
TOPCON

3D Machine Control

3D Machine Control
Why 3D?

Eliminate Stakes and Stringlines

3D Machine Control

Types

Applications

3D Processes

3D Machine Control

Types

Applications

3D Processes

3D Machine Control Types

GPS (GNSS)

mmGPS

LPS

3D Machine Control Types

GPS (GNSS)

mmGPS

LPS

3D Machine Control Types

GPS

The **Global Positioning System** (**GPS**), originally Navstar **GPS**, is a satellite-based radionavigation system owned by the United States government.

GNSS

Global navigation satellite system (GNSS) is a general term describing any satellite constellation that provides positioning, navigation, and timing

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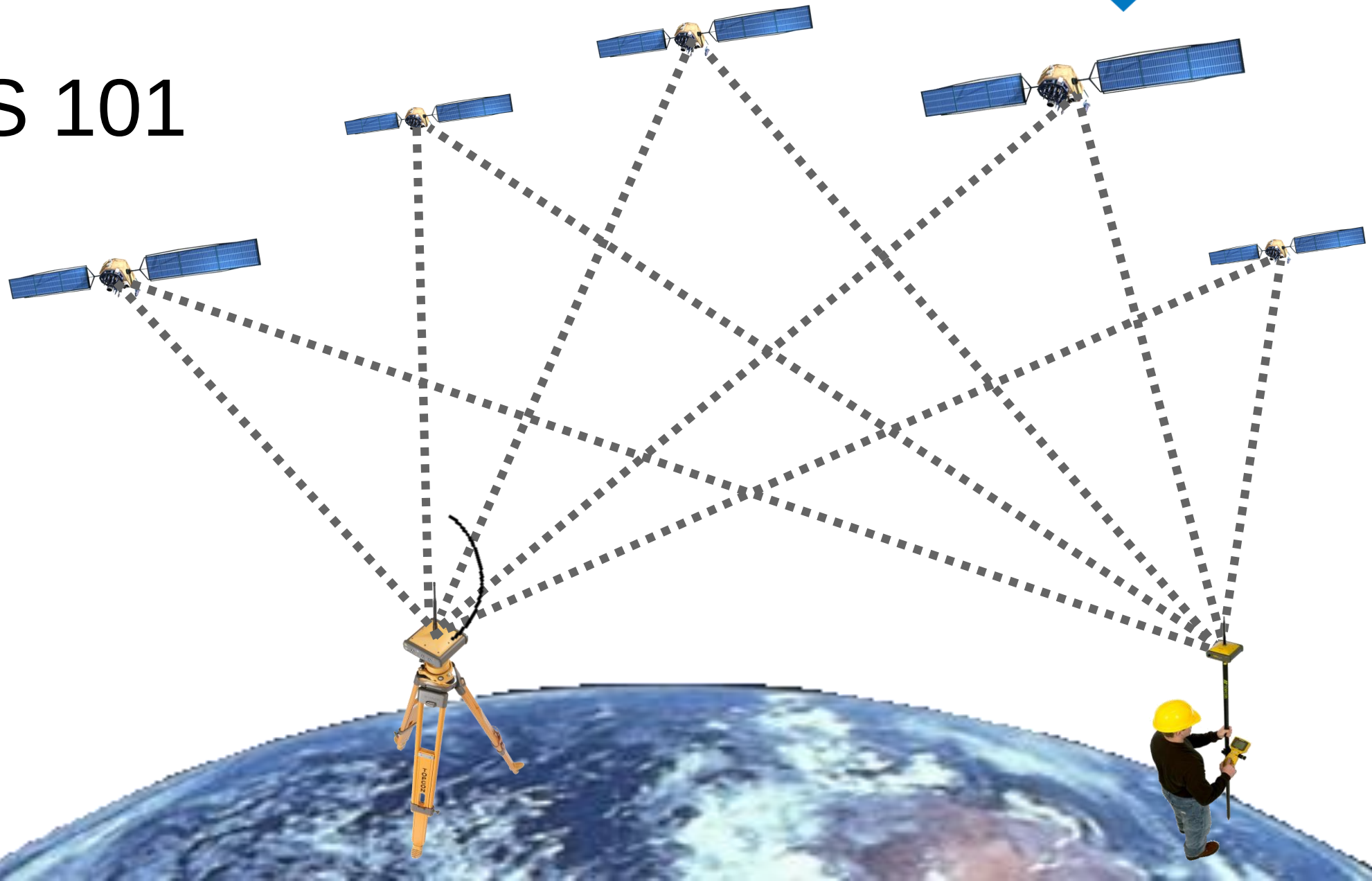
GPS 101



GPS

Vertical accuracy for GPS is +/- .10/ft.

3D Machine Control Types

GPS (GNSS)

mmGPS

LPS

mmGPS

mmGPS is patented technology, only from Topcon that solves the vertical accuracy limitation of GPS. Vertical accuracy for GPS is +/- .10/ft. This is not good enough for high precision applications such as finished grading and paving.

mmGPS was created by combining :

- Topcon's Laser Technology
- Topcon’s Optical Robotic Technology
- Topcon’s GPS Technology

