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Procedures to obtain enviromental surveying

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ABSTRACT

The man has gone through several evolutionary processes of survival throughout history from its primary forms to the current settings of society. The first people of prehistory were nomads who had no fixed residence and survived by hunting, fishing and plant extraction . Over time , there was the need for human survival change habits , for the food , which until then only exploited , were getting scarce , going to have a fixed residence and becoming a sedentary species. He learned to grow their own food and raise animals , emerging then , agriculture and livestock, thus forming more complex societies , such as towns and cities. Planimetric survey are various surveying procedures, without considering the relief, seeking the graphical representation of a land area by obtaining necessary elements as angles, distances, geographic location and position or orientation. The aim of work is inform the more important procedures to obtain environmental surveying.

Keywords: surveying, land surveying, distance mensurament, angle mensurament.

INTRODUCTION

Planimetric survey are various surveying procedures, without considering the relief, seeking the graphical representation of a land area by obtaining necessary elements as angles , distances , geographic location and position or orientation . The planimetric survey is divided into poligonation or traversal; irradiation; intersection, ordered and coordinated. Before making any survey, the surveyor should make m reconnaissance ; choose the vertices of the polygon; if necessary arrange production of pickets , stakes, stakes witnesses ; make a site outline called sketch ; decide which or what kind of planimetric surveys will employ to do the survey.

The aim of work is inform the more important procedures to obtain environmental surveying.

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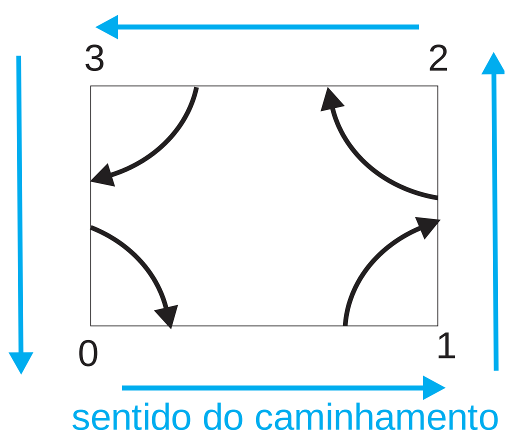
REVIEW

1. Types of planimetric surveys

1.1. Poligonation or traversal

The traversal method is performed through each vertex of the topographic polygon by measuring angles and distances, by scrolling (moving) to another vertex making up the same procedure. At the beginning is read azimuth on the first vertex for later calculations of others. For the sake of convention, due to old theodolites that mediate only one direction (clockwise) , the angles of the vertexes should be read clockwise , aiming at the previous vertex is zeroing , the horizontal angle and aiming at the subsequent vertex making the reading of the angle at the apex of which is the theodolite . Thus the process of traversal is done in poligonation or counterclockwise (Figure 1).

Figure 1 – Anti -clockwise traversal direction in a closed polygonal and reading of the angles clockwise .



1.1.2 Procedure traversal or poligonation:

After initial recognition of the terrain and marked all the vertices of the polygon to be raised, is the time of measurement of angles and distances from it. Taking as an example the polygon with 4 sides of Figure 51, first, you park, (settles) the theodolite or total station on point 0 (zero). It makes the process of centragem1 and calagem2 equipment. After centering and liming with the aid of compass and a beacon, the surveyor determines the direction of magnetic north for measuring magnetic azimuth alignment 0-1. For the measurement of the internal angle from the point 0 (zero), the surveyor is a target of a defendant asking a helper to hold a beacon of vertical form on the topographic point 3, zeroing the horizontal angle of the instrument and measuring the angle to the forward beacon located in 1. for the measurement of distances 3-0 and 0-1, the surveyor may be used in an ordinary tape measure, tape measure or electronic sights speaker to measure by tacheometry. With the completion of the reading of angles and distances at the vertex 0, the surveyor walks to the vertex 1. In this corner, it can take measurements of distances 0-1 and 1-2.

The measurement of the angle is measured through the aft and forward of 0 to 2. In vertex 2 can take measurements of distances 1-2 and 2-3. The angle measurement is carried out through the aft and forward by 1 3. After the vertex 2, the surveyor walks to the vertex 3. In this corner, it can take measurements of distances 2-3 and 3-0. The angle measurement is carried out through the aft and fore 2 to 0. It is noteworthy that alignments can be measured twice, at different vertices, so that a comparison is made and if there is consistency in measurements. In practice, polygons with many vertices in even with the completion of the recognition area the fore vertices are determined the extent that it makes the traversal. So not sure where it will be the last vertex, needing to install the instrument twice in the first corner, with an installation at the beginning and another at the end or closing of the surveying polygon.

