DIMENSIONS

A Guide to Describing
Real Property

First American Title Insurance Company

ORIGINAL SURVEYS

All land within the boundaries of the 13 American Colonies, after the ratification of the United States Constitution, came under the control and jurisdiction of the particular state in which the land was situated. Therefore, there was no federal government or so-called public land within that area.

These original lands, together with the states of Kentucky, Tennessee, parts of Ohio, Maine and Vermont, were all described by the then-accepted system of "metes and bounds"—that is, the measurement of land within certain external boundaries or lines limiting the tract on all sides. This system requires a commencement point easily distinguished—usually consisting of some prominent existing object, such as a large rock or stone, a particular type or size of tree, a certain point on a river bank, or anything that would seem to be of more or less a permanent nature. Each tract of land under this system is usually different in size, is described independently of any other tract, except perhaps by reference, and is not connected in any way with any base or starting lines.

As lands were acquired and incorporated within the new country, it became necessary to adopt a more uniform system than "metes and bounds" to survey these new governmental lands. Surveys were necessary to determine tracts suitable for sale to individual citizens or as allotments for specific purposes, and to provide "homestead lands" for settlement by the public.

After some experimenting with the so-called "township system," which is based on a 10-mile square area, and after further study and trial, the system of *"rectangular survey"* was devised in 1784 at the suggestion of Thomas Jefferson. The rectangular survey consists of adjoining contiguous tracts six miles square. Each tract, or township, contains 36 sections. Each "section" is one mile square and is numbered 1 to 36 commencing at the Northeast (NE) Corner and running west to Section 6 then dropping down to 7 and east to 12, and so on to Section 36 in the Southeast Corner of the tract. (See illustration, page 4.)

This rectangular survey system, now in general use in this country, was officially adopted by the government in 1805. It was first used in the area known as the "Northwest Territories," lying west of Pennsylvania, north of the Ohio and east of the Mississippi rivers. It also covers practically all of the land west of the Mississippi—the sole large exception being the state of Texas. However, some railroad grants in that state have been re-surveyed into sections on the "rectangular survey" basis. All original surveys of the lands in these expanded areas have been made by the U.S. government under the jurisdiction of the General Land Office.

A section is the smallest subdivision usually surveyed by government surveyors. At each corner is a *marker* known as a *"monument of survey."*

The rectangular survey system necessitates the establishment of a "central" point from which all survey lines originate. These lines run as nearly north-south and east-west as it is possible to make them. This system of survey includes all lands lying within a particular area that is to be surveyed, such as a state, territory or district, or a certain part thereof. Some areas were surveyed before particular states were formed, so there are some states that have more than one survey system.

Due to the spherical nature of the earth and the curvature of its surface, all global meridians of longitude, or "great circles," of the earth converge at the poles. It is easy to understand that a flat and "perfect square," or township, could not be formed on the earth's surface. All these factors must be considered in surveying and in measurements used in determining the location and position of all lands on that surface. Also, although all meridians of longitude pass through the "true" poles of the earth, all surveying methods must consider the presence of the "magnetic" poles. While the "magnetic" poles are separate and apart from the "true poles," all navigational and surveying instruments are based on and controlled by the attractions of the "magnetic" poles.

As a result of the existence of these natural conditions, all north boundary lines of townships under the rectangular survey system must, of necessity, be a trifle shorter than the south boundary lines. To compensate for these discrepancies, each township of 36 sections has 11 "correction" sections along the north and west sides. These sections, 1 through 6, 7, 18, 19, 30 and 31, are not exactly a mile square and do not contain exactly 640 acres. The remaining 25 sections are generally a mile square and contain 640 acres.

In putting the "rectangular survey" system into operation in a given area, a north-south principal meridian line and an east-west base line are first established, crossing and running at right angles (90°) to each other. From these first lines additional lines are then established six miles apart. The lines running north-south, parallel to the "meridian line," are commonly designated as "range" lines. Those running east-west, parallel to the "baseline," are commonly called "township" lines. These lines mark off the area into six-mile squares, commonly called "townships." They are also designated by numbers, being north or south of the baseline and east or west of the meridian line, such as Township 10 North (or South), Range 11 East (or West) of the San Bernardino Base Line and Meridian. This concept is further described in "Sectional Property" on the following page.

SECTIONAL PROPERTY

This system is used for the survey and description of property that is or may have been subject to the jurisdiction of the U.S. Land Office.

A fixed point is established as a basis for the survey of a particular area of land. This point is described by its longitude and latitude, that is, by the intersection of a true north-south line (true meridian) and a true east-west line (baseline). In Southern California, this basis or point for such surveys is called the "San Bernardino Base Line and Meridian." It is located on San Bernardino Mountain in San Bernardino County.

The survey is made from the baseline and meridian, running both north-south and east-west. Points are established at six-mile intervals in the aforementioned directions, with lines drawn at these points east-west, parallel to the baseline, and north-south, parallel to the meridian.

RANGE 5 WEST	RANGE 4 WEST	RANGE 3 WEST	RANGE 2 WEST	RANGE 1 WEST	RANGE 1 EAST	RANGE 2 EAST	RANGE 3 EAST	RANGE 4 EAST	
T4N R5W					T4N R1E				TOWNSHIP 4 NORTH
			T3N R2W						TOWNSHIP 3 NORTH
								T2N R4E	TOWNSHIP 2 NORTH
									TOWNSHIP 1 NORTH
									TOWNSHIP 1 SOUTH
							T2S R3E		TOWNSHIP 2 SOUTH
	T3S R4W								TOWNSHIP 3 SOUTH

BASE LINE — MERIDIAN — 6 MI — PRINCIPAL

The six-mile intervals measured to the north and south were designated "township" and specified as Township North or South according to their relationship to the baseline. The six-mile intervals measured to the east and west of the meridian were specified as "ranges," east or west, according to their direction from the fixed meridian.
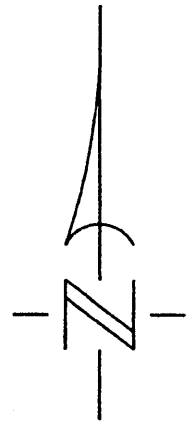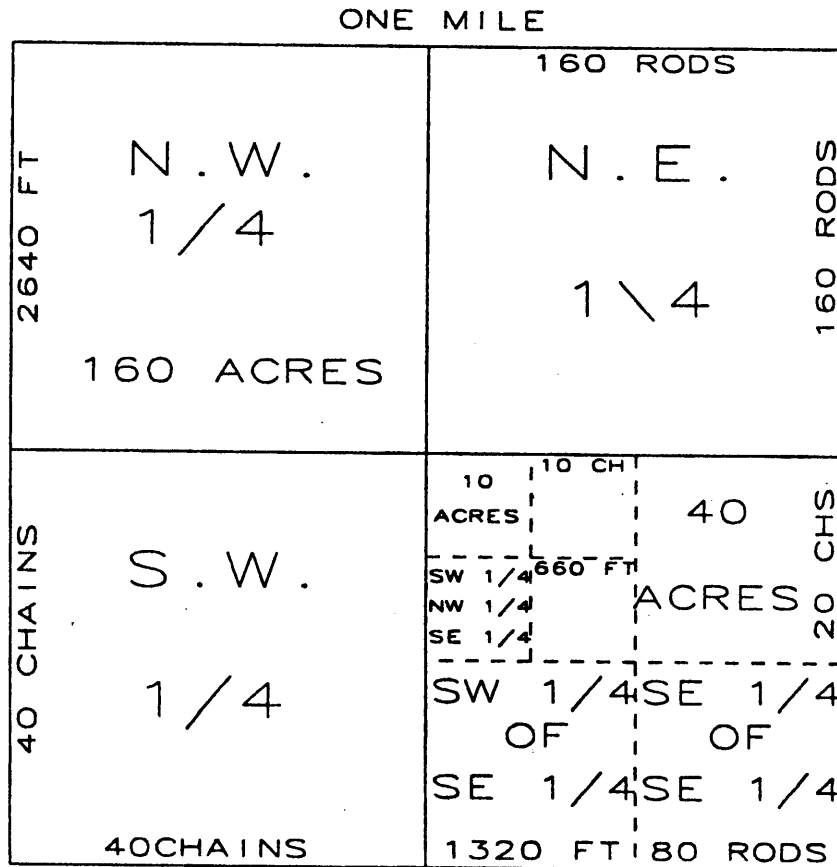
The areas set out by the intersection of township and range lines are termed "townships." The townships are six miles square and described by their adjacent township and range lines: "Township 3 North, Range 6 West" would be 12 to 18 miles north of the baseline and 30 to 36 miles west of the fixed meridian.

Townships are subdivided into 36 sections, each of which is theoretically one mile square and contains 640 acres. In the actual surveys the dimensions and areas of these sections are subject to variance from the theoretical standards of the system. The township sections are numbered progressively from the northeast corner from 1 to 36, as illustrated below.

Official plat of township sectionized and numbered, with adjoining sections

36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6
12	7	8	9	10	11	12	7
13	18	17	16	15	14	13	18
24	19	20	21	22	23	24	19
25	30	29	28	27	26	25	30
36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6

Each section is divided into quarters and quarter-quarters from the total dimensions. Thus, a quarter would be one-half mile square and would contain 160 acres. A quarter is described by its location in the section. For example, the northeast quarter would be in the north half of the east half of the section.

ONE MILE

	160 RODS	
N.W. 1/4 160 ACRES	N.E. 1\4	
S.W. 1/4	10 ACRES | SW 1/4 660 FT | NW 1/4 | SE 1/4 | 40 ACRES | SW 1/4 OF SE 1/4 | SE 1/4 OF SE 1/4	
40 CHAINS	1320 FT | 80 RODS	

(Left side: 2640 FT, 40 CHAINS. Right side: 160 RODS, 20 CHS.)

