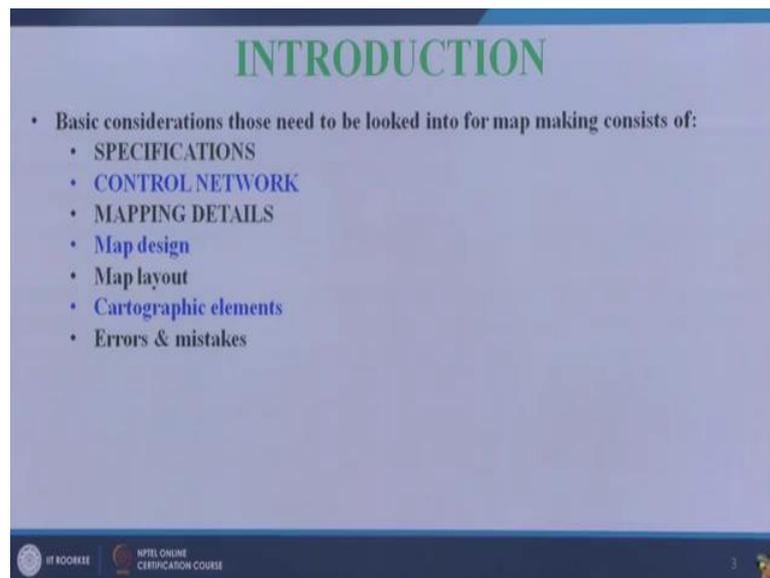


Digital Land Surveying
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Lecture – 32
Mapping Basics

Welcome students this is the thirty second class on digital land surveying and mapping, today in this class I am going to discuss on some basics for mapping. So, actually what happens before we prepare the map or during the preparation of the map, we need to concentrate on some basic points to produce the map of desired quality; now and the basic considerations which we in like to or we need to consider during or before preparation of the map are these.

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Some of these are like these specifications; we should first have the specifications which our map has to satisfy. So, this is required before actually we start surveying work.

So, before we start to surveying work we need to know what specification our map is going to satisfy and based on that actually whole of surveying work we will depend and methodology depends, two months selection will be depend, and then we will get the data and once we get the data we need to test those data to see whether it is though meeting the requirements of specifications or not. Once it satisfied the need for measurement specification then we go for preparation of map and also after preparing the

map we should go for the testing of the prepared map as per the specification whether the map is satisfied or not. So, specification for map we should know and we should strictly follow that. So, Refer Time: 00:00) I will talk more on it next point is that control network; actually from the name itself we can understand that we need to have some control point, all throughout our survey work as well as control points are required during the preparation of the map or to prepare on the map to depict different objects of features, planimetric as well as our height like contours.

So, I will talk on control network and mapping details. So, the sole purpose of mapping is to provide the different types of objects or features or some specific type of need, and those details we have to know really how to collect and how to what are those and how to present that thing. So, I will talk under mapping details then after (Refer Time: 03:34) all these things we should go for some design elements of the map.

So, that I will discuss under the map design where is the design is done then we should really actually we need go we should lay out, how we will like to help our map as per the page and for that we have to need some do some considerations that we will discuss I will discuss under map layout. Now once the map is prepared or during the preparation of the map or sometimes before we prepare the map, some elements had to be embossed in the map and those elements we need to know what are those elements and that we have to I will discuss on it and finally, before and after and during map preparation we need to know what are the different types of error that may arise of that arises and what are different types of mistakes we do, and that I will discuss on this under this set errors and mistakes in mapping.

Now, let me start with the specification now all you need specification for map. As we need the specification for all engineering product also map is a engineering product, it is a product of engineering surveying. So, map should also have some specification because through this specification only we will be able to maintain the standard really what we are looking for. Another thing is that the purpose of specification for a map is that the user will have some basic quality of the about the protect the interest of the consumer or the user of the map.

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MAPPING SPECIFICATIONS

- Specification for a map is required to :
 - 1.provide a set of uniform standards for guiding the production of maps
 - 2.Protect consumers of map
- Specification for a map is to defined in terms of some accuracy measure.
- Accuracy of a map may be specified in terms of coordinates of points, ground distances and elevations at the 95% confidence level.
- Standard involves checking a set of at least 20 well-defined points against information obtained from an independent source of higher accuracy.
- RMS errors are computed and converted to 95% confidence level, by using a multiplier of 1.96
- Map should contain a statement with the level of pass both for horizontal and vertical accuracy in its legend box.
- At least 90% of all contours should be correct within one half the specified C.I.