MIL

LAZER ZONE

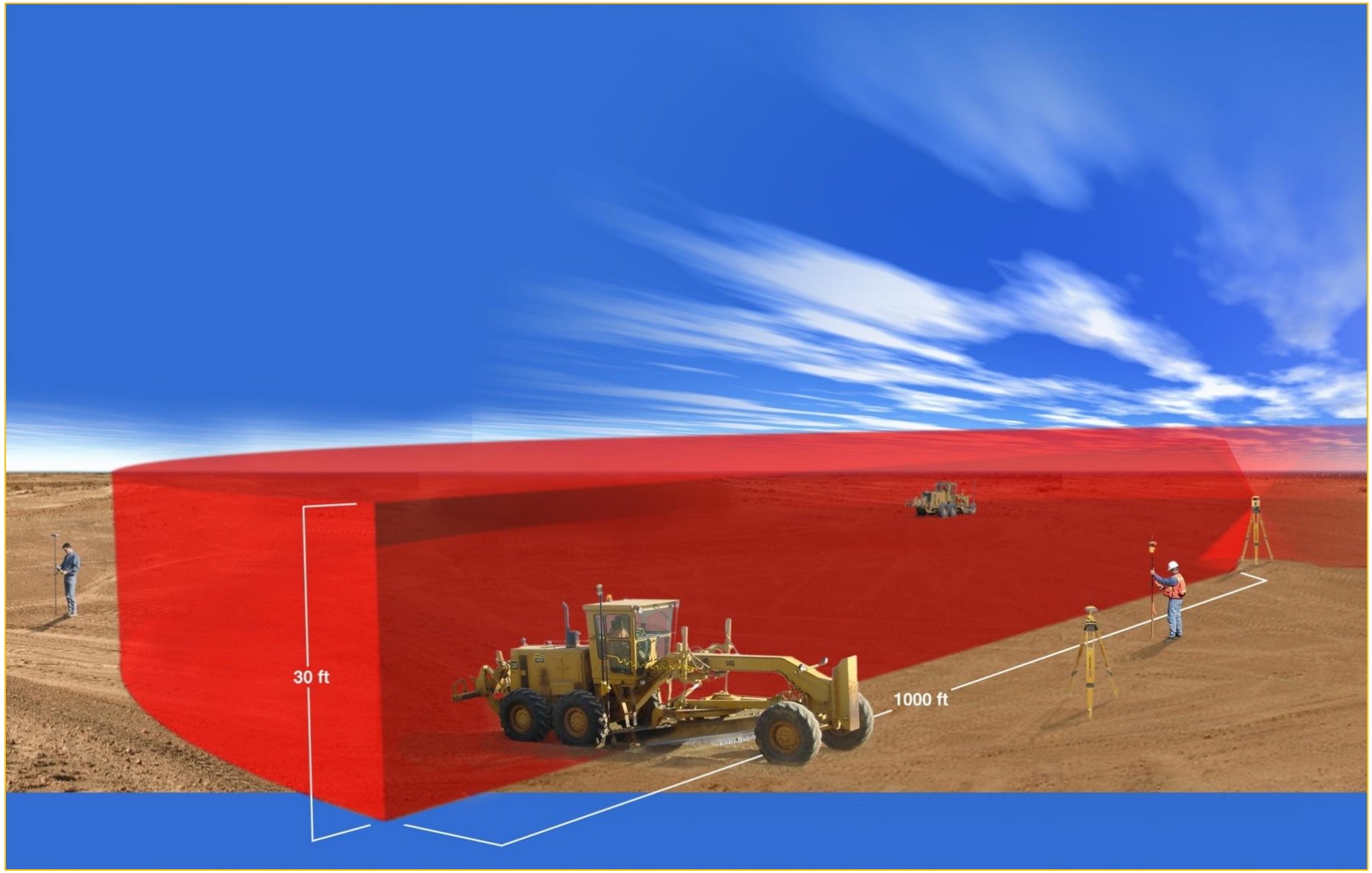
mmGPS System Components

PZS-1 Survey Rover
- 1000’ Range
- Rechargeable Battery

PZS-MC Machine Receiver
- 360 degree window
- Standard mast mount

LZ-T5 mm Transmitter
- Self Leveling easy to use transmitter
- Unparalleled accuracy

Theory of Operation



3D Machine Control Types

GPS (GNSS)

mmGPS

LPS

Machine Control LPS

Machine Control LPS

Robotic Total Stations and Machine Control

Machine control is most commonly associated with GPS/GNSS positioning systems. However, it can be just as efficient and accurate to use a LPS (Local Position System) method. LPS employs the use of a robotic total station tracking an on-machine prism and utilizing radio communications to inform the machine control system of the machine's real-time position. You can build a dedicated Topcon LPS system or LPS can be an option on a system already outfitted for GPS machine control. LPS provides a useful option in areas of bad or impossible satellite or RTK network acquisition. This can include areas with tree cover, near tall buildings inside or under overhead structures.

- Can be the only installed, preferred system
- Can be an add-on option when needed
- Efficient and accurate
- Can solve GPS/RTK connection issues

