior Geodetic Engineer for whose work the Geodetic Engineer accepts responsibility;

c) ensure that: the survey is carried out under the immediate personal supervision of a Geodetic Engineer who shall attend in the field to provide the necessary supervision in carrying out of the survey in accordance with these Regulations and any relevant directives issued by the DENR; that only qualified and highly trained assistant shall be allowed to handle the instruments under his supervision and for whose work the Geodetic Engineer accepts responsibility;

d. ensure that with a survey method or equipment which he employs in performing a survey he can demonstrate that such method or equipment is capable of achieving the purpose of the survey and the appropriate standards of accuracy: Provided that when such method or equipment involves a departure from or variation of any directive issued by the DENR, he shall submit a report and shall include in the records of the survey full information so as to state clearly the method or equipment used;

e) ensure that the rules and regulations issued by the Professional Regulations Board of Geodetic Engineering governing the practice of Junior Geodetic Engineers are strictly observed; and

f) ensure that the Code of Ethics for Geodetic Engineers and Junior Geodetic Engineers have been faithfully observed.

Section 1015 - Geodetic Engineers who have been Chief of Survey Party from commencement to the completion of a large survey project requiring at least secondary precision or fourth order accuracy, or licensed geodetic engineer who had worked as assistant in such a project from commencement to completion as per records of the Lands Management Bureau or Land Management Services, or geodetic engineers of the DENR who have held positions equivalent to chief of party, may execute cadastral survey subject to the authority or order which may be issued by the Regional Executive Director (RED) or the Regional Technical Director for Lands (RTD/Lands) in accordance with Section 394.

Section 1016 - Only licensed Geodetic Engineer shall execute relocation/reinstatement of the boundaries of decreed and/or titled lands as well as the verification of property boundaries subject of litigation; Provided, that if the survey is not performed personally by the Geodetic Engineer but by a licensed Junior Geodetic Engineer under his direct supervision, the former must accept responsibility of the work and he shall sign the records of the survey and the plan.

VIOLATIONS OF REGULATIONS AND PENALTIES

Section 1017 - (a) Violations

(1) Violations of any provisions of this Manual by the Geodetic Engineer, Junior Geodetic Engineer, and survey contractors shall be sufficient ground for the Regional Technical Director for Lands to deny the acceptance for verification and/ or approval of any survey made by him. In case he is in the service of the DENR, he shall further be subject to administrative action which the RTD/Lands, the Regional Executive Director and/or the Director of Lands Management Bureau may deem justifiable under the circumstances.

(2) In case of approved surveys executed by Geodetic Engineer or Junior Geodetic Engineer in private practice, the matter shall also be referred to the fiscal and/or the Board of Geodetic Engineering for whatever disciplinary action the fiscal and/or the Board may find necessary to take in the case in relation to the Code of Ethics of Geodetic Engineers, the provisions of the Geodetic Engineering law, RA 4374, as amended, and to the provisions of other laws, without prejudice to the cancellation of the survey; Provided, that any official or employee of the DENR found abetting or knowingly helping directly or indirectly in the approval of any survey in violation of the provisions of this Manual shall be subject to disciplinary action which the Secretary may find necessary. The cost of field and office verifications of erroneous surveys shall be charged against the Geodetic Engineer or Junior Geodetic Engineer concerned.

(b) Penalties for surveys conducted by unauthorized persons.

(1) Penalties shall be those prescribed by laws, by the Board of Geodetic Engineering, and those prescribed or may be prescribed later by the DENR.

(2) Any person who shall, without permit to survey from the Secretary of the Regional Executive Director, enter any forest lands, whether covered by a license agreement, lease, license, or permit, or not, and conduct or undertake a survey for whatever purpose shall be liable to Imprisonment of not less than four (4) years, in addition to the confiscation of the implements used in the violation of Section 73, PD 705, including the cancellation of his professional license, if any.

(3) Any public officer or employee who knowingly surveys, classifies, or recommends the release of forest lands as alienable and disposable lands contrary to law, shall, after administrative proceedings, de dismissed from the service with prejudice to re-employment, and upon conviction, suffer imprisonment of not less than one (1) year and a fine pursuant to Section 74, PD 705. The survey, classification and release of forest lands shall be null and void.

(4) Administrative sanctions such as blacklisting or denial of the acceptance of surveys may be imposed on the Geodetic Engineer or Junior Geodetic Engineer who violates the provisions of this Manual. A list of Geodetic Engineers or Junior Geodetic Engineers who violate the Manual will be periodically provided by the Lands Management Service to the Lands Management Bureau and other concerned agencies.

SUPPLEMENTARY AND MANDATORY REGULATIONS

Section 1018 - Whenever additional or supplementary regulations or amendments to this Manual is necessary, the same shall be issued in the form of administrative orders.

Section 1019 - Survey regulations and specifications governing national geodetic network controls, hydrographic and other kinds of surveys not covered by this Manual shall be provided in a separate Manual.

Section 1020 - The Lands Management Bureau as the policy-making arm of the DENR in the effective and efficient management, surveys, disposition of public A & D lands, government-owned lands and other lands not falling under the jurisdiction of other government agencies, in coordination with the other agencies performing surveys, shall continue to study these instructions, develop and recommend new standards and operating procedures consistent with the advancement of surveying science and technology.

EFFECTIVITY OF MANUAL

Section 1021 - This Manual of land Surveying Regulations shall take effect fifteen (15) days after publication in the Official Gazatte.

VICTOR O. RAMOS
Secretary