

Online Surveying FE 208

Lectures 18

Topographic Surveys and Contour Mapping

Learning Objectives for this Lecture

- 1. Know the purpose for contours**
- 2. Be able to read contours from a map**
- 3. Be able to compute interpolated points to a contour map**
- 4. Be able to draw a contour map from designated intervals**

Topographic Surveys

The survey of positions, x, y, z , on the Earth's surface of the natural and man-made features in a given area or locality, and the determination of the configuration of the terrain.

Typically used for:

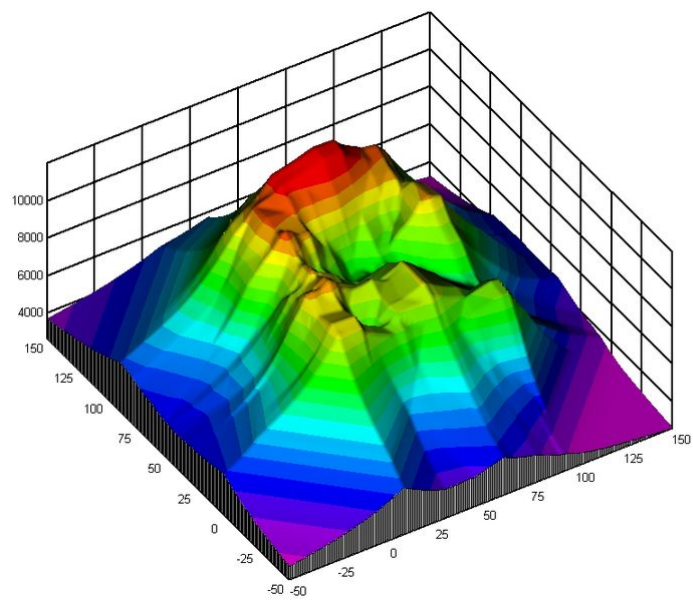
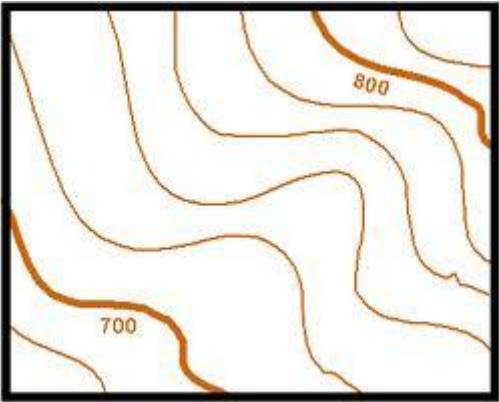
1. Location and design of man-made features, roads, bridges, etc.
2. Location of drainage
3. Spot elevations for volume calculations, Earthwork for example