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So, where these backgrounds with specifications are required for a map, and actually the specification of a map is defined some though some accuracy parameters or accuracy measures. Now the accuracy measures which is used for our map is the 90 percent confidence level.

Now, we know that in map we do have the coordinates of the point; we have the distance between points and the height of the points. These are the basic parameters really points ground distance elevations, these are the basic elements which we will try to represent in a map and so we should make a accuracy measure on these elements and that accuracy measure is that the it should be have the 90 percent confidence level. Already I have discussed about this confidence level and accuracy in our previous classes. So, those concepts we have to borrow and to apply to find out the accuracy of the map elements which are the coordinates of points ground distance elevations.

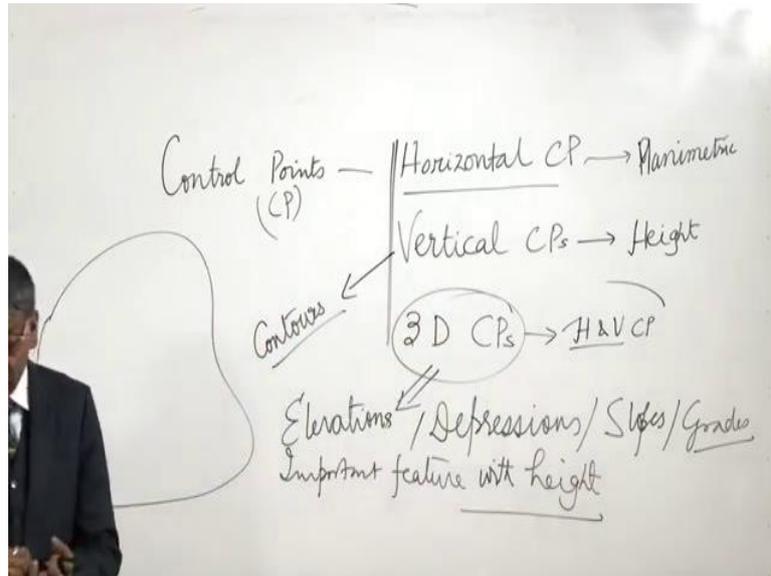
Now, to apply the 90 percent confidence level what we need to do? We have to take a set up at least 20 well defined points or ground distance or elevations, and those for those points or lines or elevations we must have the same parameter measured using some instrument which heavy accuracy than the instruments or a measurement methods we have adopted in finding out those parameters for this particular survey. And then from the existing value of the parameters which has been derived from some high better accuracy or better method of measurement, we have to find out the values mean square

error. So, already we have discussed what is root mean square in our previous class. So, the root mean square errors get computed and converted to 90 percent confidence level, and then then we should see whether the ah those 20 or more than 20 samples are satisfying the criteria of our accuracy or not.

Now, if it is not then we have to go for this is the corrective measures like within carrying out the surveying again to get the measurements to do the thing all thought out; otherwise if it may satisfy then we will be able to write we have to give a comment on the map that these map satisfied the 95 percent level having this much of accuracy. So, that type of note we should keep in at the end of the table in a map. So, the map should contain a statement with the level of pass both for horizontal and vertical accuracy in its listen box. So, listen box should have another statement which shows the level of pass; now all these is they do whatever I had discussed due to planimetric position and also we know that in case of our map there is another important parameter which represents the height; that means, and that is by through contours and we should test and we should find that at least 90 percent of the contour should be correct within half of the specified contour interval.

So, this is also important that 90 percent of the contours that is available within a map should be correct within half of the specified contour level. So, when I discussed about the contours, I have already discuss that the half of the contour interval is considered to be the standard deviation and standard error of the contours. So, we may allow up to that error and for 90 percent of the contours. So, this is what is about the a specification for mapping, the next criteria which is important which are the for mapping is the control network. So, as you know control network are the network of points whose position is already being defined and that can be used as the base for all other measurements or all other work.