Machine Control LPS

3D Machine Control

Types

Applications

3D Processes

3D Dozers

3D Motorgraders

TOPCON

GPS

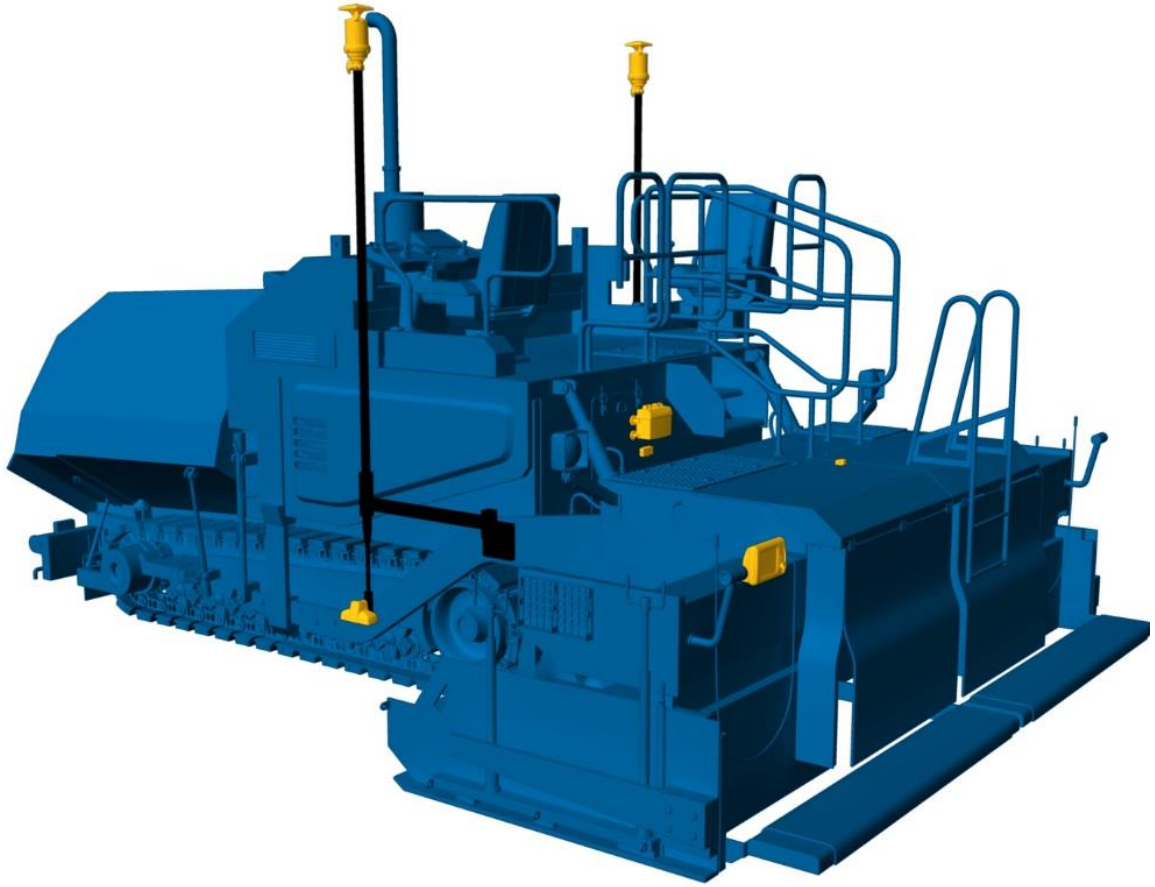
3D Systems

- GPS position on earth
- RTK corrections
- On-board 3D design model

mmGPS Applications

- Dozers
- Graders
- Profilers
- Trimmers
- Pavers
- Grading Boxes

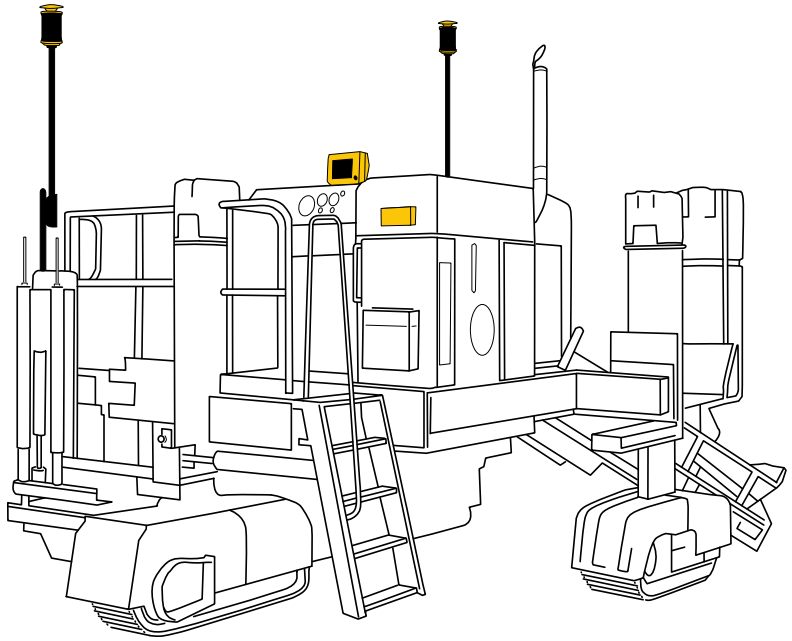
P-63 Millimeter Paving



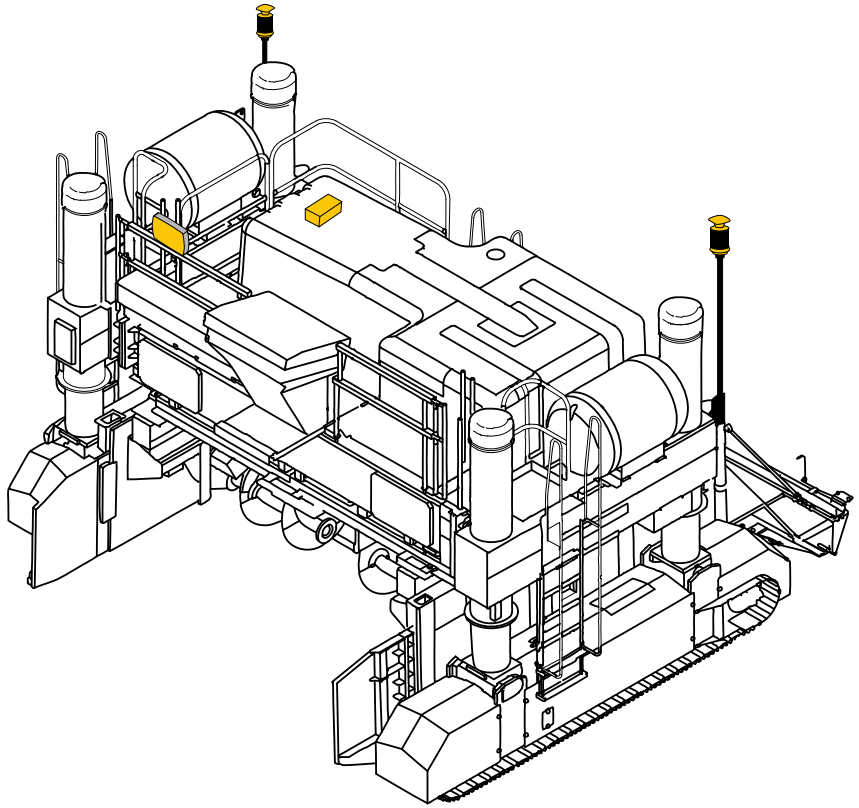
mmGPS Milling

mmGPS Trimmers

mmGPS Curb and Gutter



Dual mmGPS Concrete Paving



3D Machine Control Types

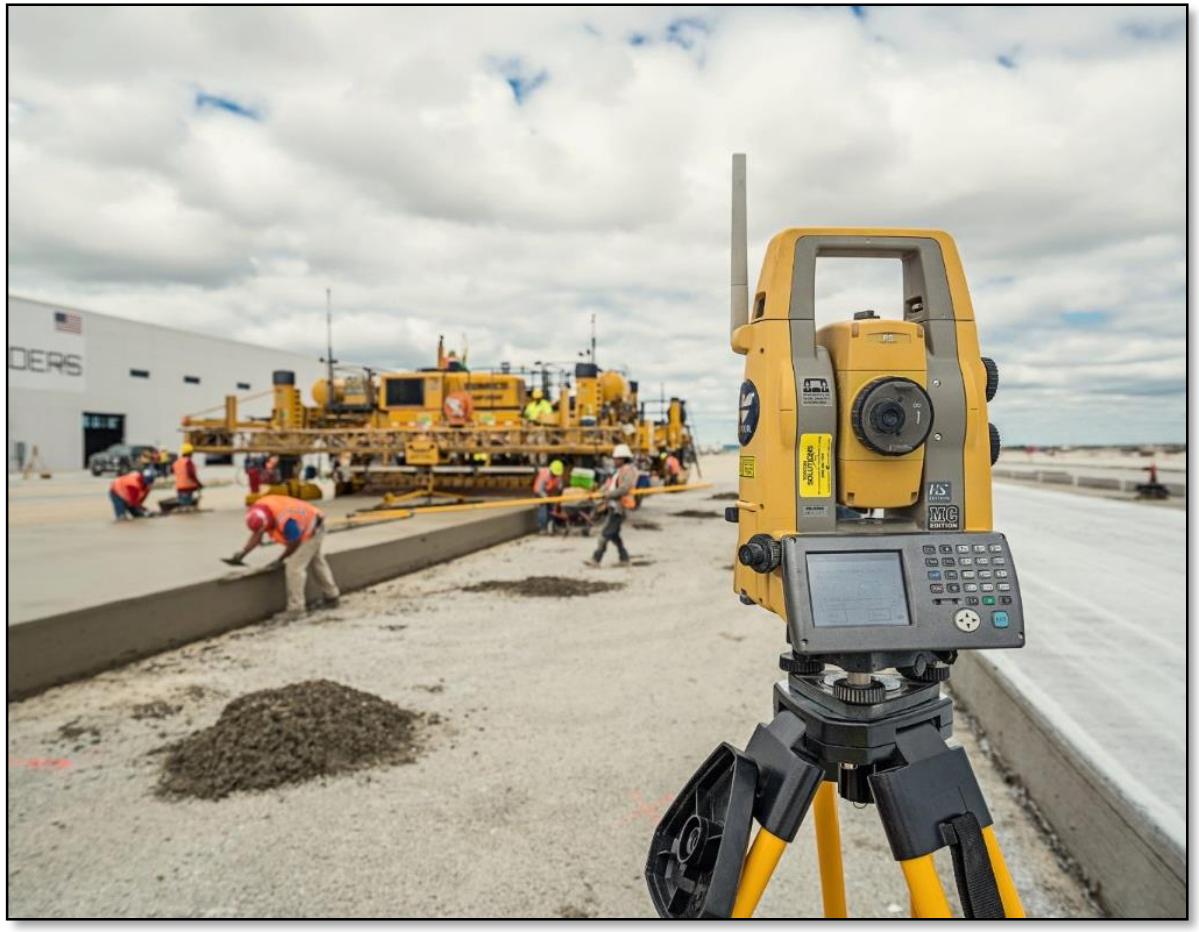
GPS (GNSS)

mmGPS

LPS

Robotic System Overview

- Multiple robotic total stations tracking two prisms mounted on a concrete paver for steering and elevation control.
- Another set of robotic total stations setup required for handover procedure for continuous paving.
- MC-i4 is the central modem on paver, Longlink communication being used.