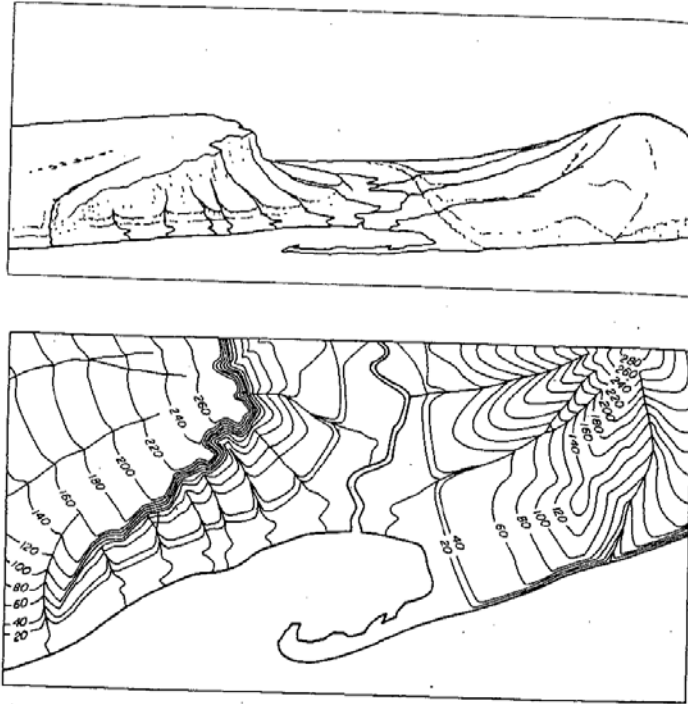
Contour lines

- lines drawn on a map joining points of identical height
- unites points of equal height above a given level, such as mean sea level.
- curved or straight lines on a map describing the intersection of a real or hypothetical surface with one or more horizontal planes.

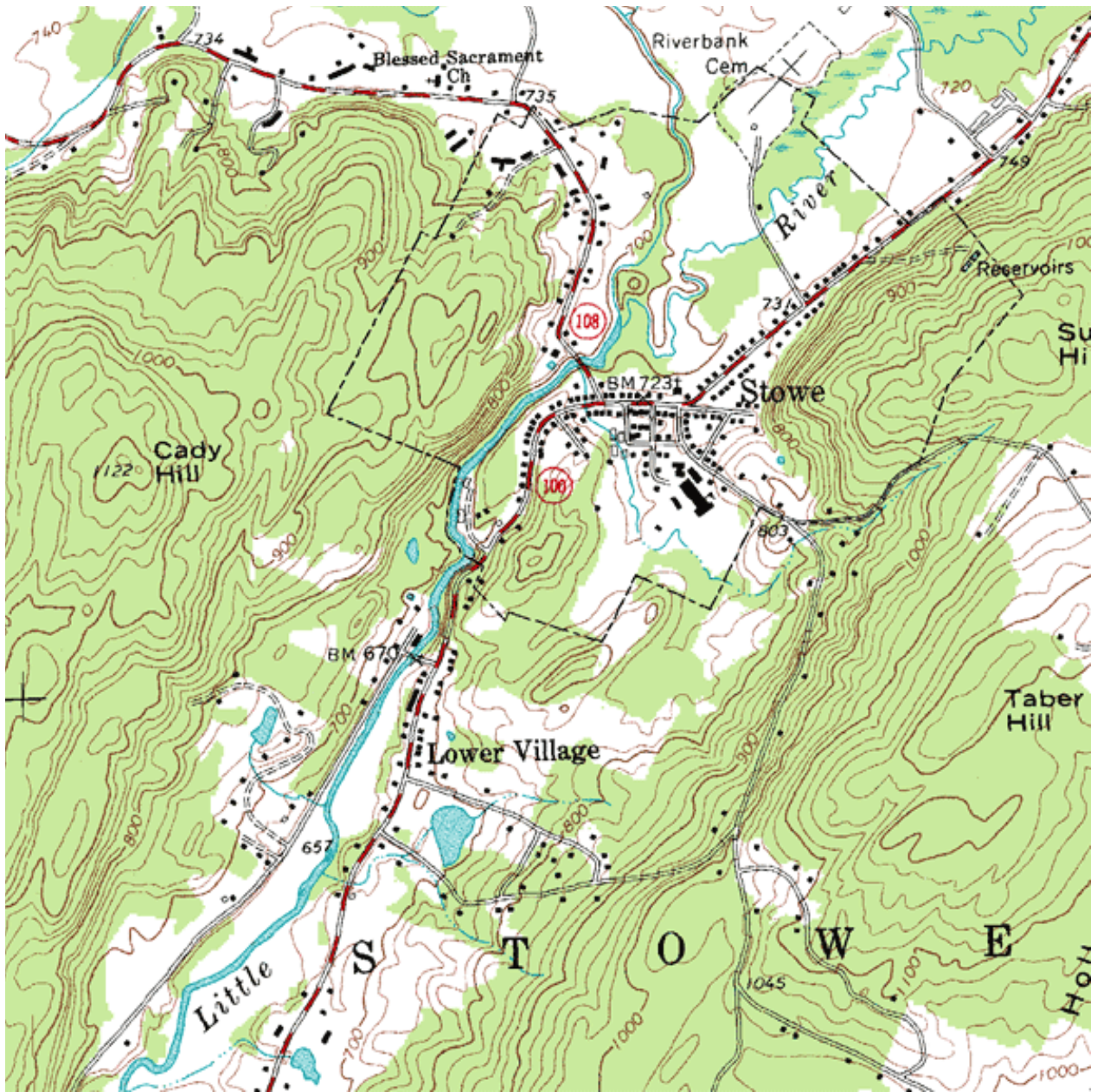
The configuration of these contours allows map readers to infer the shape of the land surface

