SURVEYING-I

Basic Surveying

Introduction to Surveying

- Definition:

Surveying is the science and art of determining the relative positions of points above, on, or beneath the earth's surface and locating the points in the field.

The work of the surveyor consists of 5 phases:

1. Decision Making – selecting method, equipment and final point locations.
2. Fieldwork & Data Collection – making measurements and recording data in the field.
3. Computing & Data Processing – preparing calculations based upon the recorded data to determine locations in a useable form.
4. Mapping or Data Representation – plotting data to produce a map, plat, or chart in the proper form.
5. Stakeout – locating and establishing monuments or stakes in the proper locations in the field.

2 Categories of Surveying:

1. Plane Surveying – surveying with the reference base for fieldwork and computations are assumed to be a flat horizontal surface.
   - Generally within a 12 mile radius the pull of gravity is very nearly parallel to that at any other point within the radius and thus horizontal lines can be considered straight.
2. Geodetic Surveying – surveying technique to determine relative positions of widely spaced points, lengths, and directions which require the consideration of the size and shape of the earth. (Takes the earth's curvature into account.)

7 Types of Surveys:

1. Photogrammetry – mapping utilizing data obtained by camera or other sensors carried in airplanes or satellites.
2. Boundary Surveying – establishing property corners, boundaries, and areas of land parcels.
3. Control Surveying – establish a network of horizontal and vertical monuments that serve as a reference framework for other survey projects.
4. Engineering Surveying – providing points and elevations for the building Civil Engineering projects.

7 Types of Surveys:

5. **Topographic Surveying** – collecting data and preparing maps showing the locations of natural man-made features and elevations of points o the ground for multiple uses.
6. Route Surveys – topographic and other surveys for long – narrow projects associated with Civil Engineering projects.
   - Highways, railroads, pipelines, and transmission lines.
7. Hydrographic Surveying – mapping of shorelines and the bottom of bodies of water.
   - Also known as bathymetric surveying.

Brief History of Surveying:

1. Surveying had it's beginning in Egypt about 1400 BC
   - Land along the Nile River was divided for taxation. Divisions were washed away by annual floods.
   - "ROPE-STRETCHERS" Egyptian surveyors were created to relocate the land divisions (measurements were made with ropes having knots at unit distances).
   - Extensive use of surveying in building of Egyptian monuments
2. Greeks: expanded Egyptian work and developed Geometry.
   - Developed one of the earliest surveying instruments – Diopter (a form of level).

Brief History of Surveying:

3. Romans: developed surveying into a science to create the Roman roads, aqueducts, and land division systems.
   - Surveyors held great power, had schools and a professional organization
   - Developed several instruments:
     - Groma – cross instrument used to determine lines and right angles
     - Libella – "A" frame with a plumb bob used for leveling
     - Chorobates – 20' straight edge with oil in notch for leveling

4. Middle Ages: land division of Romans continued in Europe.
   - Quadrants – square brass frame capable of turning angles up to 90° and has a graduated scale developed by an Italian named Von Piso.

Brief History of Surveying:

5. 18th & 19th Century in the New World: the need for mapping and marking land claims caused extensive surveying, especially by the English.
   - 1785: United Stated began extensive surveys of public lands into one mile square sections
     - 30 states surveyed under the U.S. Public Land System (also called the Rectangular System)
   - 1807: United States Geological Survey founded to establish an accurate control network and mapping
   - Famous American Surveyors: George Washington, Thomas Jefferson, George Rogers Clark, Abe Lincoln and many more.

Brief History of Surveying:

6. 20th Century and Beyond: As technology advanced, population increased, and land value caused development of licensure for surveyors in all states.
   - Educational requirements for licensure began in the early 1990's
   - Capable of electronic distance measurement, positioning using global positioning systems, construction machine control, and lidar (scanning) mapping
   - Involvement in rebuilding of the infrastructure and geographic information systems (GIS)
   - Shortage of licensed professionals is projected well into the 21st century

Thanks