FE 308 Lecture 16 – Control Surveys

Control Surveys

Definition:

There are two types of control surveys.

1.

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Methods for setting horizontal control:

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Horizontal Datums

Definition:

There are two primary datums within the US.

A.

B.

2.

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Methods for setting vertical control:

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Vertical Datums

Vertical datums establish elevations for a set of benchmarks. There are two primary vertical datums in the US.

A.

B.

Accuracy Standards

Factors affecting accuracy:

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The Federal Geodetic Control Subcommittee (FGCS) established sets of standards for the accuracy of control surveys. The purpose of these standards is to:

1.

2.

FGCS orders of accuracy

Horizontal

GPS Order	Traditional Survey Order	Relative Accuracy Required
AA		**1:100,000,000**
A		**1:10,000,000**
B		**1:1,000,000**
C-1	**First Order**	**1:100,000**
	Second Order	
C-2-I	**Class I**	**1:50,000**
C-2-II	**Class II**	**1:20,000**
	Third Order	
C-3	**Class I**	**1:10,000**
	Class II	**1:5,000**

The horizontal standards are applied to measurements derived from triangulation, trilateration, and traverse procedures.

These are applied to the relative error in distance between any two horizontal control points.

Application:

Two first order stations located 100 km (60 miles) apart should be correctly located to within +/- 1m with respect to each other.

Vertical

Survey Order	Relative Accuracy Required
First Order	
Class I	**0.5 mm * √K**
Class II	**0.7 mm * √K**
Second Order	
Class I	**1.0 mm * √K**
Class II	**1.3 mm * √K**
Third Order	**2.0 mm * √K**

K = distance between benchmarks in km

These are applied to the relative error between any two benchmark elevations.

Application:

Two elevation benchmarks 25 km apart, established by second-order class I standards, should be correct to +/- 1.0 √25 or +/- 5mm.

These vertical accuracies are slightly looser than the specifications given for level loops.

Vertical accuracies are applied after adjustments, whereas accuracies for level loops are applied before adjustments.

Horizontal Control Hierarchy

Global-regional

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Primary control

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Secondary control

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Terrestrial-based control

- **Applicable to forest surveying.**
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Local-control

- **Applicable to forest surveying.**
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Vertical Control Hierarchy

- **Level lines are established and benchmarks are placed along the line at intermittent and convenient locations.**

Basic framework

- **A Network**
  - **Level lines are spaced about 100-300 km apart using first-order class I standards.**
- **B Network**
  - **Level lines are spaced about 50-100 km apart using first-order class II standards.**

Secondary network

- **Densifies the basic framework, especially in metropolitan areas and for large engineering projects.**
- **Set to second-order class I standards.**

General area control

- **Vertical control for local engineering, surveying, and mapping projects**
- **Set to second-order class II standards.**

Local control

- **Vertical references for minor engineering projects and small-scale topographic mapping.**
- **Set to third-order standards.**