Sectional property descriptions are specified by this quarter system. As an illustration, the southwest quarter of the northwest quarter of the southeast quarter of a section would be an area of 10 acres, or 660 feet square. It is best to follow "part lot" or sectional property descriptions from the largest portion to the smallest or from the end to the beginning.

If a section does not have the regular complement of land, as when a portion of its area is taken up by ocean or a land grant, it is called a fractional section. The irregular parts are called "lots" and are numbered. Irregularities of township areas are placed in the northerly and westerly sections. Since Section 6 is in the northwest corner of the township, it will have the greatest variance of dimensions and area. In the subdivision of this section the irregularities are placed in the north half of the north half and the west half of the west half. This area is divided into lots and numbered progressively from the northeast corner of the section.
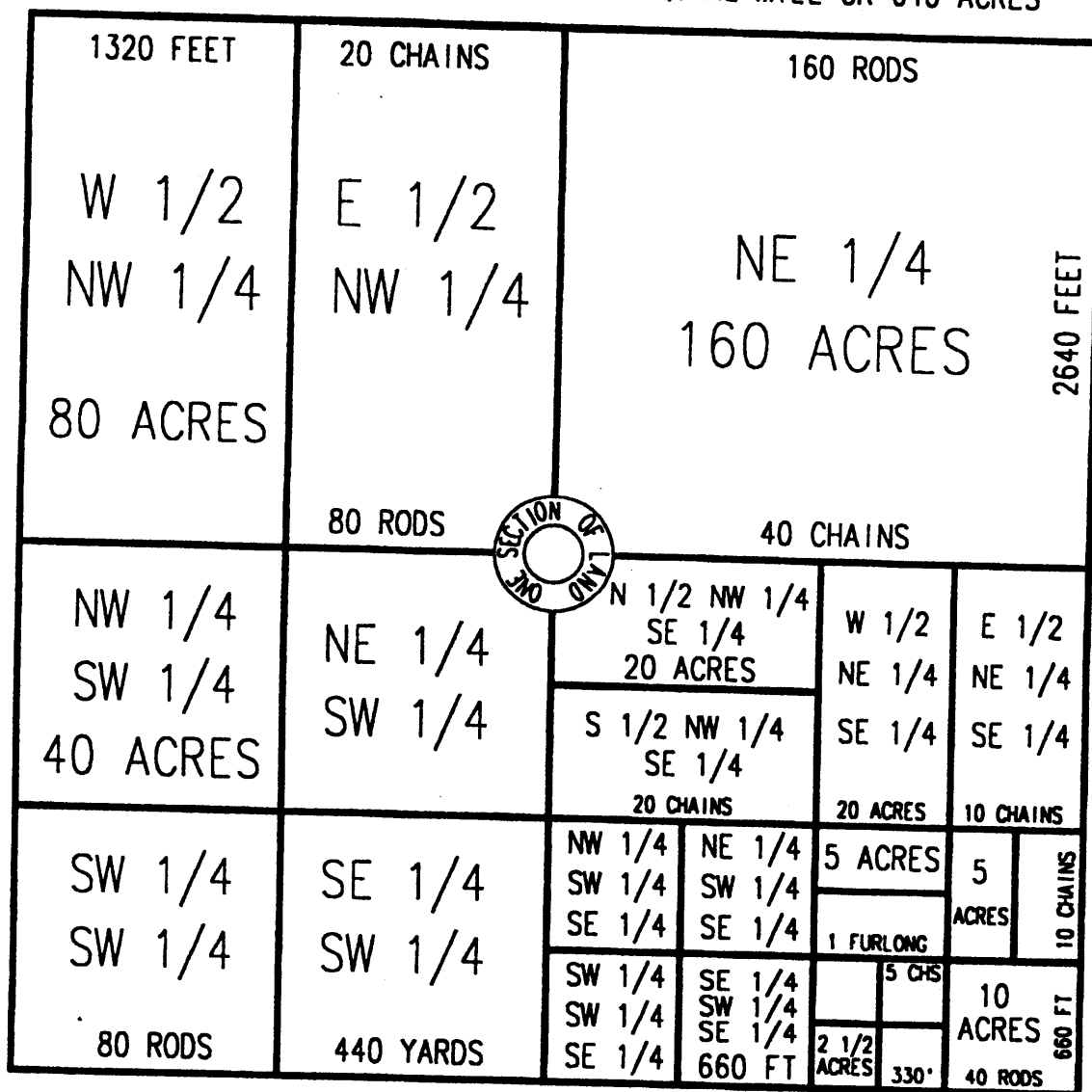
All irregularities in measurements north and south are located in the northerly lots. The irregularities of east and west measurements are located in the westerly lots.

19.27 CH.	20 CH.	20 CH.	20 CH.
20.75 CH. LOT 4	LOT 3	LOT 2	LOT 1 20.75 CH.
20 CH. LOT 5	SE 1/4 OF NW 1/4	SW 1/4 OF NE 1/4	SE 1/4 OF NE 1/4 20 CH.
20 CH. LOT 6	NE 1/4 OF SW 1/4	SE 1/4	
20 CH. LOT 7 19.27 CH.	SE 1/4 OF SW 1/4	40 CH.	

In some instances, land grants held under private ownership have been subdivided by private survey into areas simulating government sections. These areas are not true sections; the subdivisions are not strictly controlled by the rules for sectional division. The general procedure in describing such sections, in order to distinguish them from true sections, is to add the name of the land grant in which they are located after the section designation. For example, one such description reads: Section 10, Township 4 South, Range 11 West, S.B.B. & M., in the Rancho Los Coyotes, County of Orange, State of California.

SECTIONAL CHART

ONE SECTION OF LAND CONTAINS ONE SQUARE MILE OR 640 ACRES

1320 FEET	20 CHAINS	160 RODS	
W 1/2 NW 1/4 80 ACRES	E 1/2 NW 1/4	NE 1/4 160 ACRES	2640 FEET
	80 RODS	40 CHAINS	

ONE SECTION OF LAND

NW 1/4 SW 1/4 40 ACRES	NE 1/4 SW 1/4	N 1/2 NW 1/4 SE 1/4 — 20 ACRES		W 1/2 NE 1/4 SE 1/4	E 1/2 NE 1/4 SE 1/4
		S 1/2 NW 1/4 SE 1/4 — 20 CHAINS		20 ACRES	10 CHAINS
SW 1/4 SW 1/4 80 RODS	SE 1/4 SW 1/4 440 YARDS	NW 1/4 SW 1/4 SE 1/4	NE 1/4 SW 1/4 SE 1/4	5 ACRES / 1 FURLONG	5 ACRES / 10 CHAINS
		SW 1/4 SW 1/4 SE 1/4	SE 1/4 SW 1/4 SE 1/4 — 660 FT	2 1/2 ACRES / 5 CHS / 330'	10 ACRES / 40 RODS / 660 FT

MEASUREMENTS USED IN LAND DESCRIPTIONS

Linear Measure

1 link	7.92 inches
1 rod	25 links or 16½ feet or 5½ yards
1 chain	100 links or 4 rods or 66 feet
1 furlong	40 rods (660 feet)
1 mile	8 furlongs or 320 rods or 80 chains or 5,280 feet

Square Measure

1 square rod	272¼ square feet (30¼ square yards)
1 square chain	16 square rods
1 acre	160 square rods or 10 square chains or 43,560 square feet or 208¾ feet square
1 square mile	640 acres (one section)
1 township	36 square miles

METES AND BOUNDS

Some land cannot be described briefly. In these cases, a "metes and bounds" description is required. "Metes," meaning measurements, and "bounds," meaning boundaries, are designated for so many units of measurement along a specified boundary line.

Therefore, this description is a complete designation in succession of the various courses (segments) of the boundary of a closed area. The following general rules apply to this type of description:

- The total of the courses of the boundary must produce a closed area either mathematically or by ties between points.

- The bearing of the courses must be continuous from the point of beginning around the area of the parcel until the final course ends at the point of beginning.

- All bearings must be given the same meridian or basis of true direction.

- Any course is fixed by its bearing and length if not fixed otherwise by monuments or known points.

- Point of beginning (POB) is the reference point designated in the description as an initial point for beginning a description. At times, reference is specified as to point of beginning and "true" point of beginning. When the property in question is not monumented, a reference monument or known point is used outside the boundaries of the property in question. From this point of commencement, the descriptive bearings and distances are specified to a point on the property in question termed the "true" point of beginning. The closing courses of such a boundary description should close at the "true" point of beginning, also.

