LECTURE NOTES FOR:

We will have a 10 point quiz on Chapters 5 & 6 at the beginning of class.

Lecture notes for Chapter 5 & 6

MEASUREMENTS AS EVIDENCE
CHAPTER 5 Lecture Notes

5-1 Introduction
The aim of this chapter is (1) to discuss the dependability and accuracy of existing measuring devices, including the most modern and the old, (2) to analyze errors and uncertainties inherent in measurements and procedures and relate those to today's retracements, and (3) to define what accuracy is expected of a professional surveyor when locating property lines.

The discussion here is more from the point of view of how measurements are used to prove property locations rather than how to make measurements.

5-2 Types of Measurements:

There are two types of measurements made; Angular and Distance

The two are made in conjunction with each other to form a direction and a line with beginning and end.

PRINCIPLE 1. By law, either by statute or case law, there is no error in an original measurement that created the line or bearing.

By law, all measurements made by the original surveyor, monuments set, and accessories to that, were considered correct.

PRINCIPLE 2. When modern measurements are related to original measurements, the analysis must be in terms of the original creating units of measurements and not in terms of the more modern units of measurements.

All distances are to be considered horizontal in nature. However you may want to consider a slope measurement in analyzing the "error" in the retracement.

The original measurements were given in chains. Today's instruments measure in feet and many decimals thereof. It is important to relate your measurements to the units used in the past. A one-chain error could reflect a 66-foot bust!

5-3 Distance:

Generally in the U.S. we use the foot. The rest of the civilized world uses the meter. There relationship is this 39.37 inches = 1 meter or 1 foot = 0.3048 meters. 1 inch = 2.54 cm

The original surveys used either poles or chains. A pole being 16.5 feet in length. The chain being 66 feet in length or 4 poles.

5-4 Standardization Of Tapes And Distance Measuring Devices:

PRINCIPLE 3. It is the responsibility of each surveyor to verify the length of the tape or know the calibration of the distance-measuring device to a standard under specified field conditions at known standards. This includes maintaining the necessary records to show compliance.

5-5 Units of Length:

PRINCIPLE 4. For any conveyance or description of real property, the length of the unit measurement is that measurement that was used and recited as of the date of the deed or survey.

This statement is made to aid in the following in the footsteps of the original surveyor.

PRINCIPLE 5. Every measurement of distance or angle is subject to errors, either known or unknown.

Systematic Errors: Temperature, Length, Pull, Sag, Slope, Humidity, and Equipment.

Random Errors: Accidental Errors, Blunders, and Mistakes

5-6 Historical Determination of Distance:

See table on page 113.

Taping, stadia, edm, and gps, all have their related precisions.

5-7 Early Determination of North:

5-8 Directions:

Direction used was ASTRONOMICAL NORTH
Angular units are Degrees, Minutes, and Seconds
360° in a complete circle, 60 seconds to a minute, 60 minutes to a degree.

5-9 Reckoning:

Noting the declination of MAGNETIC NORTH to ASTRONOMIC NORTH performed a reckoning.

5-10 Methods of Observing Directions:

Compass, Transit, Theodolite, Total Station, GPS?

5-11 Historical Application of Measurements:

Calculators and computers have allowed the surveyor to “convert” old measurements into present day units of measure…good or bad?

5-12 Survey Computations:

Computer software and computer hardware have done for the advancement of surveying computations. What is the software doing for us…has it helped or hurt us as land surveyors?

5-13 Consistency Of SIGNIFICANT FIGURES:

See page 121 concerning significant figures and the relative error of the value.

See distance listed in feet or chains

5-14 Significant numbers in angular measurements:

Angles listed in degrees or degrees, minutes, and seconds. See example of 5 ½ 8 versus 58 30’

5-15 Meridian Determination from Celestial Observations:

The reliance of computed information rather than direct observations.

5-16 Measurements from Photographs:

5-17 Photogrammetric Measurements:

5-18 Availability of Photographs:

ERRORS IN MEASUREMENTS:

5-19 Precision and Accuracy

Precision is the degree of refinement, "how close together the measurements fall"

Accuracy is the nearness to the true or exact value the determination is.

Precision without accuracy is meaningless, and better accuracies can be obtained only through increase skill and more refinement. What good is a precise survey from a corner that is misidentified or even lost? All the precision available cannot properly locate the parcel if it is misidentified.