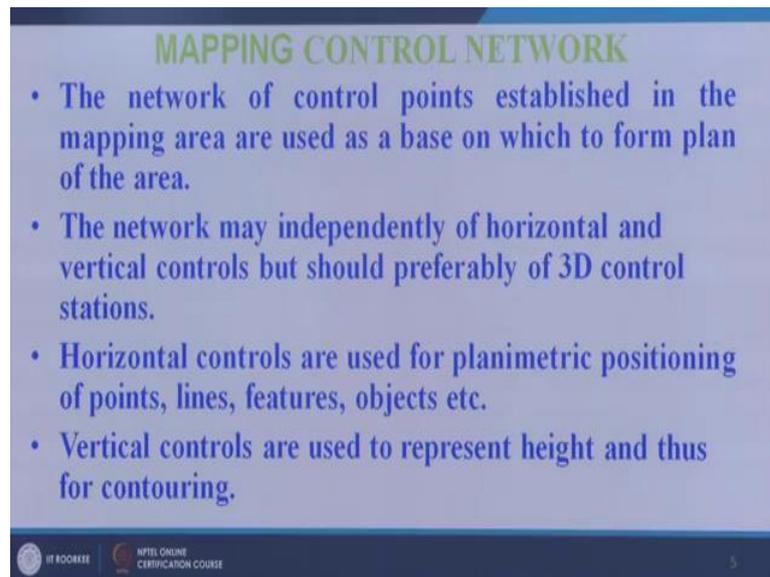
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Now, there may be two types of control points: one is called horizontal control point another is called vertical control point. Control points may be may be horizontal control points or vertical control; points vertical control points or and nowadays one more widely available that is the 3-D control points, which is both which can be considered as both horizontal and vertical control points. Now the horizontal control points are for planimetric for planimetric positioning, planimetric work like our planimetric coordinate x y or it may be the horizontal distance, and vertical control point is for height and when we at the 3-D control point these control points may be use both for planimetric positioning as well as height.

Now these control points are very important in surviving already we have learned it, also it is very important for mapping purpose because whole of the mapping starts from these control points. And whenever we go for the mapping work we do first setup or we do first draw the control points with the and we prepare the base map on control point with control points, and on those base map actually whole of the other verity of other work of mapping continues. So, control points are very important and that has to be Refer Time: 12:23) or accurately noted down in the map. And also control points are huge for our Refer Time: 12:44) drawing the contours, vertical control points are used for contours.

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MAPPING CONTROL NETWORK

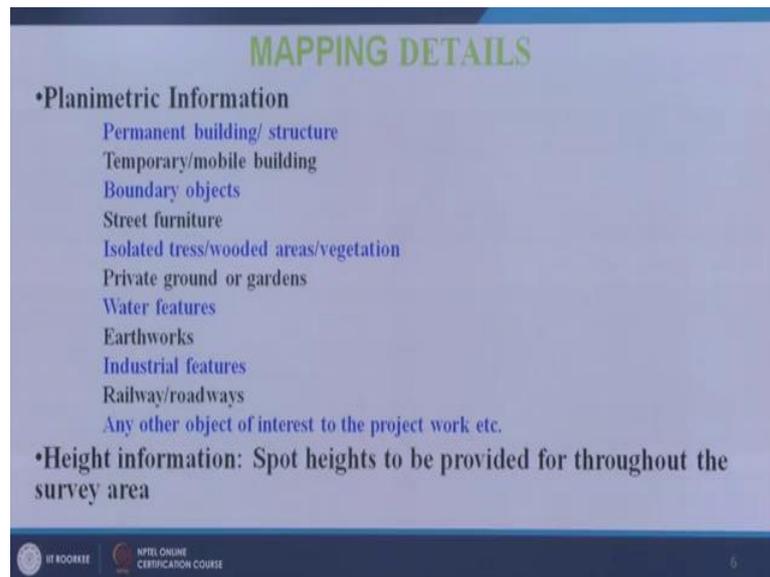
- The network of control points established in the mapping area are used as a base on which to form plan of the area.
- The network may independently of horizontal and vertical controls but should preferably of 3D control stations.
- Horizontal controls are used for planimetric positioning of points, lines, features, objects etc.
- Vertical controls are used to represent height and thus for contouring.

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So, contours next the point which is important about the details, mapping details actually on the surface of the earth in the last class already we have told that there are 100s of objects are available, and there are so many objects are available that it is possible also it is not advisable to take care of each and every object that is present on the surface of that, neither it is possible because earth is a very big and our map is a very small. So, all the element that is available in a big earth surface cannot be accommodated in a small map.