Contours can be drawn in 2-dimension or 3 dimension



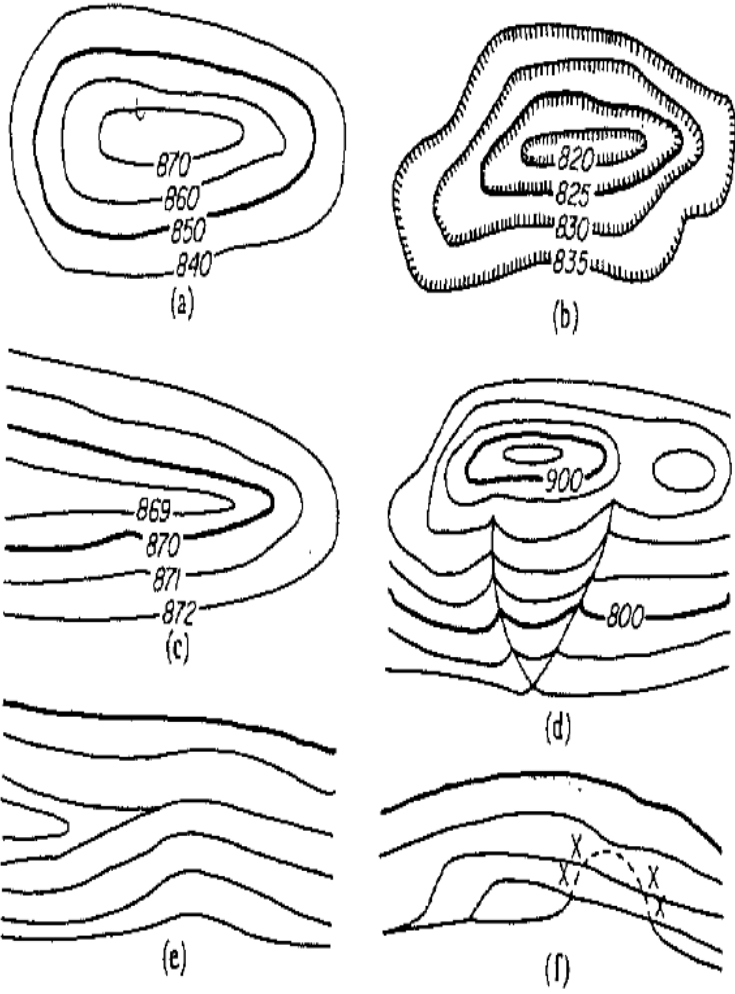


Example of how contours can be referenced to the original ground



Important points about contours

- Contours cannot end within a page, they must either close on themselves, or end at the map edge
- A series of closed contours indicates a depression or a hill



Process of Creating Contours

Elevations are generally collected on a grid spacing using predetermined spacing.

| | 1 | 2 | 3 | 4 | 5 | 6 | 534 ² |
|---|---|---|---|---|------------------|---|------------------|
| A | | | | | 536 ² | | 537 ² |
| B | | | | | | | |
| C | | | | | | | 541 ² |
| C | | | | | | | |
| D | | | | | | | |
| E | | | | | | | |