5-20 Classification of Errors:

Systematic vs. random errors

5-21 Theoretical Uncertainty Analysis (tu):

Relative Accuracy Ratio

Standard Deviation

5-22 Errors in Taped Distances:

Length
Temperature
Tension or pull
Support
Slope
Reading and recording
Alignment
Marking

5-23 Errors in Observed Directions:

Reading Uncertainty
Signal Error

5-24 Reliability of Meridian Observations:

Instrumentation
Ambient Conditions
Attending Observations

5-25 Measurement Evidence to Prove the Proximity of Corners and Monuments:

PRINCIPLE 6. Measurements may be used to prove the validity of corners and monuments. Such monuments to be acceptable should be within reasonable proximity of record measurements.

Measurements may use in conjunction with other evidence to accept or reject evidence.

There is no definite rule as to how close a distance needs to be before you accept or reject evidence. It is up to the surveyor and the other circumstances and evidence to accept or reject. Precision of the original survey may help the surveyor in determining whether or not to accept. The original surveyor had a precision of about 1/80; therefore it becomes the surveyor's responsibility to review all the available evidence.

5-26 Evidence of Measurements:

PRINCIPLE 7. In the GLO it states, unless proved otherwise, measurements of distances are presumed to be horizontal, while in the early surveys of metes and bounds states, measurements may have been made with the lay of the land.

PRINCIPLE 8. In public lands states, the presumption is that bearings are relative to the astronomic, or true north, unless otherwise specified, but in metes and bounds states the presumption is that bearings are in reference to magnetic north, unless otherwise specified.

PRINCIPLE 9. If there is a conflict within a deed and a choice must be made between bearing and distance regarding which controls, no uniform rule has been laid down by the courts. Variations between the states occur, as well as between the GLO states and metes and bounds states.

In sectionalized land distances are usually held and bearings yield, especially when monuments or accessories control.

5-27 Errors in Position:

Combined effect of uncertainty in distance and direction.

5-28 Errors in Traversing:

Similar concerns as positional errors.

5-29 Uncertainties in Area:

Computational errors…directly related to the measurements made to compute them.

5-30 Purpose of Survey Specifications

ALTA, ACSM, Model Law, Minimum Standards.

5-31 Adaptability of Existing Standards:

NGS and GLO for example.

5-32 Uncertainty Expression:

Based on the distance traveled to get the accuracy stated.

5-33 Theoretical Uncertainty:

A value from the theory of probability and propagation of accidental errors.

5-34 Value of Property:

Should this really be of concern if we are true professionals?

5-35 Specifications for Location of Property Boundaries

Error theory, et. al.

5-36 Size of Properties for Each Class

See classifications on page 149

5-37 Closures

See table in section 5-34

5-38 Adjustment:

All positions should be adjusted to balance out the closure discrepancy.

5-39 Monuments:

The refinement of measurements can never take the place for good reliable monumentation. The perpetuation of monuments will help to eliminate problems later on.

5-40 Computations:

Don't let the computer baffle you with its wizardry…it too, is only a tool to assist the surveying in their work. Software will not allow you to magically discover anything.

PLATS AS EVIDENCE
CHAPTER 6 Lecture notes

6-1 Introduction:

The use of drawings to identify land predates written descriptions. We have relied on drawings to communicate since earliest times. Drawings have supplemented written words many times to help depict the intent of the conveyance. The aim of this chapter is to discuss the effect plats have on boundary determination.

6-2 Definitions Of A Survey Plat:

The maps, plans, plot, and plats are often used interchangeably. They, however, have two different meanings in a legal sense.

MAP: A "scaled" representation of the surface of the earth, or some portion of it, showing the relative parts on a flat surface.

PLAT: A "scaled" representation of a piece of land subdivided into lots, alleys, and streets.

PLANS: A scaled map, chart, or design, being delineation of a projection on a plane surface of the ground lines of a house, farm, street, city, structure, etc. It has also been held to be an ocular view of the result of a survey, constituting a visual demonstration of work done.

It can be seen that a map can be produced from collected information, one's imagination, or hearsay. The plat can only be derived from a survey.

A plat is more restrictive in scope than a map. It only shows property lines and their relationships, whereas a map shows features found in an area on the surface of the earth.

6-3 Types of Plats:

Generally surveyor's give more credence to plats than they deserve…they are after all a graphical opinion of what took place by the individuals that created them.

6-4 Purpose of Survey Plats:

PRINCIPLE 1. The essential purposes to be accomplished by a survey plat are (1)to represent the correct size and shape of a property to scale, (2) to define by dimensions the correct size and shape of a single and unique parcel of land, (3) to specify locative elements (monuments and features), (4) to show title identity.