All work done in the field should be guided. The instrument used for guidance is a compass. The

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polygonal orientation procedure should be concomitant with traversal method of procedure.

In the vertex 0, it reads the magnetic azimuth alignment 0-1 , are made later do the calculations to find out the values of the azimuths of the other alignments.

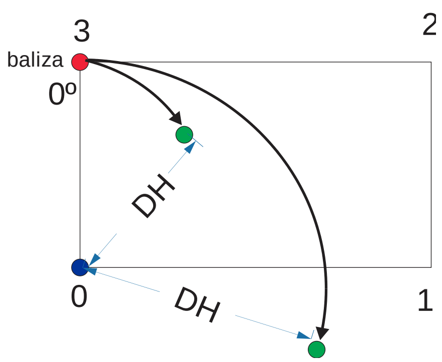
1.1.3. Error

The error is inherent in any measurement. For a planimetric survey by traversal can control (calculate, correct or discard) the angular error, knowing the geometric shape of the polygonal and the rules for sums of angles. Sum of the internal angles = (n -2). 180, where n is the number of vertices or sides of the closed polygon . For example, in a rectangle , we have: SRetângulo = (4-2) = 360 .180º Therefore, the sum of the internal angles must be 360 for the rectangle . The tolerance of error, according to the norm is 1'√n , therefore, for the rectangle may be wrong to 2 '.

1.2. Irradiation or Polar Coordinate

This method is normally used for small areas and relatively flat . Its onset is from a vertex measuring the precise position of various objects in the survey through angles and distances (polar coordinates) from a reference point (Figure 2) .

Figure 2 - Irradiation from a vertex (vertex zero).

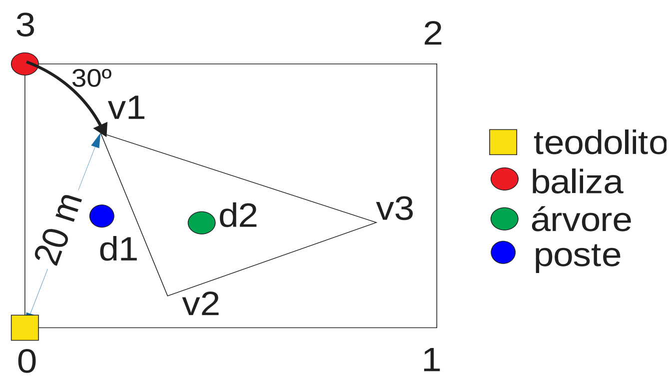


It is important to emphasize that in some cases, for a more detailed and representation of the terrain, use is the combination of the traversal method or poligonação to raise a basic polygon , the method of irradiation used for detailing some objects of interest, from the polygonal vertices, as shown in Figure 3 and the following Table 1.

Table 1 – Surveying book.

Station	Points target	HD (m)	Angle
I	v1	20,0	30º00'00"
	v2	5,0	50º00'00"
	v3	25,0	80º00'00"
	d1	15,0	40º00'00"
	d2	19,0	30º00'00"

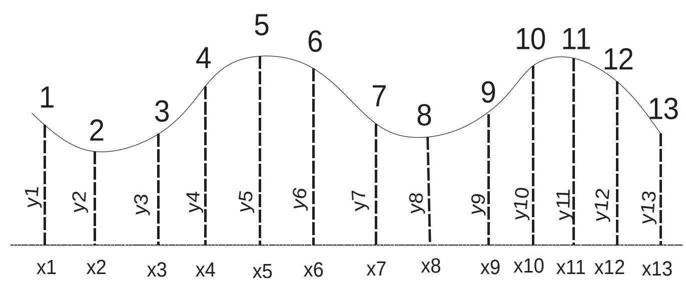
Figure 3 - Methods Traverse and Irradiation used together.



1.3. Orderly method

It is a method used to survey curved alignments as well as auxiliary method of traversal or poligonação . It consists in tracing an auxiliary alignment and from this are raised so ordered as necessary to represent the alignment of interest (Figure 4) . Each point has a value x and y value. Points 1 to 13 of example, are obtained from distances (x) in aid alignment and distances (y) measured from lines perpendicular to the same auxiliary alignment.

