



Basic Concept of Topographical Maps by S. Manna, Department of Geography, Narajole Raj College

Topographic Map:

- Map characterized by large-scale detail and quantitative representation of relief, usually using contour lines
- Traditional definitions require a topographic map to show both natural and man-made features
- A topographic map is typically published as a map series, made up of two or more map sheets that combine to form the whole map.

Need & scope:

- Topographic surveys were prepared by the military to assist in planning for battle and for defensive emplacements. As such, elevation information was of vital importance.

As they evolved, topographic map series became a national resource in modern nations in planning infrastructure and resource exploitation.

- By the 1980s, databases of coordinates that could be used on computers by moderately skilled end users to view or print maps with arbitrary contents, coverage and scale. (Google Terrain Maps [non satellite image])

Uses of topographic maps:

Topographic maps have multiple uses in the present day: any type of geographic planning or large-scale architecture; earth sciences and many other geographic disciplines; mining and other earth-based endeavour's; and recreational uses such as hiking or, in particular, orienteering, which uses highly detailed maps in its standard requirements.

Topomap conventions:

- The various features are represented by conventional signs or symbols. These signs are usually explained in the margin of the map, or on a separately published characteristic sheet.
- conventionally show topography, or land contours, by means of contour lines.
- These maps usually show not only the contours, but also any significant streams or other bodies of water, forest cover, built-up areas or individual buildings (depending on scale), and other features and points of interest.
- Today, topographic maps are prepared using photogrammetric interpretation of aerial photography, LIDAR and other Remote sensing techniques. Older topographic maps were prepared using traditional surveying instruments.

Information is available on different parts of a toposheet:



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Sheet No. (index)

Representing States

Representing Districts

Latitude

Longitude

Legend

Graphical layout of sheet (index to sheet)

Map Scale

District extent outline

Legend

Toposheet Header (left):

Type: RESTRICTED

- District: Kangra GURDASPUR &....
- Surveyed: 1967-69
- State: Himachal Pradesh ...
- Region: Pathankot (can you read the word??)
- Lat/Lon Degree: 32 / 75 (see top left of sheet)
- Minutes: 15 horizontal 30 vertical then 35

Toposheet Header (right):

No. 43P/12 (12th sheet) of series 43

- Magnetic Variation: True north (geodetic north) is the direction along the earth's surface towards the geographic North Pole. Magnetic variation is the angle between magnetic north (the direction the north end of a compass needle points) and true north.



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Forests & Contours:

- Green forests SALOTH PF (protected forest)
- Contour Lines: Some brown lines with numbers 3200 3212 3480

Contour Line:

- A contour line is a combination of two line segments that connect but do not intersect; these represent elevation on a topographic map.
- Technically, it's a line of a function of two variables or is a curve along which the function has a constant value.
- In cartography, a contour line (often just called a "contour") joins points of equal elevation (height) above a given level, such as mean sea level.

Index to sheets:

- Since toposheets are series of maps, index tells who are the neighbors of present sheet (current sheet will be highlighted)
- Administrative index indicates bird's eye view of administrative regions covered

Map Series – map published over several sheets:

- A map series is a group of topographic maps usually having the same scale and cartographic specifications, and with each sheet appropriately identified by its publisher as belonging to the same series.
- Map series occur when an area is to be covered by a map that, due to its scale, must be spread over several sheets.
- The individual sheets of a map series can also be used quite independently, as they generally have full map surround details and legends.

Map series:

- It is technically very difficult, and it would be highly impractical, to print
- the National Map of Switzerland on a single sheet at a scale of 1:25,000 (that particular map would be about 9 metres (30 ft) high and 14 metres (46 ft) wide).



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- For that reason, map series are issued and preserved in loose-leaf form.
- In extreme cases, a map series can include thousands of sheets.
- Probably the greatest map series ever created is the 1:25,000 topographic map of the Soviet Union, with about 300,000 sheets, completed in 1987.

Survey of India:

- The Survey of India is India's central engineering agency in charge of mapping and surveying.
- Set up in 1767 to help consolidate the territories of the British East India Company
- It is one of the oldest Engineering Departments of the Government of India.
- The Survey of India's distinguished history includes the handling of the mammoth Great Trigonometric Survey under William Lambton and George Everest.