LPS HMA Paving

LPS Concrete Paving

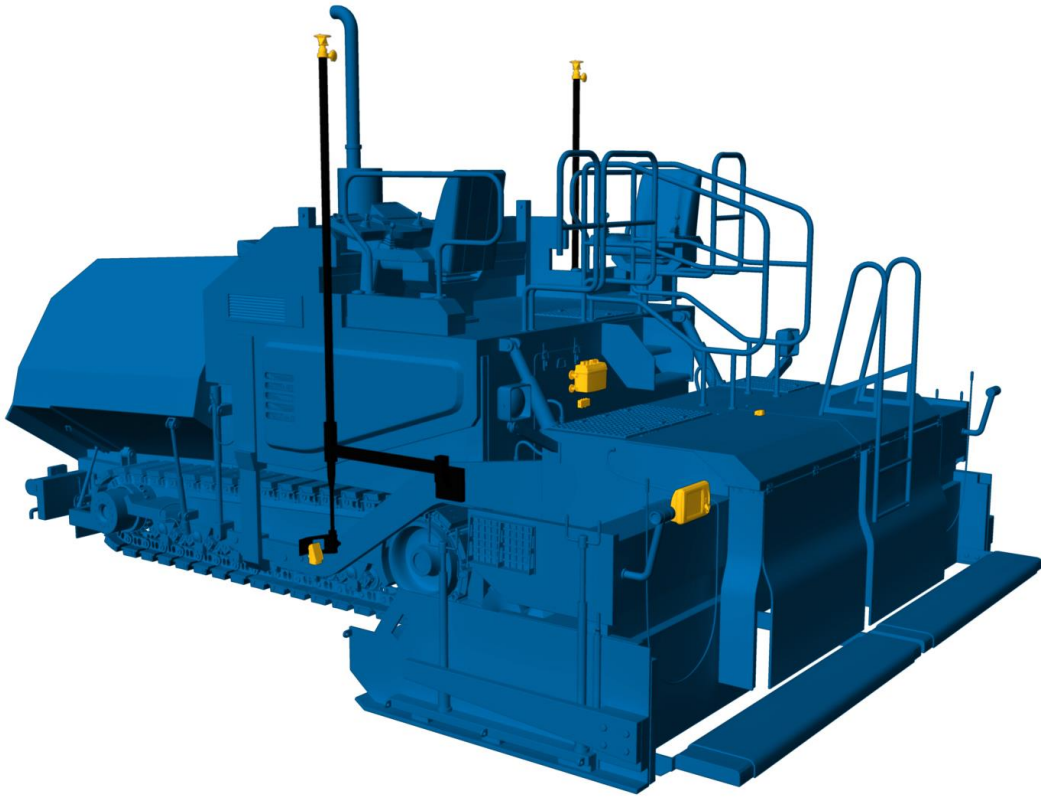
3D Milling and Paving
With SmoothRide

TOPCON

RD-M1 Road Scanning

RD-MC Milling and Paving

- ***R***ealistic ***D***imension
- Sonic Tracker vertical control
- GNSS horizontal control
- Variable thickness paving
- Variable depth milling
- Accounts for differential compaction
- TopNETlive GNSS network service, no base required



