GPS Base & Rover Training 101

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What is GPS?

- Global Positioning System is government funded system originally created by the Department of Defense in 1978.
- System of 38 satellites orbiting the earth from space sending signals to earth.
- Other governments are also putting up positioning systems:
  - Russian / GLONASS (16 satellites)
  - European / Galileo systems (2 test satellites)
  - China / Compass (5 satellites)
How does GPS work?

- Satellites send signals (time stamps) down to receivers on Earth
- 3 satellites required for horizontal positioning, 4 for vertical
- AccuGrade requires 5, the 5th satellite is used for a check

Distance = Speed x Time
GPS Correction

1. Autonomous: 30-45 ft
2. DGPS: 1.5-15 ft
3. Float: <1 ft
4. Fixed: 0.01-0.1 ft
Real Time Kinematic GPS
What is a base station and what does it do?

- Base Stations receive signals from the satellites and create a correction factor.
- This correction is sent via radio to rovers and machines.
- A base station is required to achieve .1’ accuracy, without a base station accuracy is within 30’.
- When a base station signal is used this is call a “RTK Fixed” GPS position, if no base is used position might be “DGPS” “Float”, or “Autonomous”.

Base/Rover 101
Base Station sends correction signal to GPS rovers
What is Rover?

• A Rover is a survey tool used to receive signals from satellites and a base station to calculate grade.
GPS used in many applications

- Airplanes
- Communications
- Agriculture
- Recreation
- Construction

GPS is becoming more and more commonplace as technology advances.
GPS and Construction Equipment
Engineers Create Files

- Engineers Create 3D design files that are used to create paper plans
- 3D plans can also be used for stakeouts and machine control
- Surveyors set control points in the field that are used to correlate lat long to local coordinate system
Site Calibrations

• A site calibration makes it possible to use GPS equipment along with engineers plans
• Control points need to be set by surveyors, and coordinates given to grade checker
• Control points are typically set using a laser level loop or ATS robot, this way more accurate elevations are achieved
• Calibrations link coordinates from design to coordinates in the field- converts lat, long to northing, easting
Site Calibrations

• Minimum of 3 control points are required, at least 5 are recommended

• Control points should encompass the job site and not be bunched together—This is important for high accuracy
Site Calibrations

• Calibration is performed at the beginning of the job, unless base station is moved
• The rover is used to occupy each control point for 30 seconds, after that is completed, a calibration file is created
• This file is also used for machine control
Customer Comments

- Fewer passes
- Less Waste - (avoid moving unneeded material)
- Information is right in front of them
- Less time putting in cut stakes
- Efficiencies for multiple machines
Questions?