Great Trigonometric Survey:

- A project of the Survey of India throughout most of the 19th century. It was piloted in its initial stages by William Lambton, and later by George Everest.
- Among the many accomplishments of the Survey were the demarcation of the British territories in India and the measurement of the height of the Himalayan giants: Everest, K2, and Kanchenjunga.
- The Great Trigonometrical Survey of India started on 10 April 1802 with the measurement of a baseline near Madras.
- The East India Company thought that this project would take about 5 years but eventually it took more than 60 years, draining the profits of the Company, so much so it was brought under the Crown after 1857

National Map Policy:

- To provide, maintain and allow access and make available the National Topographic Database (NTDB) of the SOI conforming to national standards.
- To promote the use of geospatial knowledge and intelligence through partnerships and other mechanisms by all sections of the society and work towards a knowledge-based society.

TWO SERIES OF MAPS – DSM:



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- Defense Series Maps (DSMs)- These will be the topographical maps (on Everest/WGS-84 Datum and Polyconic/UTM Projection) on various scales (with heights, contours and full content without dilution of accuracy). These will mainly cater for defense and national security requirements.
- This series of maps (in analogue or digital forms) for the entire country will be classified, as appropriate, and the guidelines regarding their use will be formulated by the Ministry of Defense.

TWO SERIES OF MAPS – OSM:

- Open Series Maps (OSMs) for supporting development activities in the country. OSMs shall bear different map sheet numbers and will be in UTM Projection on WGS-84 datum.
- Each of these OSMs (in both hard copy and digital form) will become “Unrestricted” after obtaining a one-time clearance of the Ministry of Defense.
- SOI will ensure that no civil and military Vulnerable Areas and Vulnerable Points (VA’s/VP’s) are shown on OSMs

NATIONAL TOPOGRAPHICAL DATA BASE (NTDB) :

NTDB in analogue and digital forms consisting of following data sets:

- National Spatial Reference Frame,
- National Digital Elevation Model,
- National Topographical Template,
- Administrative Boundaries, and
- Toponymy (place names).

Both the DSMs and OSMs will be derived from the NTDB.

IMPORTANT DEFINITIONS ON TOPOSHEETS :

- REPRESENTATIVE FRACTION (RF): It is the ratio between the distances on the map to its corresponding distance on actual ground. The RF on this map is 1:50,000.
- SCALE : Scale is the ratio between the distance of any two points on the map and the actual distance of the same points on the ground. The scale of the given map extract is 2 cm: 1 km or 1:50,000.
- CONTOUR: Contours are imaginary lines drawn on maps, joining all places with the same height above sea level.



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- **CONTOUR INTERVAL:** The interval between two consecutive contours is called contour interval
- **INDEX CONTOUR:** Contour lines are thickened at regular intervals to make it easier to read contours. For example at every 100 mts the contour line is made darker. The darker lines are called Index Contours.
- **TRIANGULATED HEIGHT:** It is the height of a place which has been calculated using trigonometry, represented by a small triangle e.g. $\Delta 540$
- **SPOT HEIGHT:** The height of random places between contours shown with a dot. Eg - .425
- **BENCH MARK -** Height of a place actually marked on a stone pillar, rock or shown on a building as a permanent reference. It is written as BM 200 m.
- **RELATIVE HEIGHT:** Relative height is the height of a feature with reference to the height of the surrounding land and NOT to sea level. It is represented by the height with a small 'r' e.g. -12r.
- **MIXED FOREST:** A forest with more than two varieties of trees growing in close proximity to each other. • **OPEN JUNGLE:** A forest where trees are widely scattered.
- **DENSE JUNGLE. :** A forest where trees grow very close to each other.
- **OPEN SCRUB:** Scrub is a vegetation found in regions with less than 100cm of rainfall. Therefore it indicates a dry region.
- **EMBANKMENT:** They are raised rock or soil filled constructions on which roads/railway tracks are built. Also made near tanks and rivers to prevent flood.
- **FORM LINES:** Form lines are contour lines, but show only approximate heights above sea level as they are used to indicate the elevations of the area which are not accessible for proper survey. Hence they are drawn as broken lines and are called 'form lines'.
- **Q.C. Q.D., OC, OD,PQ, ETC :** These are alphabetical codes used to represent the biggest grid sq. of 10,000 square kms. The Govt. of India has adopted metric system for all measurements. All the ordnance survey maps issued by the Survey of India were drawn to the scale 1:50,000 In this system , the surveyed territory is divided into 100km X 100 km squares, and each square is denoted by English alphabets. for example, OC, OD, PQ, PG, etc . This system of map drawing is known as National Grid Reference.