RD-MC Milling

3D Machine Control

Types

Applications

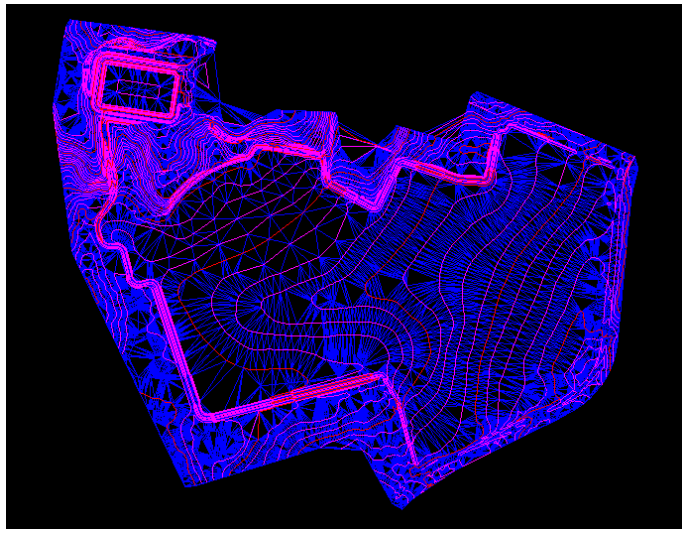
3D Processes

3D Machine Control

3D Processes

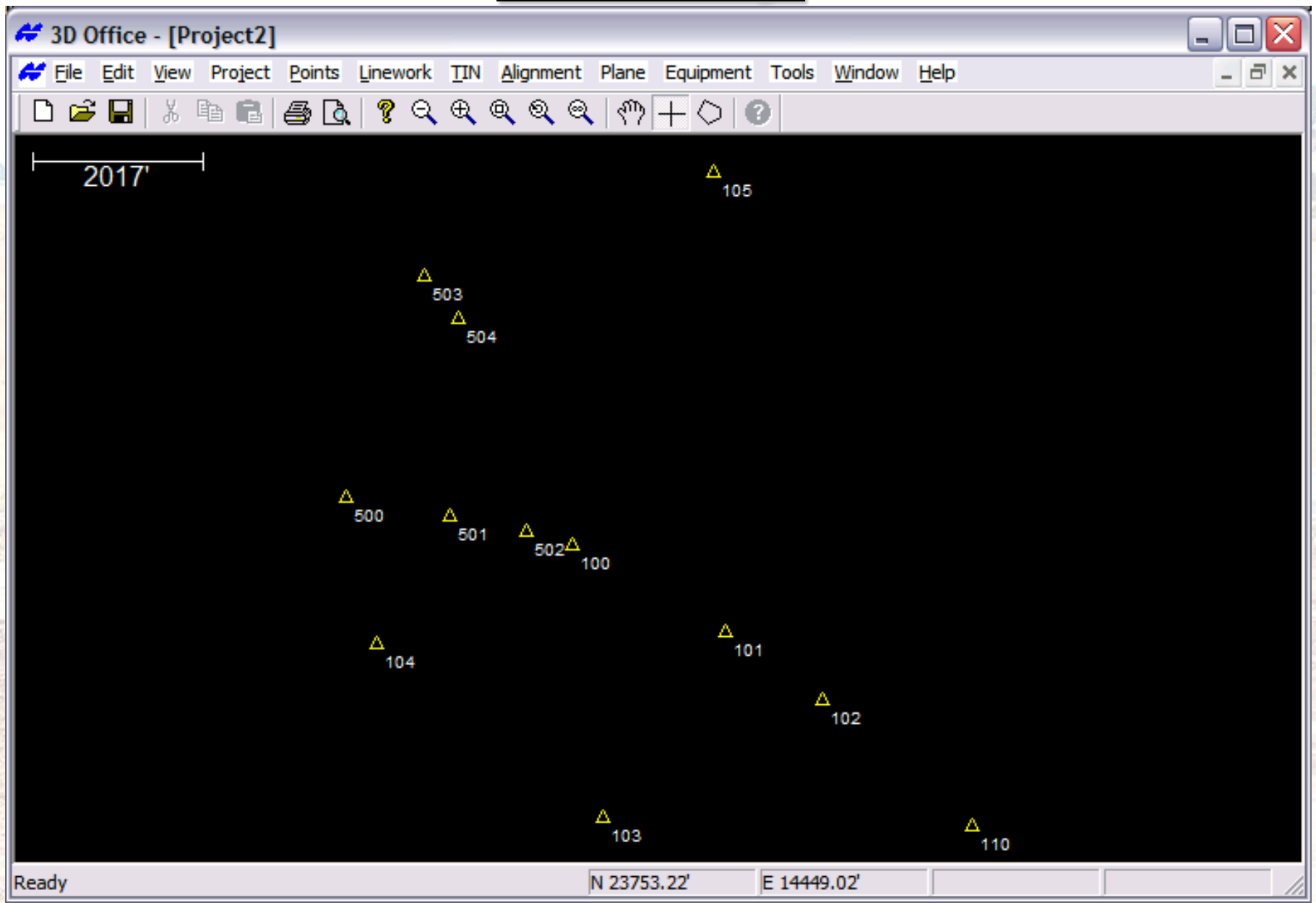
Survey

Design

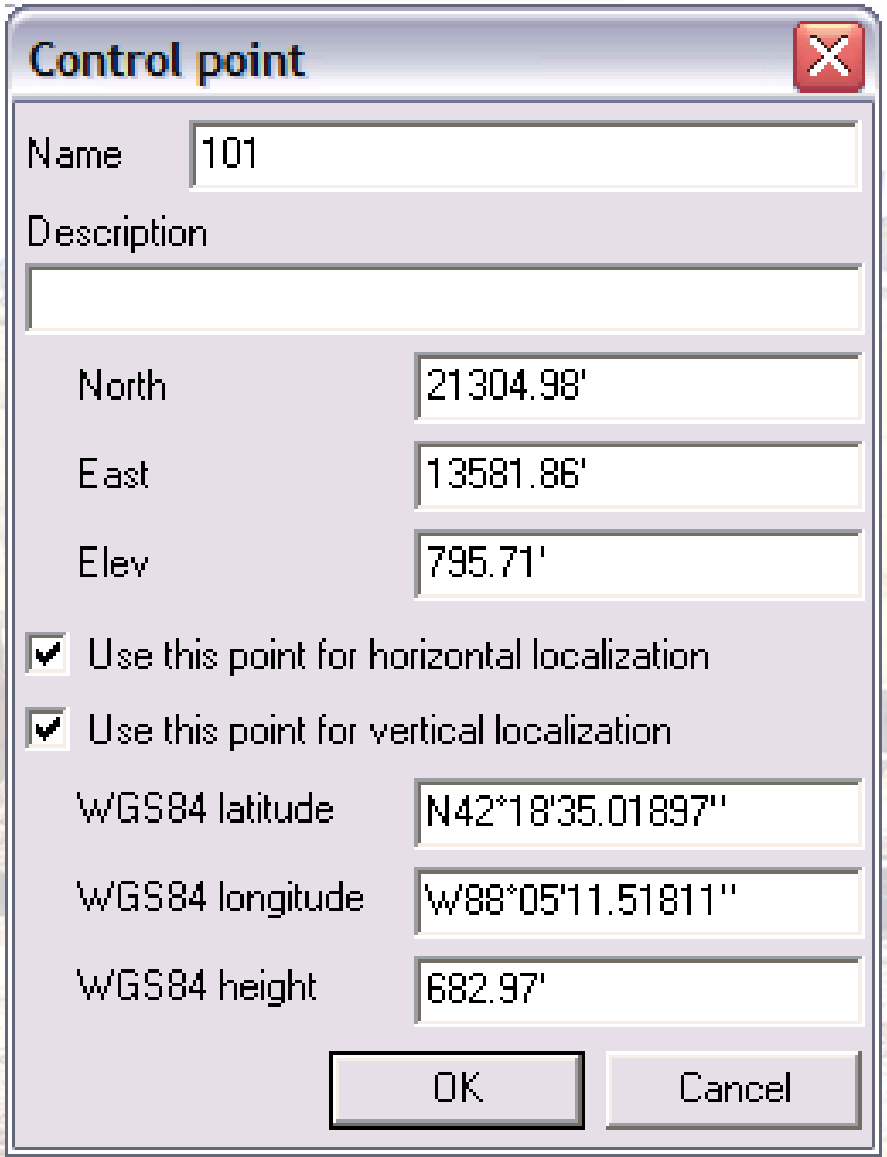


Machine Control

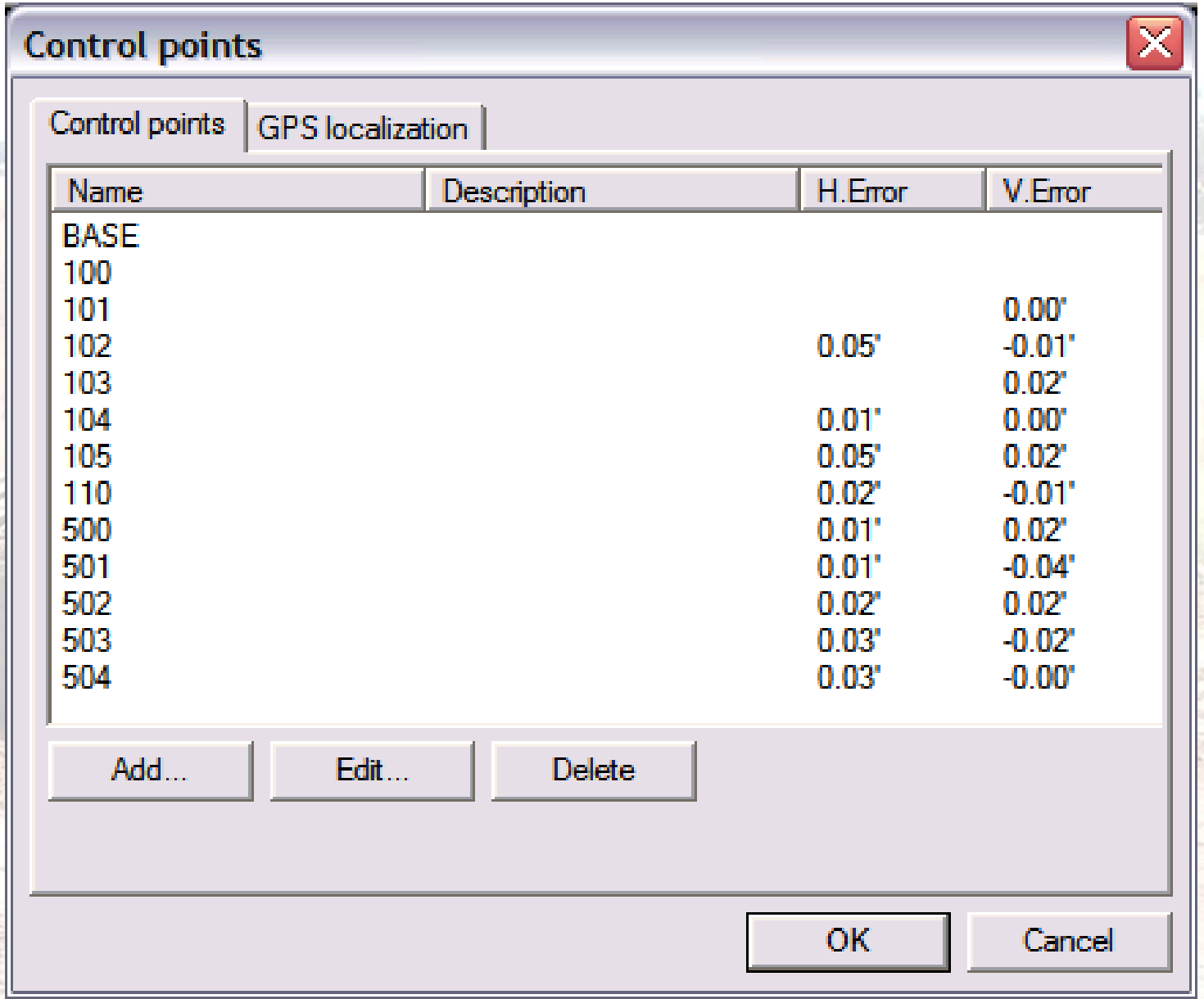
Survey


3D Office - [Project2]
File Edit View Project Points Linework TIN Alignment Plane Equipment Tools Window Help
2017'
105
503
504
500
501
502
100
104
101
102
103
110
Ready
N 23753.22'
E 14449.02'