So, all us we need to know what are the objects to be picked up and to be represented in the map, and already we had learn in the last class that we have to apply the method of generalization of the method of generalization to identify which are the objects to be taken for our mapping purpose and which are to be left out.

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So, most of the thing most of the play time in case of civil engineering projects or in civil engineering works or engineering topographic map, we should have this minimum objects to be noted down like permanent building or structures temporary or mobile building; boundary of objects like our boundary of our houses or there may be some boundary of some area or some built up area or something like that and street furniture's then therefore, there may be different type of trees or wooded areas or vegetation those has to be marked in our map. Now then private ground or gardens if it is available that has to be noted down in our map then water features; that means, there may be pond there may be river there may be other drainage system.

So, all those all thing has to be noted down then the earth work, earth work is another important; that means, sometimes somewhere the earth may be cutted cut down or sometimes there may be (Refer Time: 15:19) of earth. So, earth thing is to be noted down industrial features. So, industry may come up somewhere and the extent of industry, the area of industry, the boundary of the industry, the type of industry like that so many important features of parameters will come up along with the industry and is goes. So, those thing we have to note down (Refer Time: 15:47) relay, cannels like those linear objects which are of very important for engineering works as an engineering work has to be noted down, and over and above every project or every surveying will have some objective; depending on the objective we will be need to know what are the objects which are important for that particular project. And according to that we have to pick up

all those important objects in our map, like if we want to study the ground water resource.

So, in that case we will be need to invariably have the water bodies, along with that which is mentioned here along with that we have to go for all the location of the hand pumps or there may be wells then there may be any water flow. So, all those important information's we have to pick up and we have to represent in the map. Similar to that every surveying work we will be for some particular purpose may be for particular purpose maybe one or two or three. So, for all those purposes whatever is the important objects that has to be picked up and shown in our map, and planimetric information has to include those. Apart from the planimetric information we must have the spot levels of sufficient number of points, which will be spread all throughout the project area. Not only the spot heights of all for the project area, but also we have to pick up the spot heights of important elevations depressions, elevations depressions there is change in slope slopes grade any important feature associated with important feature associated with height.

So, spot heights should be overly spread not only that also the important locations where the elevation is suddenly high or top of the hill form the you like that some depressions. So, the best point of the depression then if there is a change in slope or there is slope or change in slope or slope, or then there is a grading's and any other important features (Refer Time: 18:42) it is height. So, of our all those points along with some normal points we should have the spot heights while is spread throughout the whole area. So, that those spots heights as I already discussed in the class of contour that spotlights are the required for drawing the contours, and we will be need of lot of spot has to develop the contours.

So, we have to take care of that during detailing of maps, and we have to accordingly plot it in the map.

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MAPPING DETAILS

Conventional symbols

- Field objects and features are depicted on a map using conventional symbols.
- A set of conventional signs for the topographical map of India has been proposed by the Survey of India. These are considered as standard In India.

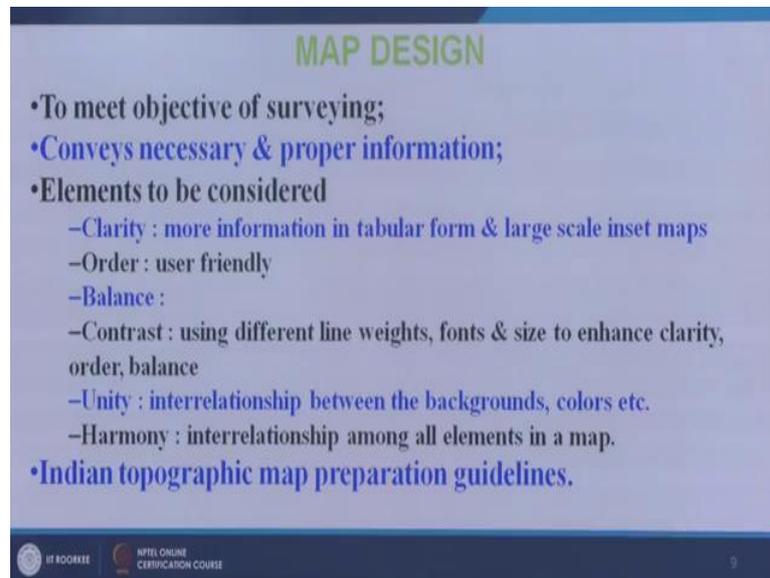
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Now, the we so many objects that has to be noted down in the map; now to actually represent the objects we do make use of some standard symbols. So, standard symbols and lines will be used to represent the salient objects that will be available that the present on the surface of the earth. So, we need to know really what is the particular symbol for particular object or what is the particular way a line has to be drawn for a particular linear feature. Now of all over the in the world if for each country they have their own standard, list of symbols and lines which represents the particular cultural details of the area. Similar to that India is also having its one set of symbols as well as linear representation and the survey of India provides that list.