- The principles of metes and bounds descriptions as applied in practice are illustrated by the following example:
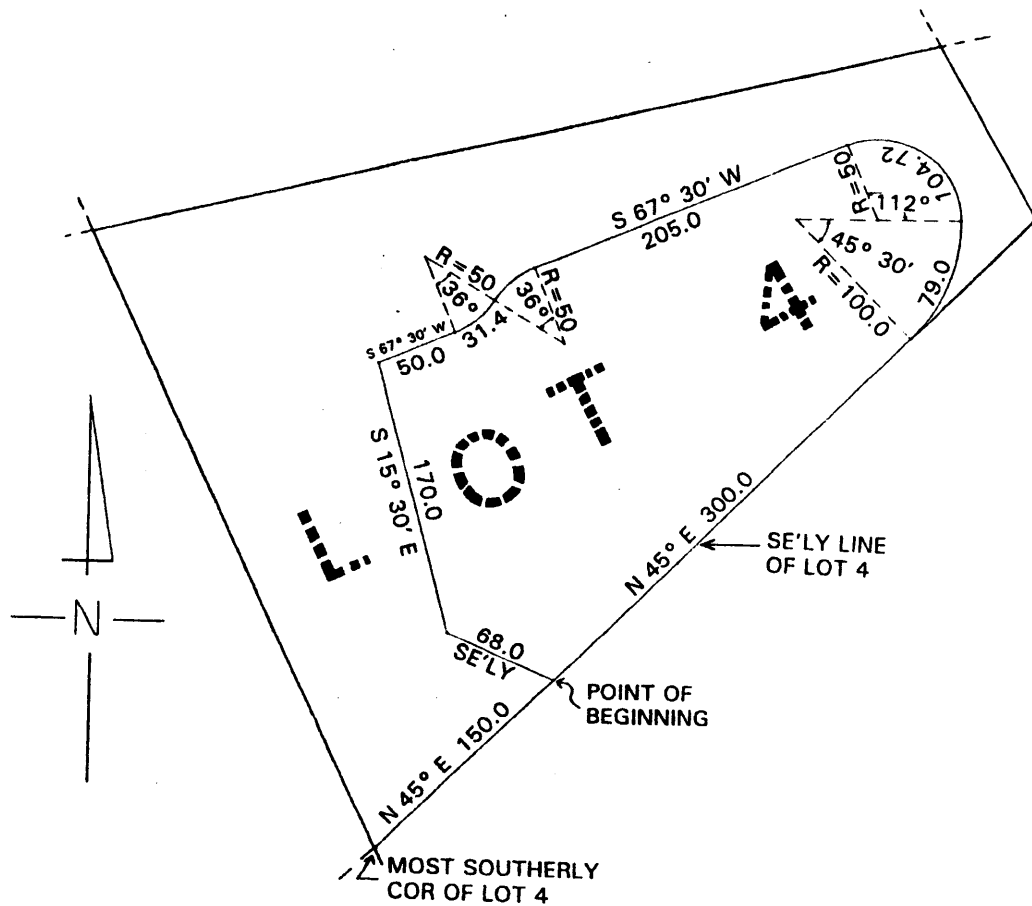
That portion of Lot 4 of Tract No. 16824, as shown on a Map recorded in Book 286, page 42 of Maps, records of ___ County, California, described as follows:

Beginning at a point on the Southerly line of said Lot 4 distant thereon North 45° East 150.00 feet from the most Southerly corner thereof; thence along said line North 45° East 300.00 feet to the beginning of a tangent curve concave Northwesterly and having a radius of 100.00 feet; thence Northeasterly along said curve through a central angle of 45° 30′ an arc distance of 79.00 feet to the beginning of a compound curve concave Southwesterly and having a radius of 50.00 feet; thence Northwesterly along said compound curve through a central angle of 112° an arc distance of 104.72 feet; thence tangent to said curve South 67° 30′ West 205.00 feet to the beginning of a tangent curve concave Southeasterly and having a radius of 50.00 feet; thence Southwesterly along said curve through a central angle of 36° an arc distance of 31.41 feet to the beginning of a reverse curve concave Northwesterly and having a radius of 50.00 feet; thence Southwesterly along said reverse curve through a central angle of 36° an arc distance of 31.41 feet; thence tangent to said curve South 67° 30′ West 50.00 feet; thence South 15° 30′ East 170.00 feet; thence Southeasterly 68.00 feet to the point of beginning.

MONUMENTS

Descriptions utilizing monuments also may include, at least partially, a metes and bounds description. A monument may be defined as *a landmark that is used for the purpose of indicating a boundary of a parcel of land.* It may be either natural or artificial.

Natural monuments are rivers, lakes, streams, trees, mountains, rocks or springs.

Artificial monuments are landmarks such as fences, walls, houses, streets, alleys, posts, canals or drainage ditches.

A monument may consist of an "imaginary line" caused by a produced street or alley or the intersection point of two produced streets, etc.

This is the most dangerous of all descriptions — the danger becoming apparent in later years when it is found that the monument marker has changed or disappeared completely. Over a period of years rivers change course; lake, stream and even mountain boundaries change; trees may be cut or blown down; fences, walls, houses, posts and stakes are easily moved; canals and drainage ditches may be filled in; streets may be closed, be widened or have their names changed.

LOT DIVISIONS

A person working with legal descriptions must ascertain the characteristic features of the whole lot before plotting the "part" description. That is, determine whether the whole lot is square or rectangular with lines due north and south, east and west, or if it is odd-shaped with various courses describing the boundary lines.

In any lot where the property in question is a "part," determine whether boundary lines are westerly, northerly, etc. ·

Rules for determining directional characteristics of boundary lines follow:

* If the bearing or course of a boundary line is 20 degrees or less from due north or south, that boundary line is an easterly or westerly boundary depending on whether it is on the easterly or westerly portion of the lot.

* If the bearing of a boundary line is 70 degrees or more from north or south, it is a northerly or southerly boundary line depending on whether it is on the northerly or southerly portion of the lot.

* If the bearing of a boundary line is between N 20°E and N 70°E or S 20°W and S 70°W, it is a northwesterly or southeasterly boundary line depending on whether it is on the northwesterly or southeasterly portion of the lot. If the bearing of a boundary line is between N 20°W and N 70°W or S 20°E and S 70°E, it is a northeasterly or southwesterly boundary line depending on whether or not it is on the northeasterly or southwesterly portion of the lot.
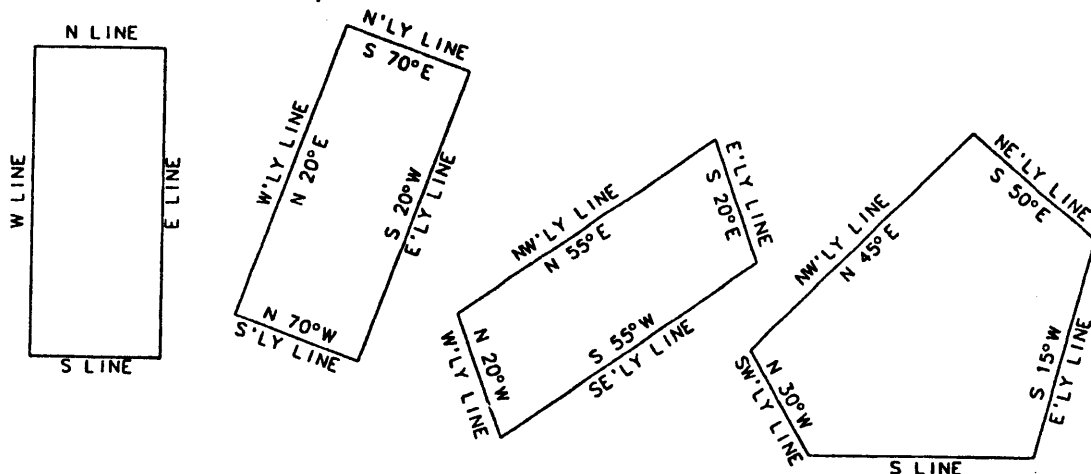
Care must be exercised to measure part lot descriptions from the true lot lines. Normally, a lot on a map is the area bounded by solid lines that coincide with the side lines of adjoining streets or alleys; the dimensions of the lot are measured along such lot lines. If streets are dedicated after filing of a map by conveyance or condemnation of a portion of a lot, the original recorded lot lines are not changed by subsequent vacation of a street shown on the map; the lot lines remain as they are shown on the map.

Occasionally, however, recorded maps may carry recitals indicating that lot lines are considered to be the center lines of adjoining streets. For example, a map may read, "areas and distances measured from street centers." In such cases, descriptions of portions of the lot should specify whether measurements are to be made from the side lines or from the center lines of streets. In the absence of such specifications, areas and distances may be computed to either side or center lines of streets, depending upon such circumstances as intention of the parties, possession, etc.
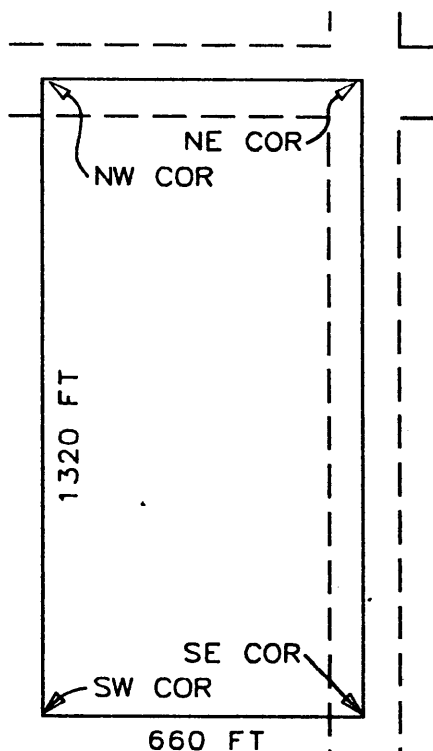
Fig. A

Sketch showing lot with streets deeded after lot was recorded. Lot lines never change.
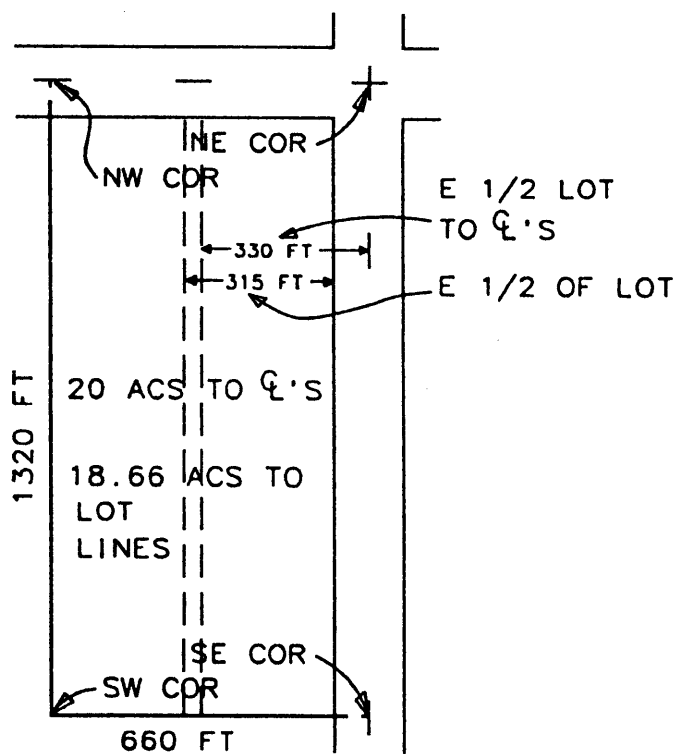
Fig. B

Sketch showing recorded lot with lot dimensions and acreage to street centers.