Figure 4- Orderly method.



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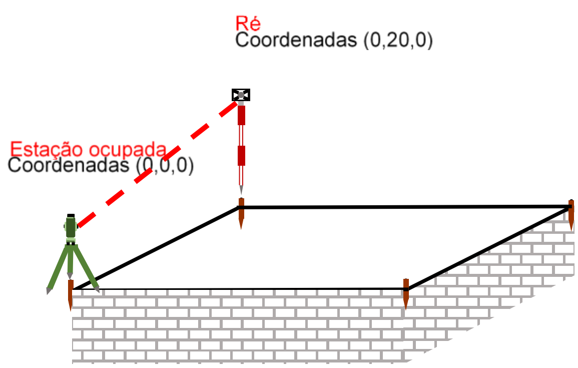
1.4. Intersection

The method of intersection or bipolar coordinates, also can only be used for small areas. It is the only method that can be used when some vertices are inaccessible area , such as in the case of very steep points or existence of a bog. In this method, a baseline is defined with known length from points 2 , distant at least 50 meters from each other , and by installing the instrument each for obtaining the values of the angles α and β . In this way it can be determined the location of the point inaccessible C and calculated the distances from A and B to point C inaccessible by law of sines.

1.5. Coordinate

The survey by coordinates is to create a Cartesian plane, assigning at least two support points with known coordinates. In one of these points settles the instrument and the other puts up the baton to make the mooring by a reference to the instrument. The survey by coordinates is widely used by surveyors working with Total Station (Figure 5).

Figure 5 – Coordinate surveying.



2. Leasing surveying planimetric

The planimetric lease is the reverse process to the survey . It is characterized by a more lengthy and costly procedure. To perform the lease is first necessary to survey, then make the graphical representation of terrain in scale, modify the information collected projecting your changes in plants and only thus making the lease

3. Surveying Distances

Distances are fundamental linear elements to the topography as to characterize land need to geometric figures formed by distances and angles. The main distances that occur in topography are: horizontal distance (HD), vertical distance (DV), slope distance (DI) and natural distance from the ground (Dnatural).

The horizontal distance (HD) is a distance between two points on a horizontal plane (perpendicular to the zenith-nadir axis). It can also be called the reduced distance or distance useful to the topography. It is considered useful because it can be developed from most uses and interests of society at the level of property, such as building houses. This is the case of land with steep slopes and where it wants to build a house. Of course the house will not be built into the slope. You have to make a cut on the ground for the construction of the house. Then, it is concluded that the slope distance is not used, the low or horizontal distance that will be used for this purpose. The same applies to various uses, such as planting trees, ponds for fish farming, rice cultivation, animal husbandry, among others.

The vertical distance (DV) is the distance perpendicular to the horizontal distance , or parallel - nadir to the zenith axis. As vertical distances have a level difference , and elevation coordinate points on the ground.

The slope distance (DI) is the straight line distance between two points in the DH and DV are different from zero.

Natural ground distance (Dnatural) is the distance course runs along the surface of the ground.

3.1. Accuracy

The surveying comes over time having quite amazing results as the precision and accuracy in

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obtaining measurements. Before the metric errors were considered tolerable, already today are the millimetric for distances and angles seconds. Thus, there are two important concepts in search of improving this improvement, namely: accuracy (accuracy) and accuracy. The accuracy is obtained when several measurements are carried out which result in very close values to each other. Indeed, it can be said that accuracy is relative, for comparing a difference of measured values between themselves, may or may not be close to the real value. The closer the values obtained, the greater the accuracy. Already the accuracy (accuracy) is related to the proximity of the values of a measure with respect to the real value of this measure. Thus, the closer the values are the real value of a measure, the greater the accuracy.

So, it may be noted that the two ways of speaking are different and independent. The degree of precision / accuracy will vary the applied methodology, tools, time and operator. In fact, for more modern than are the instruments and measurement methods, and more repetitions that may be in obtaining values of a measure, you never know for sure what the real value of the measured quantity.

3.2 Types of Measurements

The measurements are divided into: estimates for direct and indirect.

3.2.1. Visual estimation

Visual estimation is a type of measurement with little accuracy and that the decrease or increase in accuracy will depend on the visual acuity of the measurer, such as surveyor, especially the experience he has. This estimate is to make an initial work to be aware of the size of an area for example, but after a preliminary examination will have to use procedures required of direct / indirect measurement.

