



EARTHWORK AND GPS TECHNOLOGY

GPS

The Global Positioning System (GPS) is a set of satellites operated by the United States Department of Defense. Each Satellite broadcasts radio signals containing precise time and other information. A GPS receiver on the ground receives signals from several satellites and computes its location in three dimensions.

How GPS Works for Earthwork Engineering

The high-accuracy position data required for grade-control applications is achieved by using real-time kinematic (RTK) positioning, which requires linking up to five satellites in space and two GPS receivers on the ground. On the ground, a base station receiver is fixed in one place whose position is precisely determined. Then a second receiver, called the rover, can be mounted on an earthmoving machine or carried as a backpack unit by a grade-setter. Both receivers receive the GPS signals at the same time.

The base station receiver broadcasts its observed information, together with its location and other data, across a wireless data radio link to the rover receiver. The rover combines the base-station data with its own GPS data to compute a very precise position relative to the base station. ***GPS technology can guide machinery and grade-setters to within an inch of desired elevation and location anywhere on a site!*** In order to achieve this level of accuracy, seven computers are at work, five in space, and two on the ground.

Digital Terrain Modeling

The most important part of GPS Earthwork Engineering is building an accurate Digital Terrain Model (DTM). The DTM is created using the electronic design data of the project to produce a three-dimensional digital model of the site. This design data includes the horizontal layout of the project (the x,y plane) along with vertical control or elevation points of the job (the z coordinates).

Top Grade and GPS

At Top Grade Construction, we are one of few earthwork contractors in the Bay Area with its own engineering department who build DTM's for our operation crews. We first acquire the digital design data (CAD file) from the Civil Engineering firm who has designed the project site. We convert their two-dimensional design to a three-dimensional model by attaching elevations to the layout design. The DTM is built to finished elevations and then our operations crews adjust or "offset" from finished grade to subgrade (dirt elevation) in the field.

In a relatively short time Top Grade has experienced substantial increases in production from using GPS technology for our earthwork operations. Also, costs for survey staking have decreased because of our decreased reliance on survey crews to establish grade control in the field.

GPS technology and Digital Terrain Modeling is the state of the art in earthwork engineering and Top Grade is committed to remaining on the cutting edge of this fast paced, highly competitive industry.