When lots or parcels are divided, consideration should not only be made of boundary characteristics, but also how the lot was or is to be cut. The property description should include what the customer desires and should be technically correct. The following examples will point out most of the situations normally encountered in dealing with part lot descriptions.

RECTANGULAR LOT

First, consider the rectangular lot. This occurs quite frequently and is the simplest to handle. For practical purposes, the words "rectangular lot" are meant to describe a lot whose interior angles are all at or very near 90°.

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┌─────────────────────────────────────┐
│                                      │
│         N  1/2                 50'   │
│ - - - - - - - - - - - - - - - - - -  │
│                                      │
│         S  1/2                 50'   │
└─────────────────────────────────────┘
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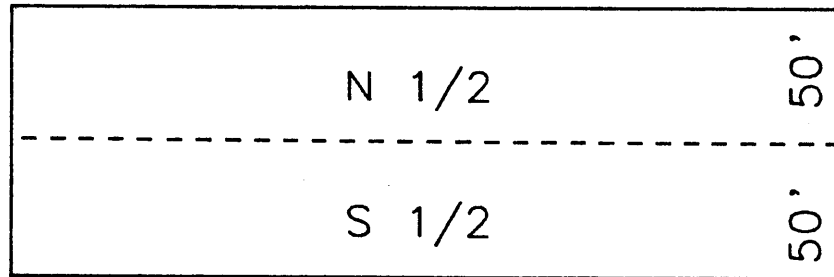
The proper description of this, as shown, would be:
    the North 50 feet of the lot (if sold first),
    all of the lot except the North 50 feet;

or it could be described as:
    the North half of the lot,
    the South half of the lot.

Either of these methods of dividing the lot are perfectly acceptable, but the **parts are not interchangeable**. Chance of error is manifestly greater if an attempt is made to combine the two methods of describing a lot. The principle behind this is that the "North 50 feet" means 50 feet measured at right angles or perpendicular to the north line of the lot. The "North half" means one-half of the area in the lot. This rule is at times not followed, but only when the problem is in the hands of a person trained in this work.

IRREGULAR LOT

Our consideration is now with the irregular or non-rectangular lot. As long as we deal with rectangular lots, leaving out of consideration the matter of streets, we do not encounter much difficulty in a description of fractional portions. Once out of this class, however, trouble may occur with the first sign of carelessness or lack of knowledge. In figures A to K are some of the situations that may arise:

The westerly 50 feet.
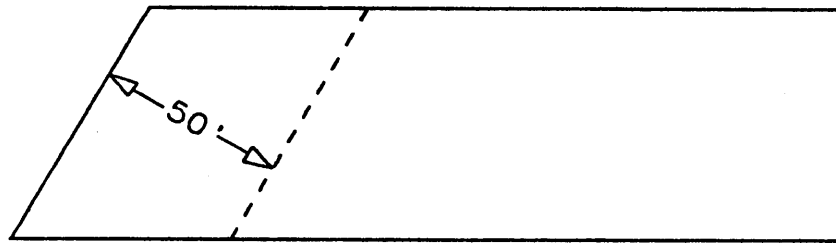
Fig. A

The westerly 50 feet measured along the north and south lines. The lines are still parallel but the distance between the lines is less than that in the preceding figure.
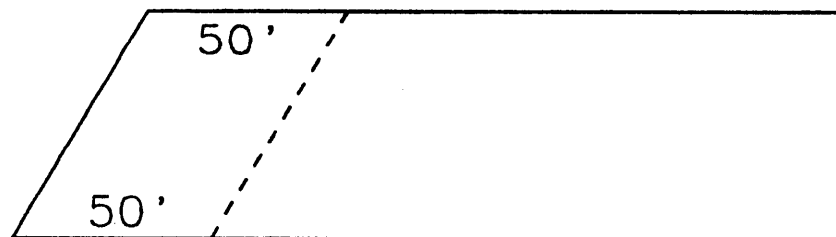
Fig. B

The westerly 50 feet and all of the lot except the west 50 feet. In this case, the curve in the street makes it necessary to describe the parts like this.
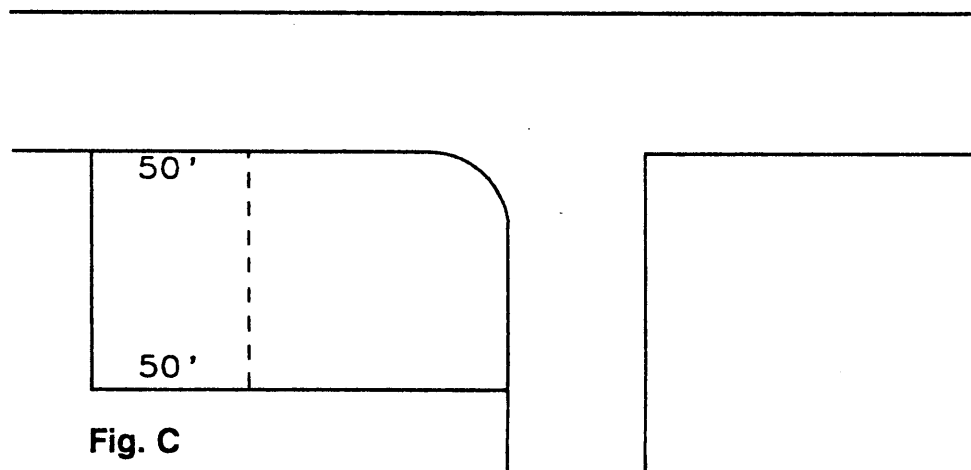
Fig. C

Lot — except the east 100 feet. In this case, we except the east 100 feet, the dividing line is parallel with the east line, running at right angles to the north and south lines.
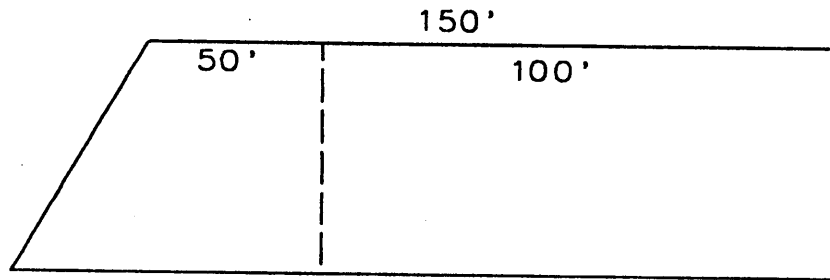
Fig. D

In each of the above examples, the description is correct. However, we must be sure any like description drawn for the first time expresses the intent of the customer. That is, did the customer want the 50 feet in frontage, 50 feet in width, or all of the lot except the east 100 feet?

When the documents creating the description are already of record, care must be exercised to avoid creating a new problem or compounding an old error. To stress this point, the following examples are given as situations to avoid, since they either create an outright overlap, the possibility of an overlap, or a shortage:

Do not use these descriptions —

The easterly 100 feet and the westerly 50 feet. This example illustrates the cause of occasional grief to anyone handling descriptions. In this case, measurements were taken from both the easterly and westerly lines — the overlap uses up the entire westerly 50 feet.
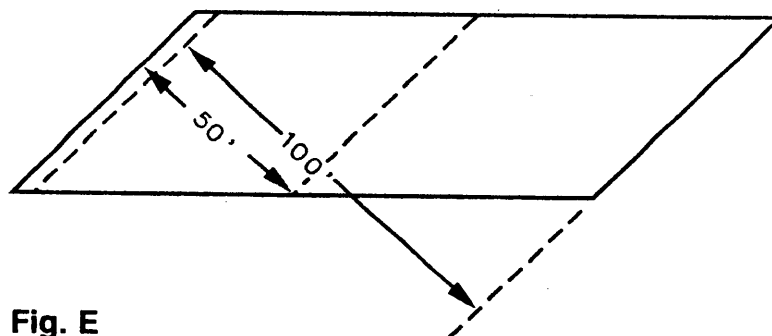
Fig. E

The north 50 feet and the south 50 feet. While this description is acceptable at times, try to avoid using it.
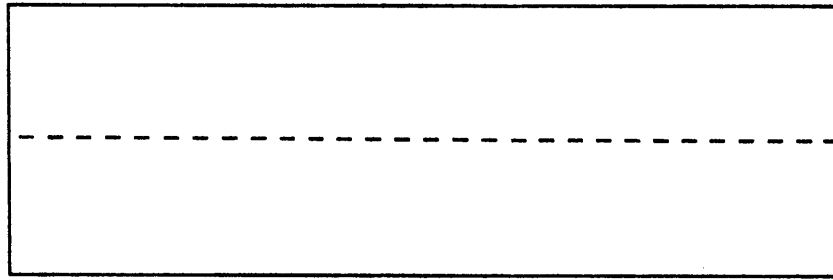
Fig. F

The north 50 feet and the south half. This indicates a shortage.