Now whenever we will go for mapping and we will go for planimetric positioning of objects or feature on the surface of the earth, that has to be represented through the list of symbols that has been given by the survey of India. Now here is a small list if list I had just to have a feeling that if we want to represent temple, it we have to use the symbol like this.

So, to design we have to take into consideration these two points, and then in designing in getting this thing we can achieve by taking these five criteria that mean six criteria; that means, the map should be having a very good clarity.

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MAP DESIGN

- To meet objective of surveying;
- Conveys necessary & proper information;
- Elements to be considered
 - Clarity : more information in tabular form & large scale inset maps
 - Order : user friendly
 - Balance :
 - Contrast : using different line weights, fonts & size to enhance clarity, order, balance
 - Unity : interrelationship between the backgrounds, colors etc.
 - Harmony : interrelationship among all elements in a map.
- Indian topographic map preparation guidelines.

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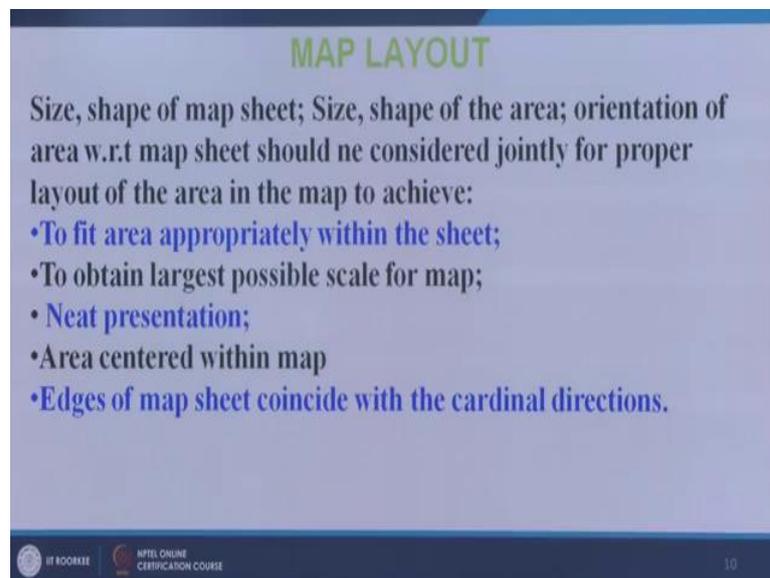
Then it must be in a order properly ordered, it must be balanced that have we master a contrast, unity and harmony these are the six basic criteria which a map if satisfies then we should design keeping into mind these six criteria. Now clarity from the name itself; so you can understand that the map ultimately should be very much clear to for the user to understand or (Refer Time: 24:06) and sometimes we may find that we are in need to provide more information than really it can depict; in that case we have to make use of some table where we will be you need to give an inset design of some portion of the map which will be in larger a scale.

So, in that way we can do increase the clarity as well as we can provide the more information. The map content should be in proper order; that means, it should be user friendly it must be balance; that means, there should not be a some portion of the map should not be more dominant than others, and it should be well balanced so that the user feel comfortable in making use of the all part of the map equally with equal each, then we must use some contrasting formation like we may use different line weights like in for example, in case of contours every fifth contour we do make a bit more.

Now, prominent, but increases that clarity in come to reading like we can change the size of the fonts or the nature of the fonts, and these all these we will do to enhance clarity order and balance. Then the unity interrelationship between the background and colour should be there, harmony interrelationship among the different elements in the map which we have discussed should be there. Now the there are some guidelines actually within each country for the preparation of the topographic map there are some guidelines, also Indian topography map guidelines are there if we follow those guidelines temporarily our design will be good; then after designing we should think up the how to lay our area in the map.

Now, for that we need to know the shape, size as well as orientation of the land, as well as shape size and orientation of the paper; and then we have to correlate between all these to a find out what will be the best way to place our map our area in the presents in the middle of the map, and the area feeds into the sheet and the scale of the map should be as well as possible.