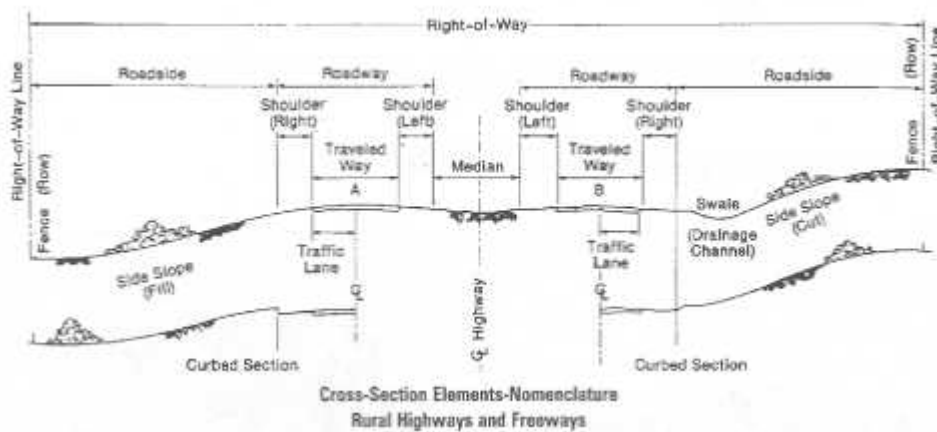
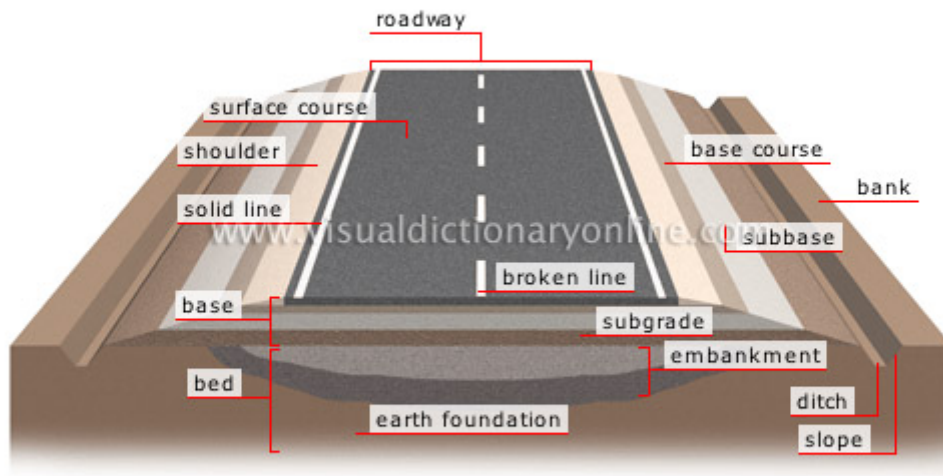
Spot elevations

Also called break points. Points used to supplement grid elevations.

Examples include drainages, ridge tops, nose ridges, etc.

Road cross Sections

A special type of “contouring” uses cross sections on a station basis to determine elevation changes in perpendicular to a road or stream surface for volume calculations.



Interpolation of points between contour lines

Proportion

The point where a specific contour crosses a grid can be found by proportioning the elevation to the grid distance at scale.

For example, let's say the grid distance is 100' x 100' and the scale is 1"=50' on the map.

The grid distance would be;

$$\left(\frac{1''}{50'} \right) = \frac{x}{100'} = 2.0''$$

| | | | | | | | |
|---|---|---|---|---|---|------------------|------------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 534 [±] |
| A | | | | | | 536 [±] | 537 [±] |
| B | | | | | | | |
| C | | | | | | | 541 [±] |
| C | | | | | | | |
| D | | | | | | | |
| E | | | | | | | |

We want to locate the point between B6 and C6 where the elevation 540.0' crosses.

In other words, we need to find the point where the elevation is reduced from C6 by 1.2'

The grid distance C6 to B6 covers (541.2' – 537.9') 3.3'

So by proportion:

$$\left(\frac{2''}{3.3'} \right) = \frac{x}{1.2''} = 0.72 :$$