3.2.2. Direct measurement

Direct measurements occur when they are made without the use of mathematical functions to obtain a certain extent, for example: average pitch, tape, pedometer, and other less common.

The odometer is a tool bit used in the topography, making the measurement of a length by counting the number of turns provided by a wheel multiplied by the length of the perimeter odometer. This instrument will go the way according to the conformity of the ground. To obtain horizontal and vertical distances on slopes, bumpy, winding, the measuring instrument will not be as efficient, we can reach extremely large errors not go, in this case, the horizontal or vertical distance desired.

Average pace is a type of measurement in which the surveyor calculates that the average value of its past under normal conditions. To obtain the value of the middle step, is placed an alignment of 100 m, where the professional will the amount of steps that will at that distance and using the distance traveled formula / number of steps = average step (PM), will come to know which the value of your average step. For example, if it performs steps 200 to 100 m, its average pitch is 0.5 m. This procedure should be performed at least three times, where the surveyor should walk in alignment, far from psychological conditions affecting the distortion between one step and another.

Another type of procedure to obtain the distances of direct way is using the tape measure.

3.2.3. Indirect measurements

Indirect measurements are those that require the use of mathematical functions to obtain the

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distances. They are divided into electronic and taqueométrica (Stadia).

Electronic indirect measurements are performed by instruments that use laser to take measurements. The distance is calculated from the time that the laser takes out the equipment and achieve the prism or object. The most common tools for obtaining indirectly distances are EDM electronic (disused), electronic measuring tape and Total Station.

The tacheometry or estadimetria is a type of indirect measurement that has as principle the horizontal distance from one point to another using an instrument (theodolite and spyglass level) and the accessory sights speaker through the relationship between the readings of the stadia lines and the instrument constant values.

The equipment involved for tacheometry are: theodolite, mira speaker and tripod or level telescope, sighting-in speaker and tripod. The stadia lines used for these procedures are the upper wire and the lower wire. These wires are parallel to each other and equidistant from the medium also called thread or wire flattener.

4. Angles

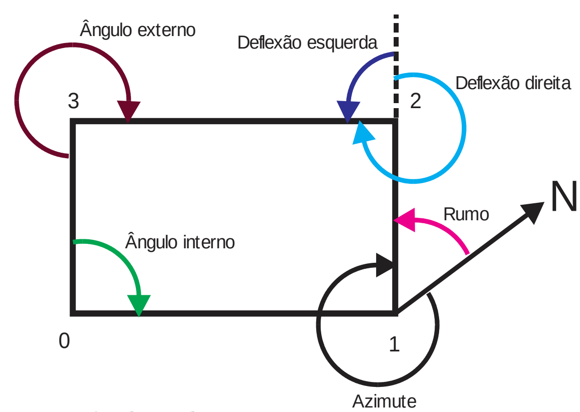
The surveying is a science that is based on trigonometry and geometry. So she constantly uses geometric elements angles and distances. It is important to a detailed study of the methods and tools used to obtain angles and distances. The branch of Topography that studies the use of angles is called Goniology.

The opening angle is an invariant property and is measured in radians or degrees . The instrument most used for reading angles in topography is called a goniometer, and have the stadia lines is called theodolite. These instruments have the same purpose of the protractor when used in a figure on paper.

4.1. Surveying Horizontal angles

In the horizontal plane , which is perpendicular to the zenith - nadir axis , the horizontal angle is measured from a topographical point of a polygon determined in accordance with the method to be employed , aimed at obtaining the angle between two alignments considered . It is measured between the projections of two local alignments to be raised / leased, designed in the topographical surface. Depending on the origin and the directions used for reading the topographical horizontal angles may be direct , which in turn are divided into internal and external ; deflections , which is divided into left and right and guidance that is subdivided into azimuth and direction (Figure 6).

Figure 6 – Types of horizontal angles.



4.2. Vertical angles

In the vertical plane which is parallel to the zenith - nadir axis , the vertical angles are those read from a source selected by the surveyor, to measure this angle in a certain place . According to the beginning of your score, they are called vertical angles , tilt and nadiral (Figure 7).