Survey


Control point
Name
101
Description
North
21304.98'
East
13581.86'
Elev
795.71'
Use this point for horizontal localization
Use this point for vertical localization
WGS84 latitude
N42°18'35.01897"
WGS84 longitude
W88°05'11.51811"
WGS84 height
682.97'
OK
Cancel

Survey


Control points
Control points
GPS localization
Name
Description
H.Error
V.Error
BASE
100
101
0.00'
102
0.05'
-0.01'
103
0.02'
104
0.01'
0.00'
105
0.05'
0.02'
110
0.02'
-0.01'
500
0.01'
0.02'
501
0.01'
-0.04'
502
0.02'
0.02'
503
0.03'
-0.02'
504
0.03'
-0.00'
Add...
Edit...
Delete
OK
Cancel

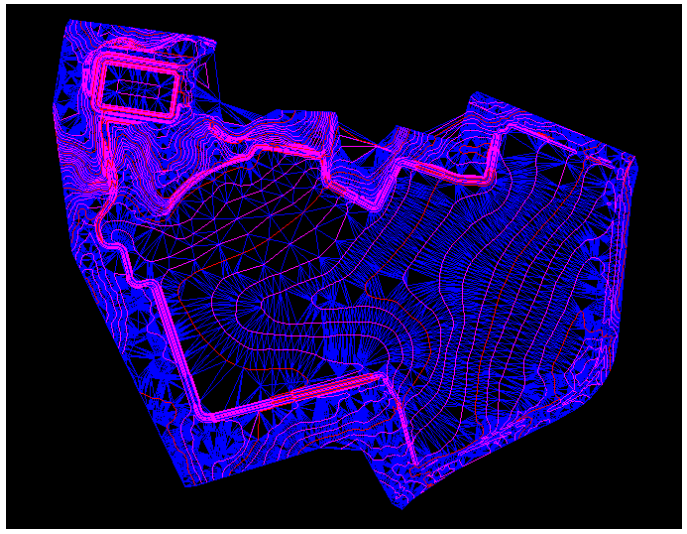
3D Machine Control

3D Processes

Survey

Design

Machine Control



Design

Data Prep – Data Modeling

DATA MODELING

1/3 END USERS HANDLE “IN HOUSE”

1/3 END USERS “FARM OUT”

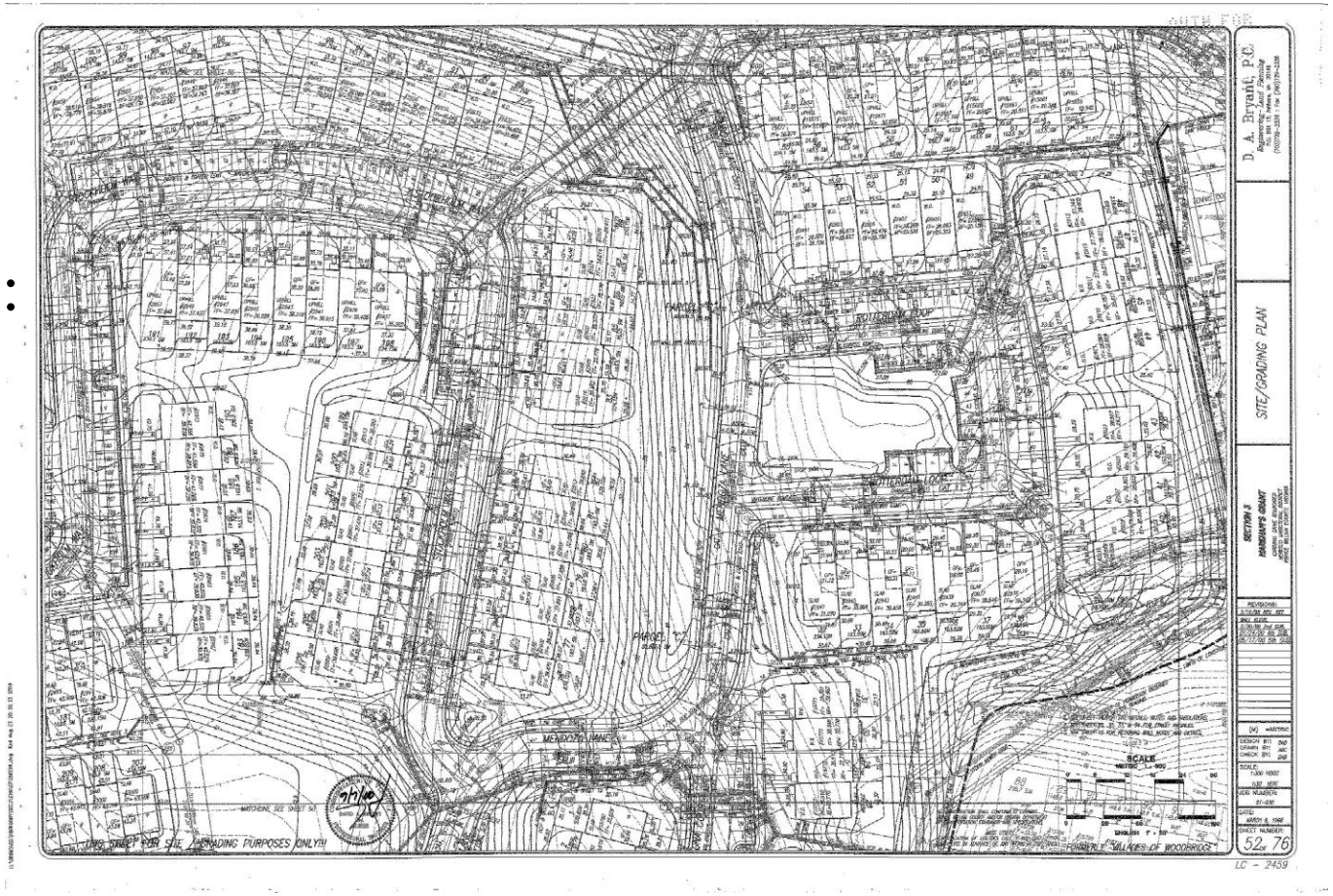
1/3 END USERS “DO BOTH”