6-5. Features Of Plats:

Symbols, north arrow, dimensions, surveyors name, clients name, title, scale, features, monuments, etc.

6-6 Drawings:

The size and shape of the plat needed to record information is set forth in the Subdivision Map Act and the Land Surveyor's Act.

Generally, the size and shape are inferior to the information presented. Better to be clear and understandable than to fit in to a specific size or shape sheet.

A plat should tell a complete story. There should be enough information on a plat to allow another person to understand the survey or the boundary being depicted.

6-7 Title Of Plat:

One should be able to immediately identify what is contained in the plat by the title. Generally it is a clear and concise description of the parcel.

6-8 Symbols:

All symbols should follow some acceptable form. A legend should be shown to clarify any symbols that are not commonly used.

6-9 Scale:

Can be shown in one of three ways: Graphically, In the form of a Ratio, or as a Fractional part of 1.

6-10 Indicating the Direction of North:

The use of a North Arrow directs us to orientation of the plat. It is a general direction. The common assumption is that the direction is Astronomic North but in some cases it is Magnetic North.

6-11 Basis Of Bearings:

This is the true method of determining direction. A note should always accompany the Basis of Bearings to explain the results and assumptions of the surveyor.

6-12 Elevation Datum:

This is the procedure used to determine elevation. It to should be stated in a note on a plat. The most commonly used datum is Mean Sea Level.

6-13 Dimensional Data:

Too many dimensions detract from a clear picture, and too few cause ambiguity.

PRINCIPLE 2. Unless otherwise proved by scaling, distances given on a plat are form the nearest point on each side of the dimension as written.

These not only include horizontal and vertical dimensions, but curve data, or measurements along a curved line.

6-14 Monuments:

These include (1) those visible to the eye, stones, iron pipes, rivers, lakes, etc, and (2) those often invisible to the eye such as adjoiner property called for, the sideline of a street, easements, portions of a block, etc.

Monuments are generally classified into two distinct types FOUND & SET!

6-15 Cultural Improvements:

Topographic features should be shown relative to the location of the boundary.

6-16 Title Identity:

Generally refers to the monument location of the call…block 3 of XYZ subd refers to the block monuments.

Plats Of Survey Results:

6-17 Effects of Plat Showing Survey Results:

A survey plat properly certified, as provided by law, will serve as evidence of:
1. limits of title rights of the client
2. the surveyor-client contract.

6-18 Plats with Omitted Information:

PRINCIPLE 3. A distance that is not indicated by writing or numbers on a map, cannot be scaled to prove true distance.

6-19 Plats of Title Surveys for Title Associations:

ALTA's, Minimum Standard of Care, etc.

6-20 Surveyor's Certificates

Surveyor's Certificate or Statement:
This map was prepared by me or under my direction (and compiled from record data) (and is based upon a field survey) in conformance with the Subdivision Map Act and local ordinance at the request of (name of person authorizing map) on (date). I hereby state that this parcel map substantially conforms to the approved or conditionally approved tentative map, if any.

This map correctly represents a survey made by me or under my direction in conformance with the Land Surveyors' Act at the request of (name of person authorizing survey) on (date).

6-21 Contents Of Plats:

1. Record monuments called for incl. abutting streets and esmnts.
2. Found Physical monuments
3. Proof of correctness
4. Notation of called for monuments not found
5. Basis of Bearings
6. Dimensions; direction, distance, coords, curve data
7. Monuments set
8. Date
9. Client's name

10. Title
11. Surveyor's name
12. Encroachments
13. Scale

ORIGINAL PLATS

6-22 Purpose
1. a boundary survey for the creation of the boundaries of a parcel of land
2. a re-survey of a previously surveyed parcel.

6-23 Laws Regarding Platting

California's SMA

6-24 Compilation of Plats

County Recorder's, City/Co. Engineers, etc.

6-25 Official Plats:

PRINCIPLE 4. When reference is made to an "official plat", this reference will include all of the field notes and all of the instructions that created the plat.

6-26 Private Plats:

PRINCIPLE 5. A map prepared by a private surveyor must be authenticated before it can be proffered in evidence, unless it is hearsay exception.

6-27 Assessor's Plats:

PRINCIPLE 6. The courts have held that the surveyor and the attorney to indicate to whom the taxes are billed and not for boundary location should only use tax maps.

6-28 Plats as Evidence:

Relevancy vs. admissibility

6-29 Conflicts Between The Notes And The Plat:

The notes are generally controlling since the plat was produced from the notes.