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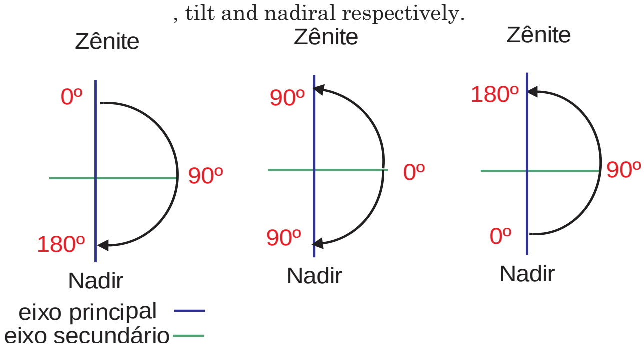
Figure 7 - On the left, center and right , schemes of zenith angles , tilt and nadiral respectively.



The zenith vertical angles are those that the beginning of your score is in Zenith 0 °, above the instrument following the direction of gravity, and goes to the nadir 180 , through the instrument of the center toward the center of the Earth following the line of gravity. Most theodolites, using the zenith angle as its vertical angle to prevent the same extent in different directions , for example, can be 46 and 46 for the slope to the slope in a vertical tilt angle. In the vertical zenith angle the same situation with the measures will be 46 and 136.

The vertical angles of inclination are those that have their start counting the horizontal plane 0º and go to the Zenith (90) and to the Nadir (90), assuming positive values in the first case and negative in the second.

The nadiral vertical angles are those that have their origin in Nadir 0º and go to the Zenith 180.

5. Plant Orientation

Plant orientation is a branch of the surveying for determining the exact position of a polygonal or topographic alignment on the Earth's surface, from magnetic or true north. Historically speaking, the word orientation, or be guided, search derives from the direction of the East (Japan), where the sun rises. The people of the East were considered very promising and developed, being considered at the time a reference to the other peoples of the earth, so to refer to a 'guidance' is took as a reference point the eastern part of the globe.

It is quite common to mix the term orientation (position) and location of land. The word orientation (position) is related to a direction of an alignment / polygonal based in the north, south, east, west, northeast, southeast, southwest and northwest, while location is related where is a certain alignment vertex / polygonal regarding the globe through coordinated mainly UTM and geographic.

True North (NV), also known as geographic north (NG) is a plane passing through a given point on Earth's surface perpendicular to the plane of the equator. Magnetic North (NM) is plane passing through a point on the earth's surface following the direction of the compass needle at a given moment. While magnetic declination is the horizontal angle between the planes of the magnetic and geographic north. Depending on the location of the point on earth and the time of your reading, this declination can be Western, when the NM is left of the north. May be East when MN is to the right of the geographical and also may be zero or coincident, when the magnetic north coincide with the geographical.

True north is unchanging over time , but the magnetic north is dynamic . The magnetic north varies from season to season , increasing its angle relative to true north at 10 ' per year , reaching 25 in relation to true north, then it starts to go back the other way to get to 25 in another direction. This dynamic is due to the large amount of iron that is in the top center of the Earth, where this iron is always in motion causing this change in magnetic declination. Therefore form the isogonic and isoporics lines. The isogonic are imaginary lines connecting the Earth surface points in the same time

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have the same magnetic declination . While Isoporics lines are imaginary lines joining points of the earth surface having the same annual variation of magnetic declination.

5.1. Orientation angles

Azimuth is the horizontal angle of orientation, which has its origin always in true or magnetic north to the alignment of the polygon in question , ranging from 0º to 360º . If the north used is the geographic , the result is a geographical azimuth ; if the magnetic north will result in a magnetic azimuth. A polygonal shaped like a rectangle for example, there may be four alignments counterclockwise direction (0-1 ; 1-2; 2-3 and 3-0) as well as four alignments clockwise (0-3 ; 3-2 ; 2-1 and 1 : 0).

The Rumo is the smallest horizontal angle, orientation, formed by magnetic north orientation, geographic north or south magnetic geographic south to the alignment of the polygon in question. If if the north / south is geographic, the result will be a geographic direction and if the north / south is magnetic, the result is a magnetic heading. This orientation angle has its origin in the north or south (which is closer to the alignment in question) to the alignment clockwise or counter-clockwise, which is closer alignment, ranging from 0º to 90º.