N 50'

S 1/2
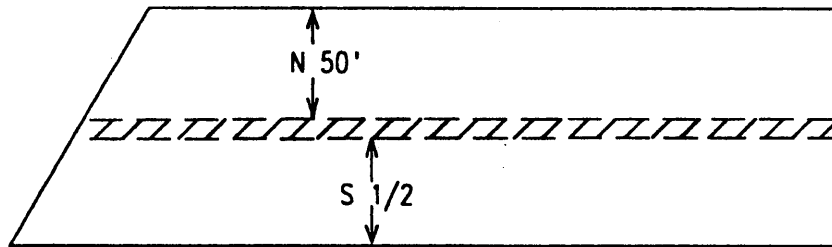
Fig. G

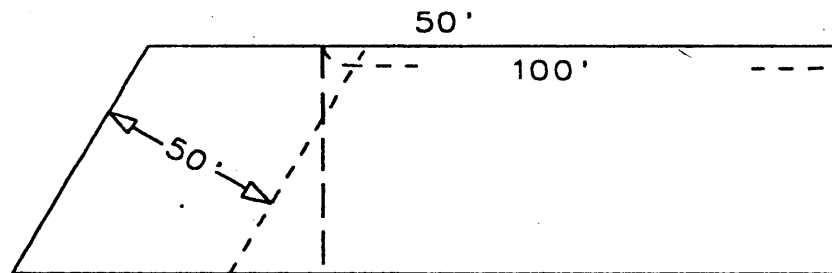The westerly 50 feet and the east 100 feet. This shows both an overlap and a shortage.

50'

100'

50'

Fig. H

The westerly 50 feet, measured along the north and south lines, and the east 100 feet. This involves a shortage.
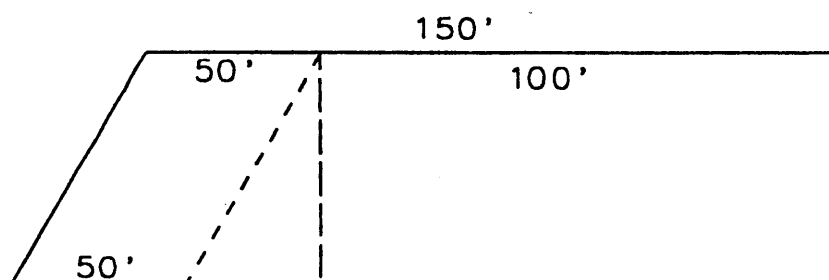

150'

50'

100'

50'

Fig. I

The east 50 feet measured on the south line of the lot. Determine north, south, west and east lines of the lot, and measure 50 feet on the south lines from the intersection of the south and east lines. Draw a line from said measured point parallel to the east line through the complete easterly portion of the lot. If the east line is broken, bisect the angle formed by the east lines and from the intersection of said parallel line and the line of bisection, and continue the drawn line parallel to the subsequent east line. Figure J illustrates this description:
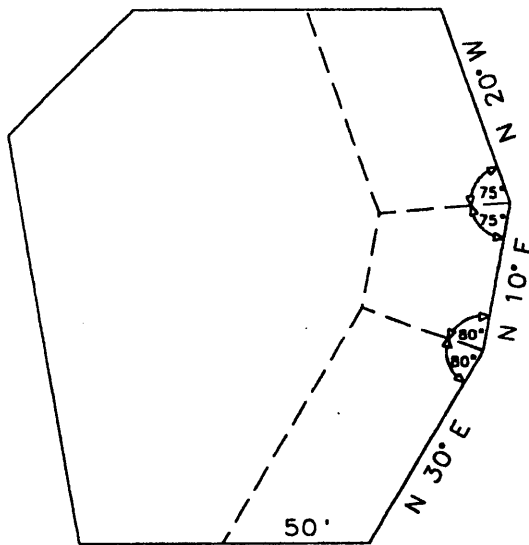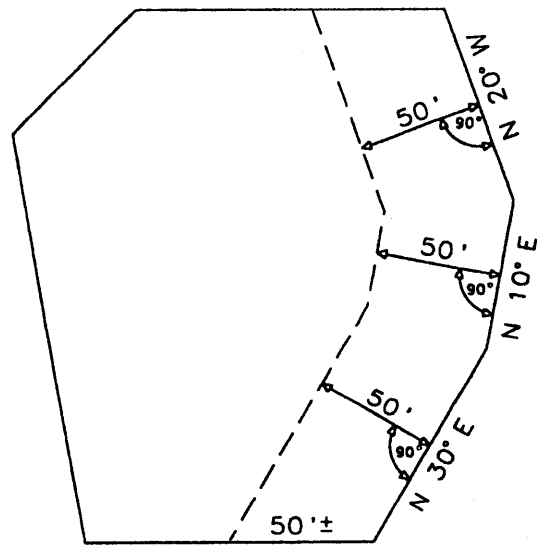
Fig. J   **Fig. K**

The perpendicular distance between the parallel lines will be constant but less than 50 feet. In Figure K, the area designated conforms to the description of the east 50 feet of the lot. This intersects at a point on the south line of more than 50 feet of its easterly portion.

Applying the illustrations of Figure J and Figure K to practice, if Figure K were the property in question, an instrument describing the whole lot excepting the area in Figure J could not be ignored since it would overlap the property in question.

CONFLICTS IN LOT DIVISION
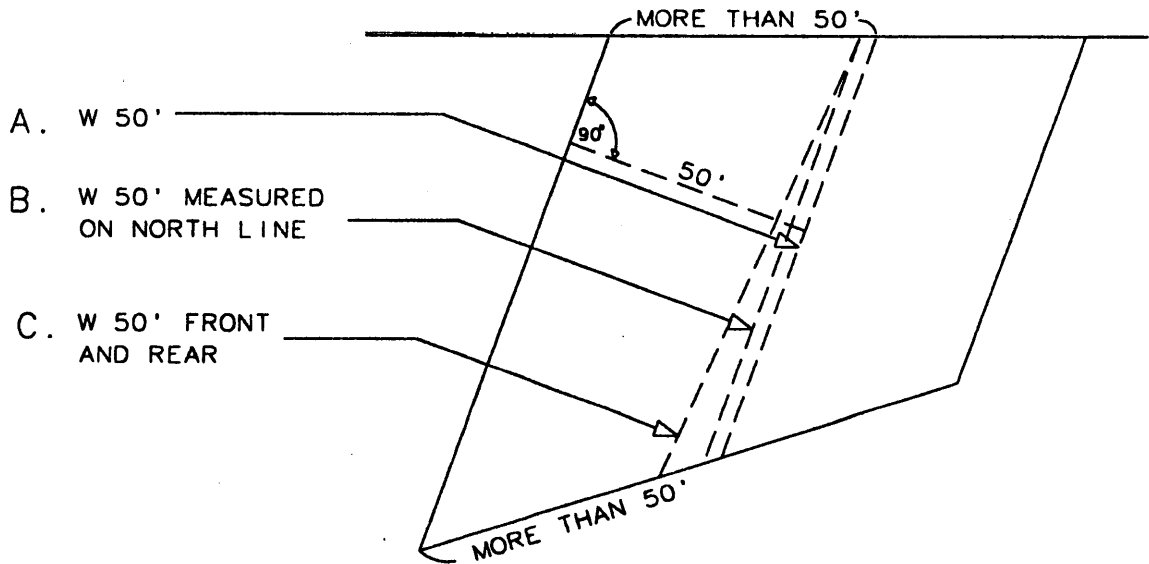
A. West 50 feet is strip of land 50 feet wide measured at right angles to the west line of the lot.

B. West 50 feet measured along the north line of the lot is a strip between parallel lines, the distance between said lines being measured on the north line of the lot.

C. West 50 feet front and rear is a strip of variable width, having a frontage of 50 feet and a width of 50 feet along the opposite or rear line of the lot.

Any one of the above descriptions is valid but no one may be accepted as meaning any other except in the case of a rectangular lot, and then only by experienced persons.

The perfect description for dividing a lot of any shape into two parcels without possibility of conflict consists of a description of the dividing line extending across the lot with a statement that the portion of the lot described lies easterly (westerly, southerly, northerly, as the case may be) of said dividing line.

COMPLEX PART LOTS

When a lot is divided into multiple parts, the divided parcel may be described either by its specific division, as east 50 feet of west 100 feet, or by excepting those parts of the lot not included within its boundaries. This principle is illustrated here:

| W 50'	E 50' OF W 100'	E 50' OF W 150'	N 50' ; EXCEPT W 150'
			LOT — EXCEPT W 150' ; ALSO EXCEPT N 50'
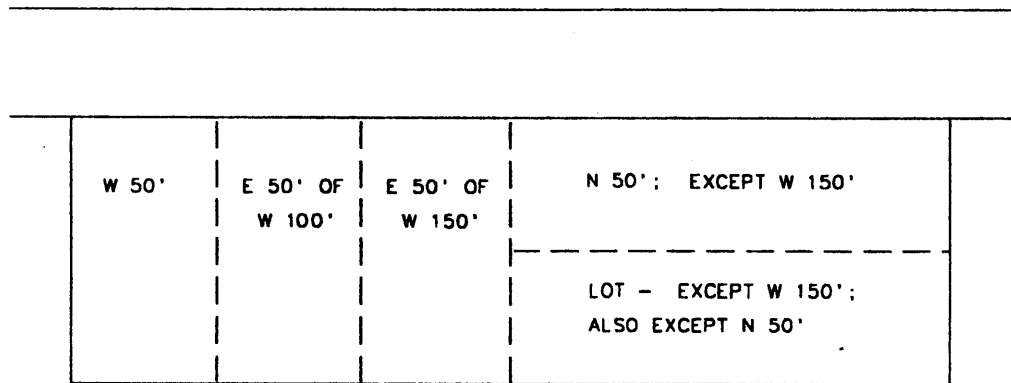
LOT DIVISION BY AREA

When a lot is not rectangular in shape, a description dividing the lot into halves should be carefully analyzed. The example below illustrates the ambiguous nature of a described half of a non-rectangular lot.