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MAP LAYOUT

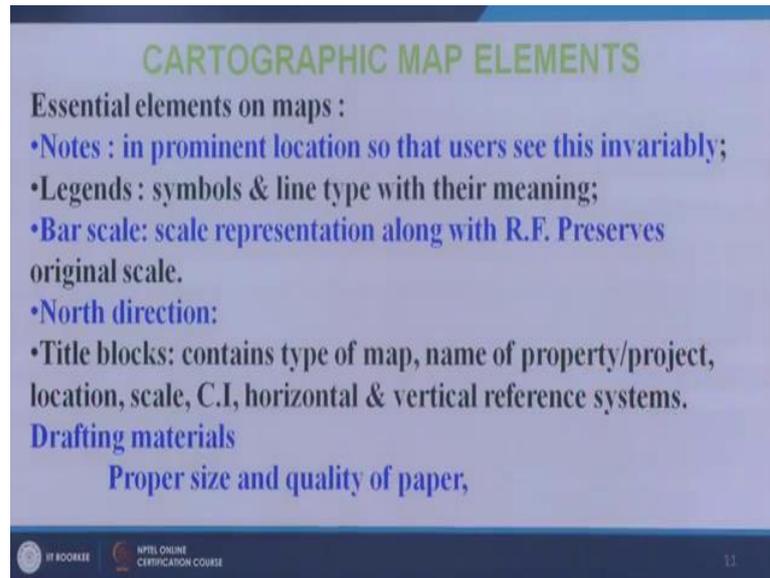
Size, shape of map sheet; Size, shape of the area; orientation of area w.r.t map sheet should ne considered jointly for proper layout of the area in the map to achieve:

- To fit area appropriately within the sheet;
- To obtain largest possible scale for map;
- Neat presentation;
- Area centered within map
- Edges of map sheet coincide with the cardinal directions.

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And the presentation should be neat, and edges of the map concern with the cardinal direction. So, these are the criteria we should try to follow, let while we will try to lay the map out outer in the sheet. And then before or also during or after the preparation of the map we need to look for some elements to be present in the map like we must have notes.

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So, at the end of the preparation of the map we may need to provide some prominent note or some important note to the user of the map, and that has to be given and that is generally made near the prominent location; that means, like listen box. Listen box is one of the prominent place where we can place the note, then listens actually symbols and the colours all these proper some particular meaning, but really what is the meaning of the symbol many times user do not remember. So, there should be a listen box where we will provide the symbols or the lines along with their proper meaning that is called listen box that has to be present in the map and that is to become the after the map has been prepared bar is scale; that means, the most important thing in a map is the scale that we have discussed in the last class, and in case of map it is better to have at least bar scales or graphical presentation of the scale.

Already we are discussed in the last class along with the representative fraction north direction has to be noted down, and this north direction preferably should be true north. Then the map should also have the title block, title block must contain the type of map name of the property or project location, scale contour interval horizontal and vertical reference system etcetera. So, these are the carto graphic elements especially listens, bar scales north direction title block and also notes which has to be present in the map and finally, we should take care about the drafting material like the size and quality of the paper.

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ERRORS AND MISTAKES

- Sources of errors in mapping are
Data used for mapping, Scale , Grids, Non-use of proper drafting software and materials
- Mistakes in mapping are
Inappropriate scale & CI, omitting important notes, inadequate trained personnel etc

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So, and also during the preparation as well as before preparation we should keep it in mind that there may be a large source of errors in the mapping like there may be error in the data used, the scale which we are using that may not be appropriate one. So, we have to take care that grids actually we do prepare grids before laying the parametric position.

So, we should take care that the grid should be made highly accurately, and sometimes there may be errors in non-use of proper drafting material and software. So, before we start mapping we should always ensure that we are making use of the proper software drafting software as well as proper material. And also there are some scope from mistakes in carrying out the mapping, that is sometimes we may not be (Refer Time: 30:35) up to use appropriate scale. So, if our scale or contour interval is not appropriate then there will be a lot of mistake and there may be we may sometimes omit important notes, or the person who will prepare the map may not be adequately trained. So, these mistakes we should try to avoid and we should avoid so that we can end up with a good map; with this I like to conclude today's class and in the next class I will like to discuss on computer software's which may be useful for mapping purpose. So, mapping software I will like to discuss in the next class.

Thank you.