Propagation of S&A Errors
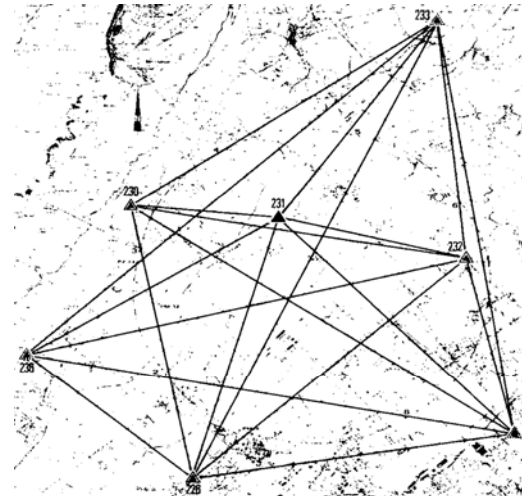
Robert Ruland

ALCPG07 · October 22-26, 2007

October 23, 2007

General Approach

- Global Reference – Surface Network
  - Controls global geometry
    GPS combined with optical leveling – 4mm StD


- Tunnel Reference
  - Traditional tunnel network
  - Licas

- ## Lay-out design
  - For long, small curvature type structures –
    Traverse supported by surface network connection points
    Measurements:
    the longer line-of-sights the better -- 200 to 250 m
    Horizontal & vertical angles, distance, leveling, gyro angles,
    stretched wire

Ideal Reference Line
Actual Reference Curve
Absolute Error Envelope
A
B
2-92
734A3
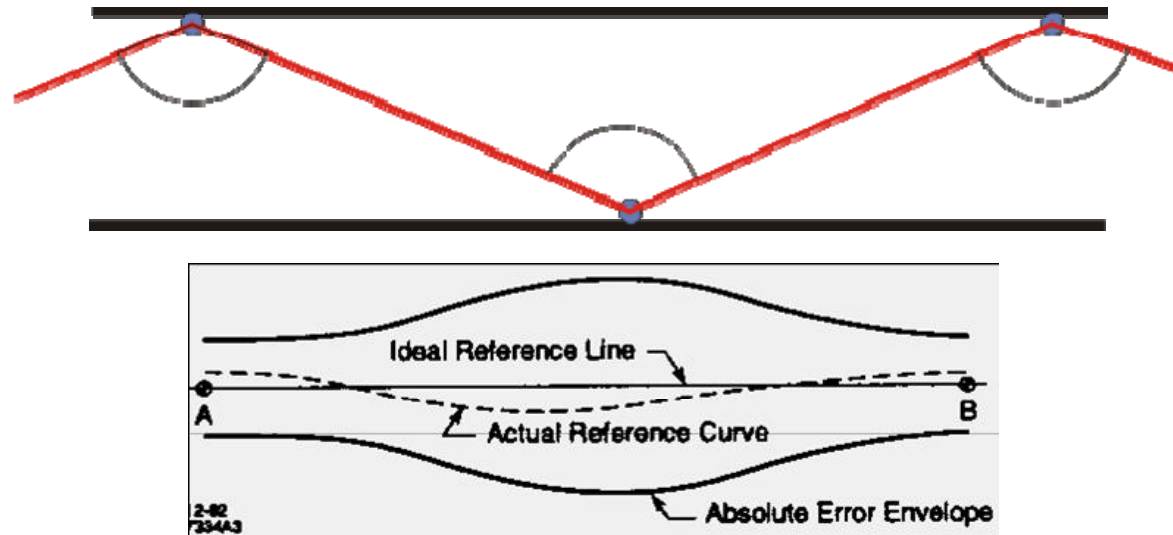
- Densification
  traverse network does not support component
  alignment, need more reference monuments
  - combine traverse with braced quadrilateral type lay-out
    Measurements: horizontal, vertical angles, distances,
    leveling

Not to Scale
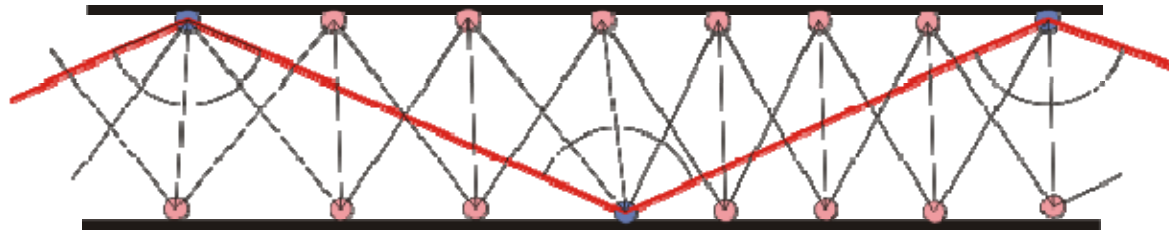
- **Summary of parameters**

  - Surface monument coordinate uncertainty 4 mm
  - Tunnel connection points 5 – 6 mm
  - Traverse points
    local uncertainty over ~ 2 km -- ~200 microm
  - Densification points
    local uncertainty over ~ 300 m -- ~75 microm