DATA IS NOT AN ISSUE

Engineering / Surveying Plans

2 Dimensional Plans:

- Digitized
- Coordinates

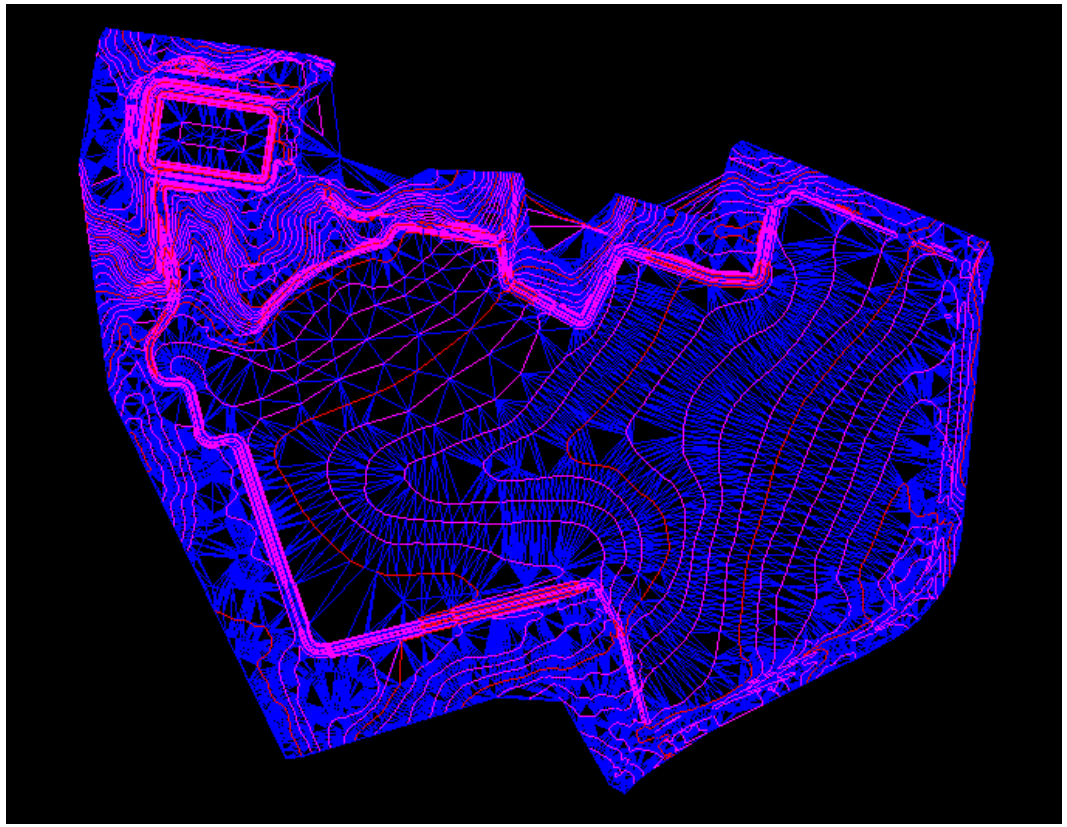


3-Dimensional Faces

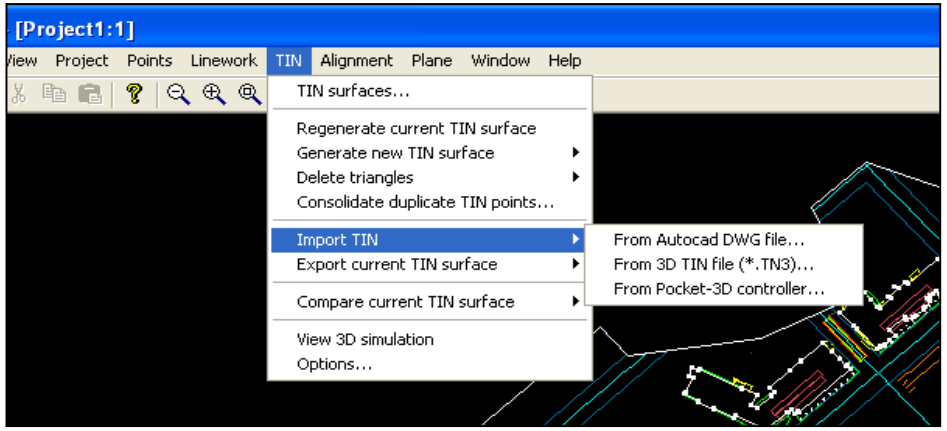
3 Dimensional CAD Files

-X, Y & Z information

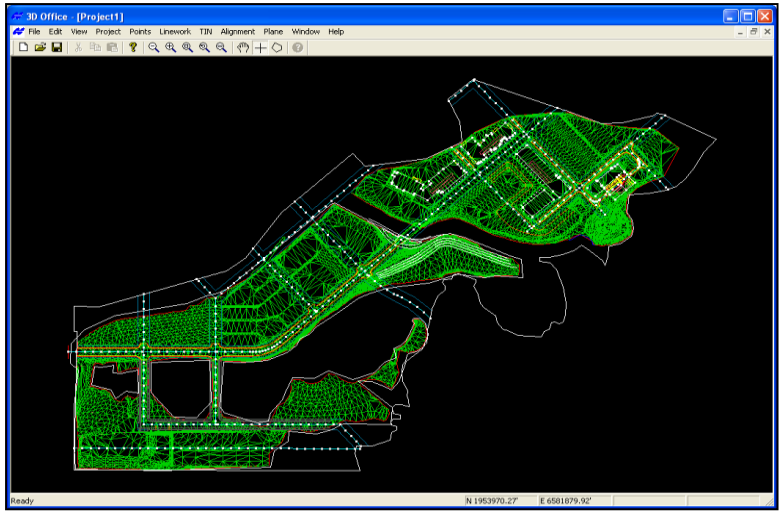
3 Dimensional Triangles
(3D Faces)