For vary from 0º to 90º, there may be, for example, 4 to 45 directions from several different directions. Therefore, all directions must inform the side points, NE, SE, SO and NO. Thus, we have: 45 NE, 45 SE, 45 SO and 45 NO, where Directions may vary from 0 ° to 90 ° (NE), 0 ° to 90 ° (SE), 0 ° to 90 ° (SO), 0 ° to 90 ° (NO) (figures 37 and 38). A polygon such as a rectangle, there may be four alignments counterclockwise direction (0-1; 1-2; 2-3 and 3-0), as well as four alignments clockwise (0-3; 3 2; 2-1 to 1; 0).

6. Scale

It is the result of the relationship between the sizes of real objects and their graphical representations , keeping its proportionality. To be studied , changed, included and excluded , the objects need to be represented on paper or scanned using software on a certain scale. large objects need to be reduced , it would be impractical or impossible to work with a graphical representation of the same size , while small objects should be expanded because of the difficulty of being worked with the original size.

Conditions so that the scale is applied correctly

a) The relationship between all sides of the corresponding real object and its graphical representations must be the same reason.

In Figure 26 the relationship between the ratios of the sides of the real object and its graphical representation are equal. Their range is equal to 1/1000 , as to one (1) graphic part correspond 1000 shares the real.

5.1. Scale Representation

The scales may be represented numerically in two ways:

a) 1/300; 1/5000

b) 1: 300; 1: 5000

5.2 life-size ratio of the object x graphical representation

As for the size of the actual object and its graphic representation, the scales are divided into: natural, enlargement and reduction. The full scale is one in which both the actual size of the object (D) as a plot (d) have the same sizes, for example, D = 15 cm, d = 15 cm, where D / d = 1, that is, scale 1: 1. The reduction ratio is one in which the actual size of the object (D) is greater than its graphical representation (d), for example, D = 1500 cm, d = 15 cm, where D / d = 100, namely, scale of 1: 100. The

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magnification scale is one in which the actual size of the object (D) is less than its graphical representation (d), for example, D = 12 mm, d = 1200 cm, wherein D / d = 0.01 or is, ratio of 100: 1.

5.3. Relationship Map, Letter and Plant

The difference between the map, chart plant and will vary according to the size of the scale, and, consequently, with detail levels. The plants are characterized by scales larger than 1: 10000 (between 1: 1 and 1: 10,000), which show details of objects in a smaller area covering interest. While the cards are characterized by scales between 1: 10,000 and 1: 500,000, having minor details and covering an area greater than the plants. Already maps have scales smaller than 1: 500,000, covering minor details and area larger than the cards. Remembering that for the concept Topography larger and smaller according to the ratio of the scale, and not in relation to the denominator of the ratio or magnitude of the scale. So 1: 100 (0.01) is greater than 1: 10,000 (0.0001).

5.4 Types of scales

The scales are divided as to type in numerical and graphical.

5.4.1. Numerical scale

The numerical scale provides the relationship between the actual size of an object and the corresponding size of its graphic representation in the form of reason. It consists of the module (M) is equivalent to how many times the actual size of the object is greater than its graphical representation (downscaling) or the graphical representation is larger than the actual size of the object (scale-up). scale-up: E = M: 1; Reduction scale: E = 1: M The formula of scale can be in module function being equal to the ratio of the actual size of the object and its graphical representation. M = D / d.

5.4.2 . Graphic scale

The graphic scale is formed by a split line or bar in equal parts , black and white , each of which represents the ratio of the size occurred in the field and its graphic representation from the numerical scale. This type of scale, makes it easy to understand the dimensions of the objects in the plant / chart / map. The use of graphic scale has an advantage over the use of numerical , it can plant / chart / map is reduced or enlarged through xerographic and photographic methods , being able to always know the document scale with which you are working . Also there may be swelling of the paper depending on age and temperature.

5.4.3. Paper Size x choice of scale

A very important point is the choice of the shape or size of paper to be used for the design of the plant as it will depend on the scale and size of the raised area. In the market there are several options. So you should check if the design will fit properly on the paper and may be smaller or larger than the paper, as shown in Figure 31. Figure 31 - On the left and in the middle there was poor planning on choosing paper. On the right there was good planning. For the representation of a given area will have to be taken into account maximum X and Y dimensions of the real area, and the X and Y dimensions of the paper. Thus, when applying the relationship M = D / d, have will be as a result two scales, one for each axis. The scale chosen to best represent the area in question and the role should be one of largest module, because it is used to lower module will not fit in the drawing on paper. In the end, if it has not found an ideal scale (1:10, 1:20, 1:25, 1:30, 1:50, 1: 75 and its multiples) the scale rounding to the highest value.

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