Any of these lines could divide the figure into halves.
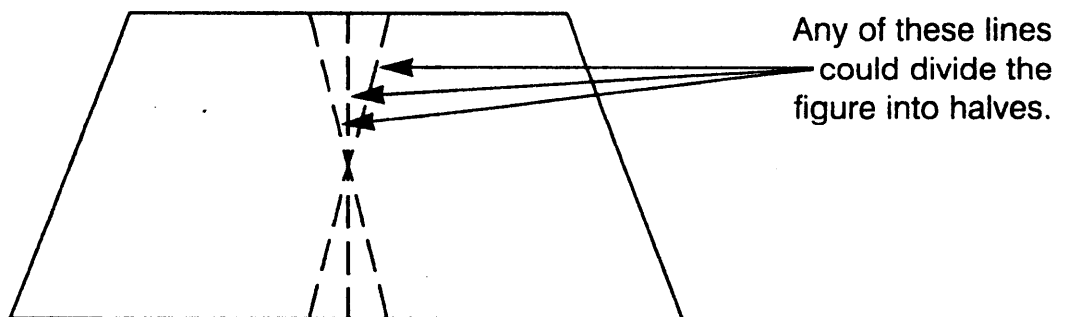
A lot division described by acreage is always restricted by the actual bearings and distances of the boundary lines. It is best to analyze the boundary characteristics of any parcel described by an acreage recital. If the property in question contains references to acreage, location of boundaries may be uncertain. Consult a First American title expert, a licensed engineer or a surveyor if you have any doubt as to the boundary locations.

If the lot is rectangular, an acreage recital may easily be converted to linear dimensions as illustrated in the following example:

All lot — except the south 10 acres.
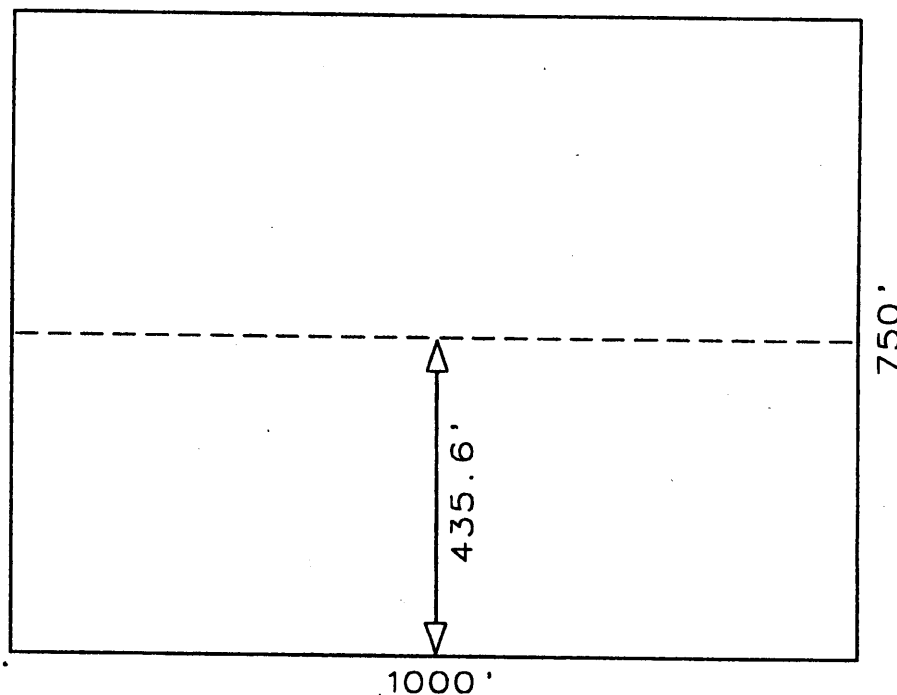
Since the south 10 acres will be bounded by the east and west lines of the lot, the southerly dimension of this area will be 1000 feet. To find the dimension to be measured northerly from the south line, divide the total square feet in 10 acres by 1000. Since 10 acres equals 435,600 square feet, the unknown dimension will be 435.6 feet. Thus, the south 10 acres may also be described as the south 435.6 feet of the lot.

DIRECTIONS OR BEARINGS

The bearing of a line is the angular deviation measured in degrees, minutes and seconds from a known line or direction generally true north or south.

A. A *cardinal line* of *true meridian* is due north and south; that of *true latitude* is due east and west.

B   Directions or courses as used in legal descriptions are predicated on the quadrant system of directions. Measurements are made from the original north and south line, thence easterly or westerly to a maximum of 89° 59' 59" (since 90° would be due east or west). There may be instances where measurements are made from the cardinal east and west line, but this is not the general practice.

C. A direction or bearing is described by the number of degrees measured and the relation of the direction from a true meridian (north and south) and a true latitude (east and west). Thus, a direction measured 20 degrees from north towards east would be described as north 20 degrees east or N 20° E.
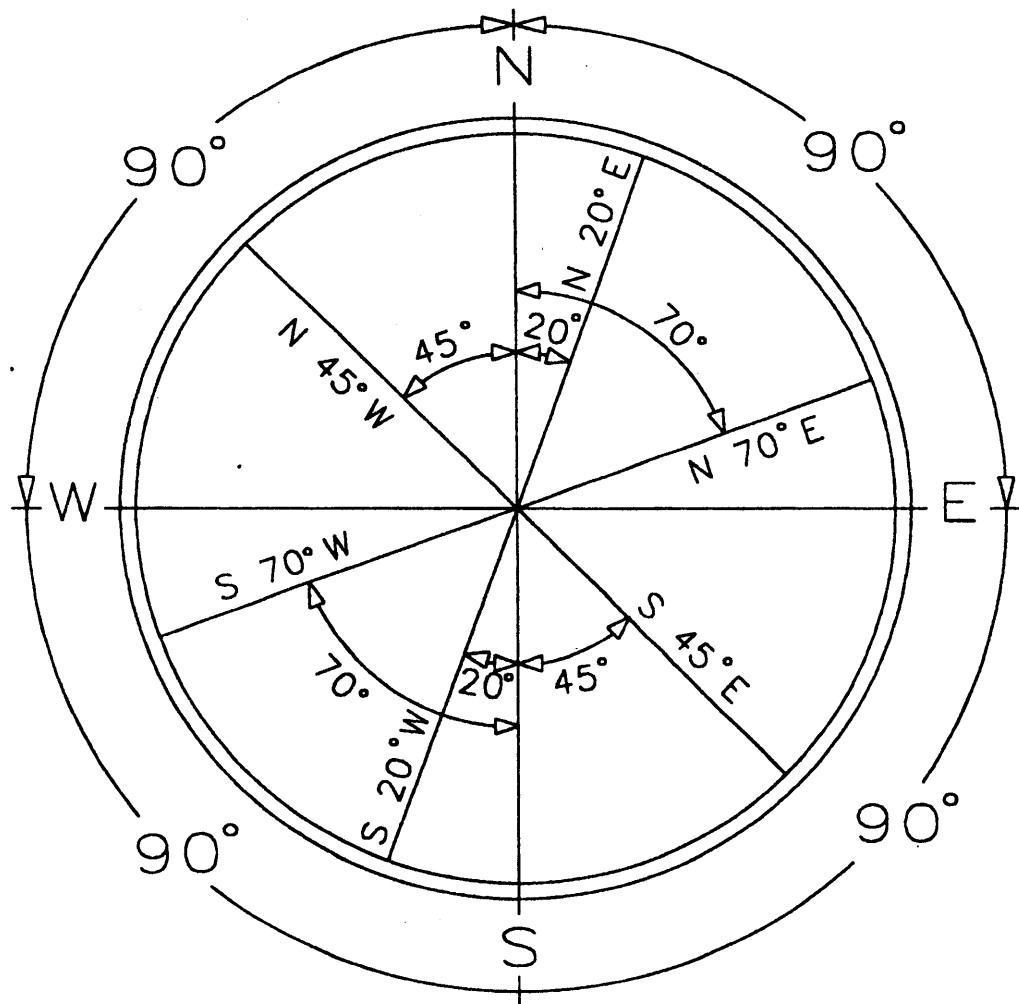
D. A bearing, which is not always designated in degrees, describes a general course between two known points, such as northerly, etc. In such instances, no bearing or distance may be given as "more or less" except when the line is tied to a monument (known point) that determines its length and bearing *regardless of the measurements given.*

E. Do not use a reverse bearing. A bearing should designate a continuous course from one point to another, or a direction of movement. To designate a reverse bearing from one point to another is incorrect; that is, to designate a bearing S 45°E as a course when the bearing from said point is N 45°W to the following point. N 45°W is the same line as S 45°E (see drawing on previous page), but the designation of the line depends on the desired course, such as, from SE to NW or N 45°W.

F. A line recited as "northerly" or "easterly" in a description, unless qualified by a tie to a point, must be considered as bearing "north" or "east" relative to the base (true direction) for the bearings of the description.

G. Descriptions naming the directional value of a line between two known points should be sufficiently specific to prevent uncertainty. It is safe to describe directions between:

　　N 20°W and N 20°E as northerly,
　　S 20°W and S 20°E as southerly,
　　N 70°E and S 70°E as easterly and
　　N 70°E and S 70°W as westerly.
　　Refer to drawing on previous page.

H. Corners in such locations that directional recital thereof may apply equally well to another nearby corner should be more specifically described to distinguish it from another for which it might be mistaken.
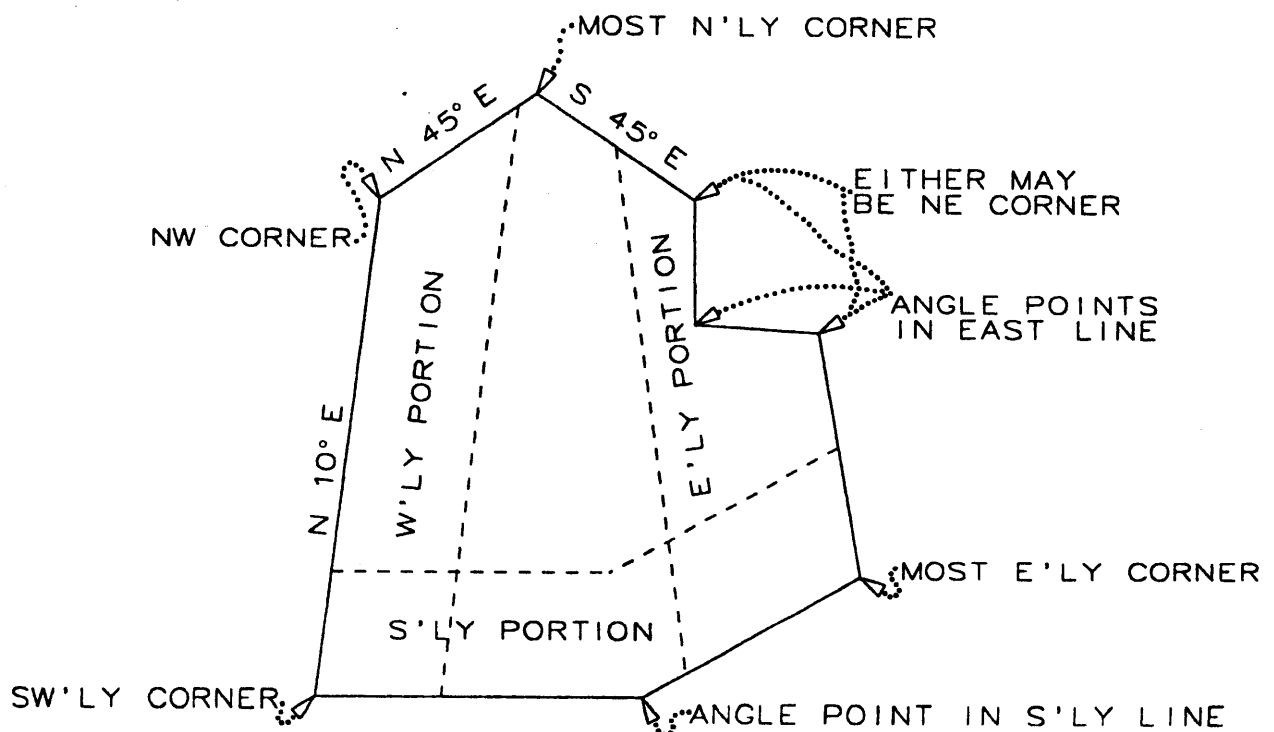
CURVES: DEFINITIONS

A curve is a part of the *arc* of a circle. It is limited at each end by the radii of the circle which form a central angle at the center of the circle. Curves are described by the following terms:

A **Radius** is the distance from a point on the curve to the center of the circle.

B. **Length** of curve is the linear measurement of the curve.

C. **Concavity** is the inside or indented side of the curve. Conversely, the convex side of a curve is the outside or the side of the curve away from the center of the circle.

D. **Direction** upon a curve is the general bearing along the curve (such as easterly, northerly, etc.) Direction applied to concavity specifies the bearing from the concave curve at its midpoint to the center of the circle.

E. **Tangency** occurs when a curve is tangent to a course at a point if the radius of the curve at that point makes an angle of 90° with the course.

F. **Radial bearings** are furnished if a curve is not tangent to a course at the point of intersection thereof. The length and bearing of the radius must be given to determine the center of the circle.

The following is a list of the types of curves encountered in legal descriptions:

A. A *simple curve* is the arc of a circle of a given radius.
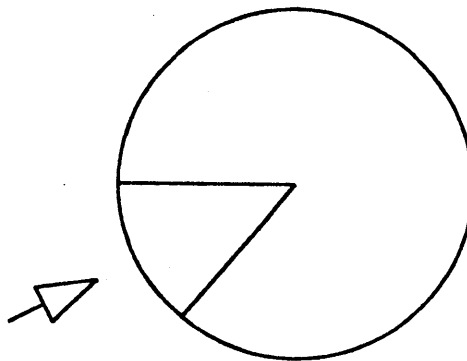
B. Curves are *compound at a point* if the curves have a common radial line at the point of contact, different lengths of radius and the centers of the circles are on the same side of the curve.
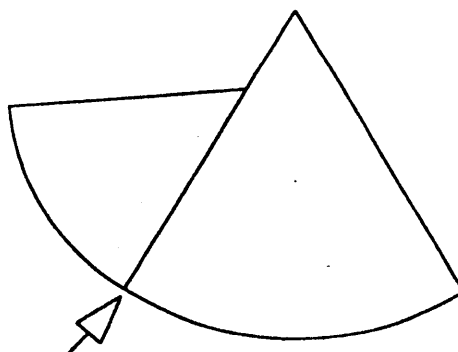
C. Curves are *reverse* if they have a common radial line at the point of reverse and the centers of the circles are on opposite sides of the curve.
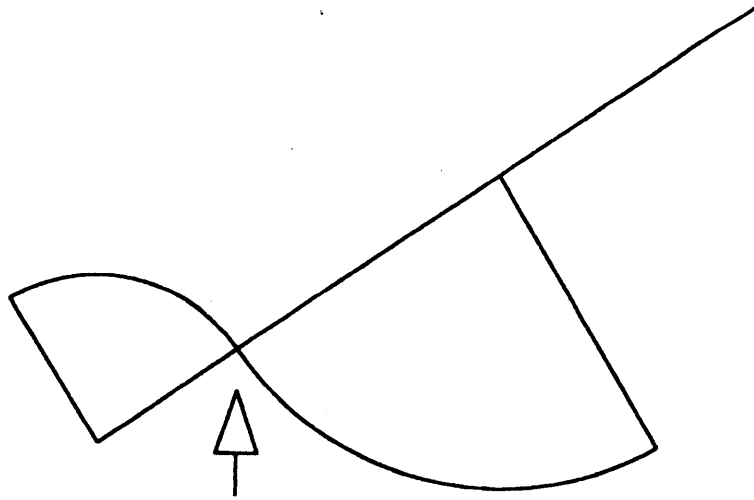

D. Curves are *tangent* if they have a common radius or radial line at the point of contact.
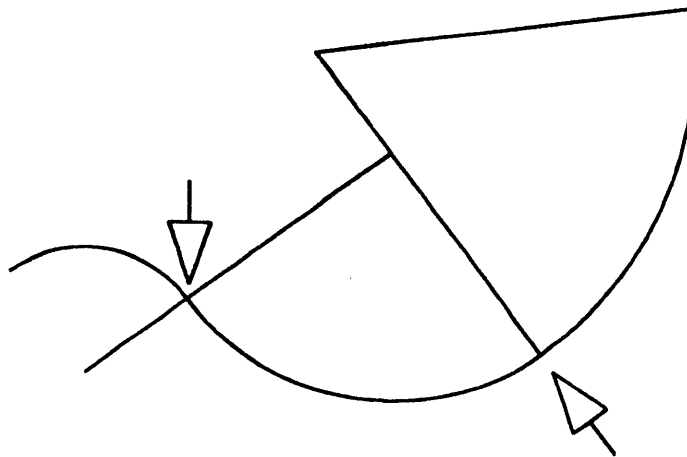
The radius of a 1° curve is approximately 5730 feet calculated on a constant chord of arc of 100 feet. To find the radius of any curve described by degrees, divide 5730 by the number of degrees in the curve desired. Thus, a 10° curve has a radius of approximately 573 feet. Curves named by angular descriptions are used principally for railroad surveys.
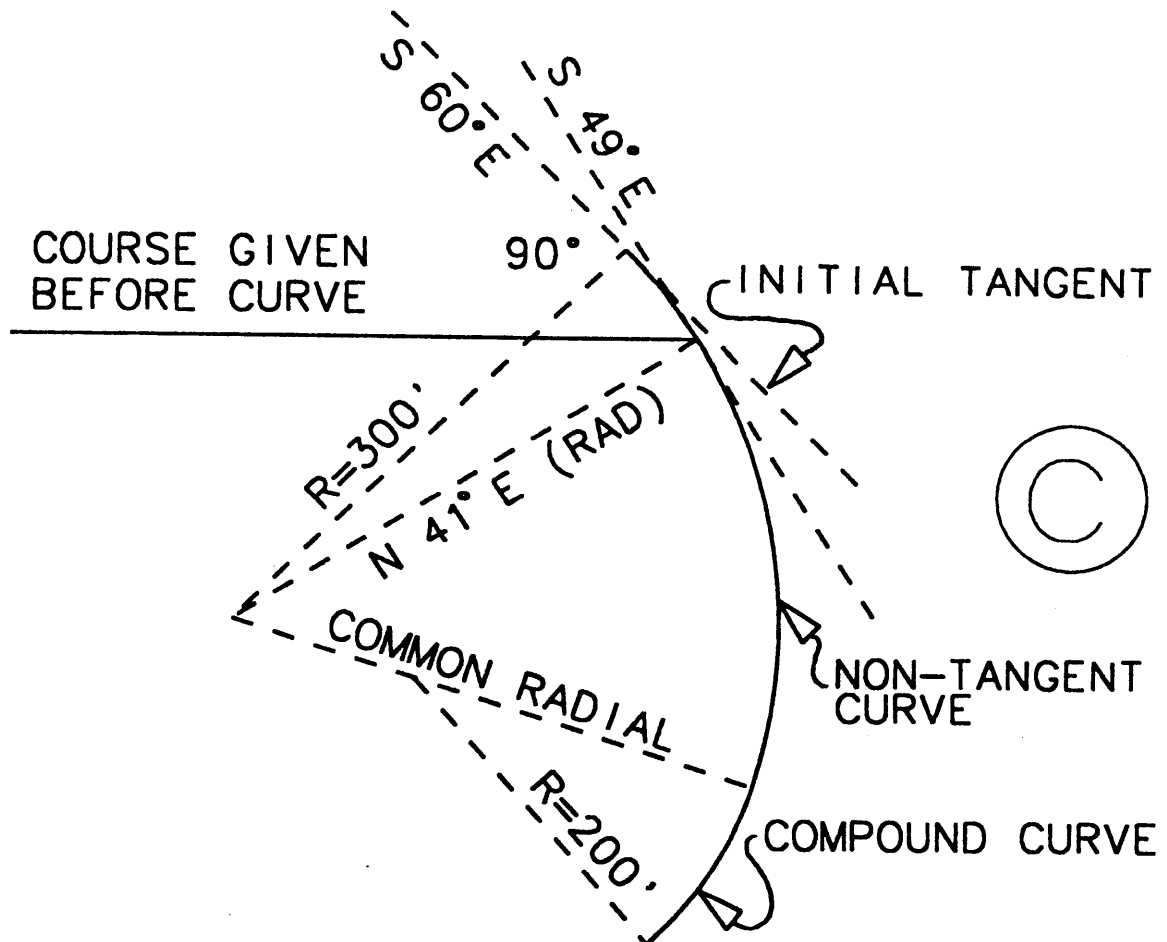
PLOTTING CURVES

A. **Reverse curve** is always plotted on extended radius of former curve. Radius does not have to be of the same length.
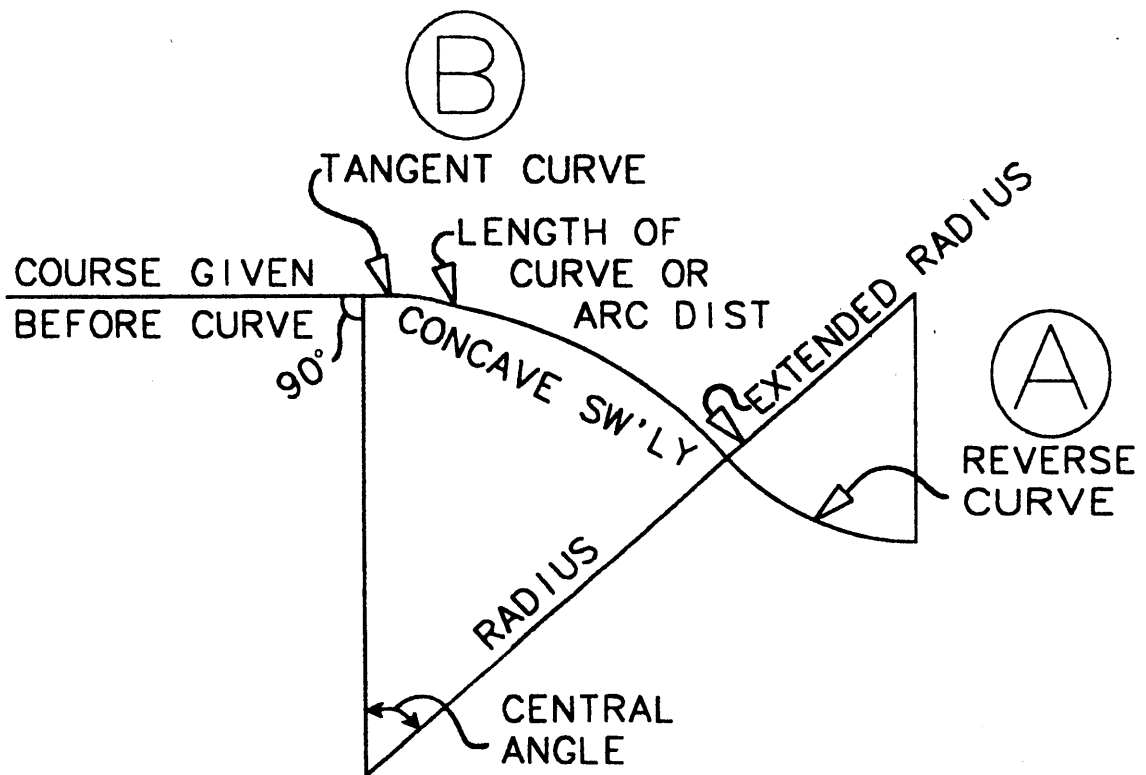
B. **Tangent curve** is always plotted from a radius drawn at 90° from ending point. If curve is *concave (curving over)* to southwest, radial line is drawn southwesterly; if concave to northeast, radial line is drawn towards northeast, etc. Central angle determines length of *arc (curve)* since it is difficult to measure around a curve with a ruler.

C. **Non-tangent curve** description may give the angle of the radial line passing through the ending point of the last course — this line being the bearing of the radius of the non-tangent curve; or the description may give the bearing of a line passing through the ending point of the last course to which the curve would be tangent. The radius would then be drawn at 90° from this bearing.

Compound curve is figured along the same radial line, but each curve has a radius of a different length.

D. When plotting street and highway descriptions, curves sometimes double back on themselves. Description will read "to a point of *cusp*, thence along a curve," etc.
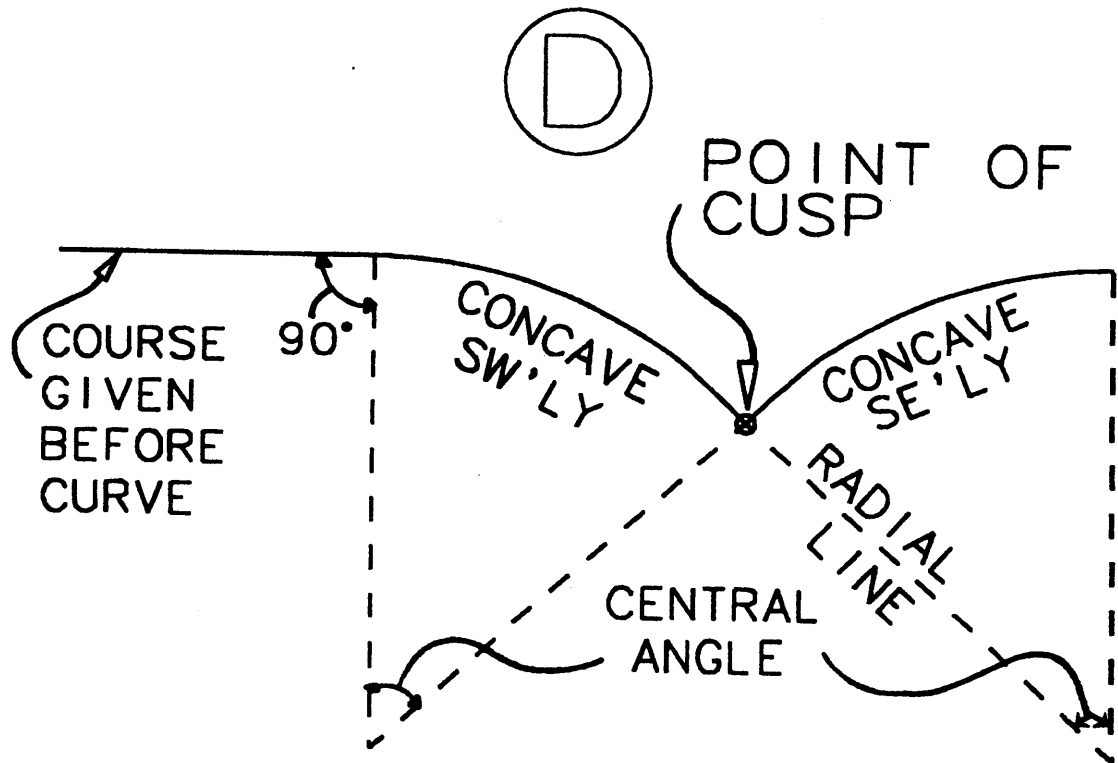
ILLUSTRATION OF CURVES...
Usage in Descriptions

POINT OF INTERSECTION OF TANGENTS (PI) OR INTERSECTION OF TANGENTS (IT)

TANGENT

TANGENT

ARC LENGTH

BEGINNING OF CURVE (BC) OR POINT OF CURVE

1/2 Δ

END OF CURVE (EC) OR POINT OF TANGENCY

LONG CHORD

1/2 Δ

TANGENT

90°

90°

TANGENT

RADIUS

Δ

VALUE OF THIS ANGLE IS DEGREE OF CURVE

CENTER

CENTER

POINT OF REVERSE CURVE

POINT OF COMPOUND CURVE

A

C

NOTE:
LINE C-D IS CONCENTRIC WITH A-B

COMPOUND CURVE

B

D

CENTER

POINT OF COMPOUND CURVE

POINT OF REVERSE CURVE

CENTER