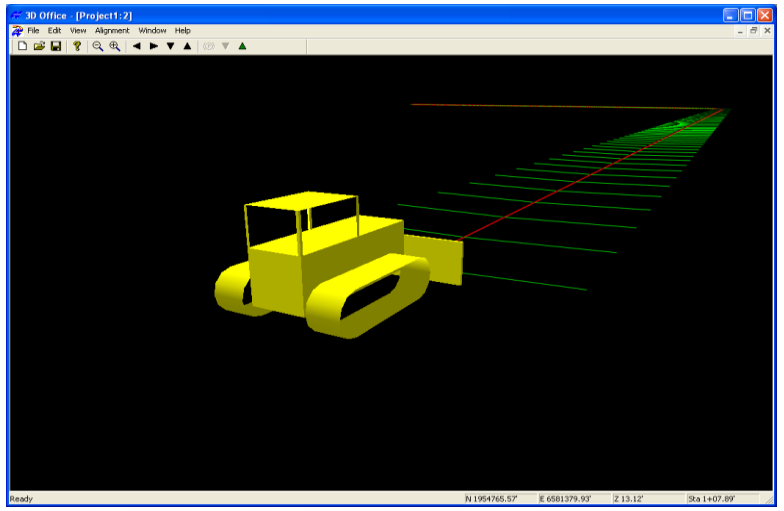


Office-3D

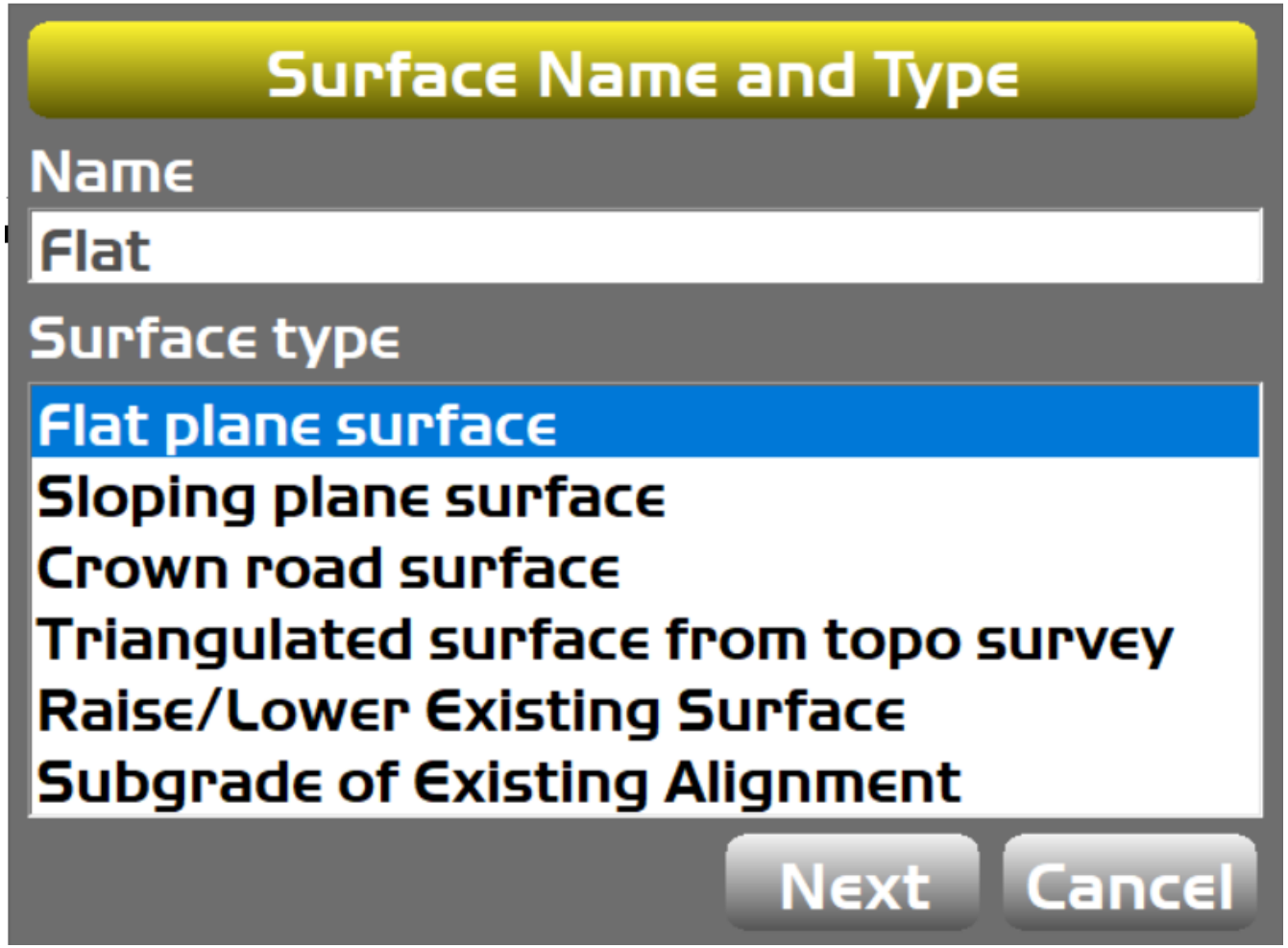


- Windows based file conversion software
- Import DXF, DWG and ASCII files
- Simulator to review 3D model

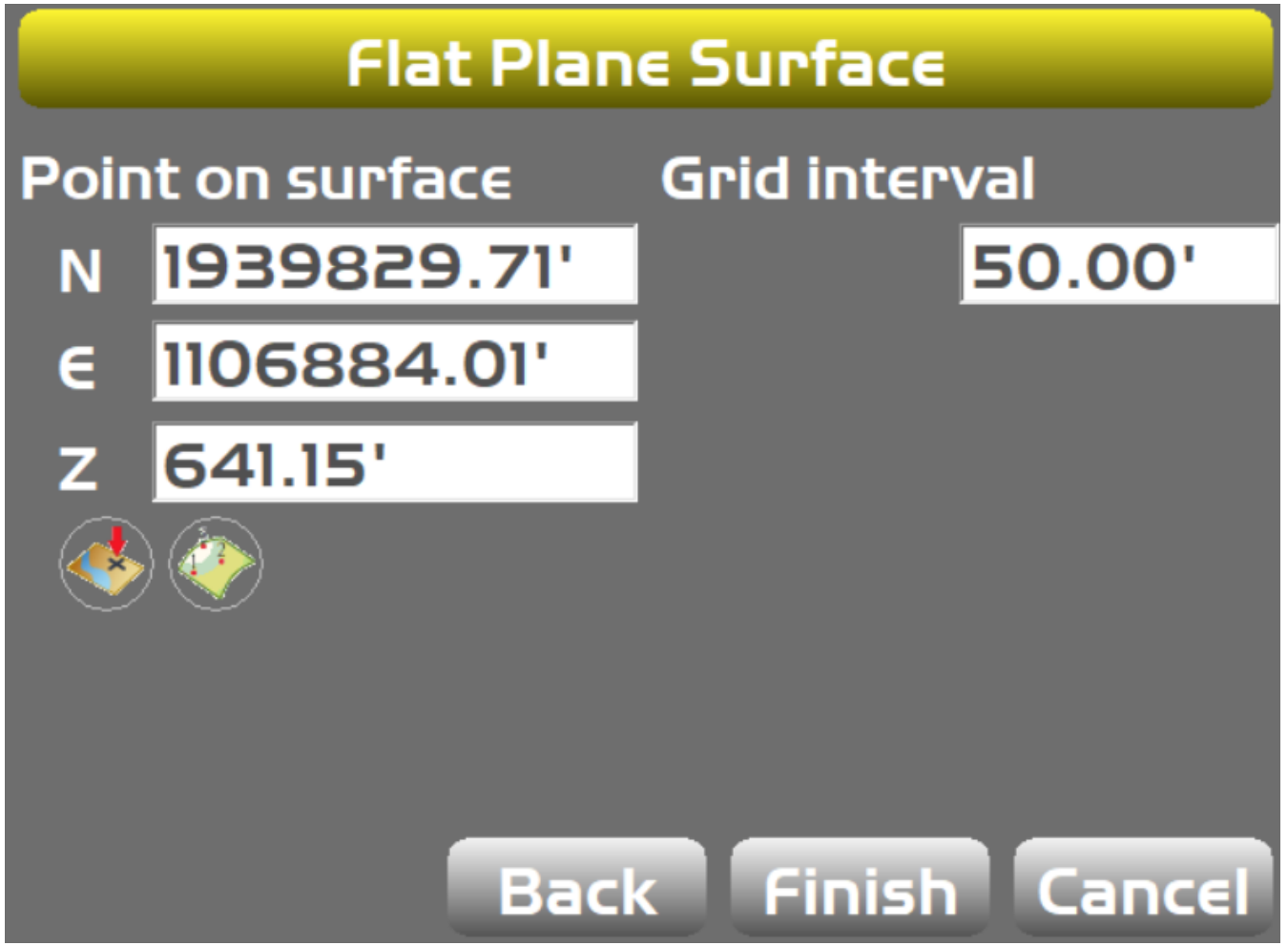




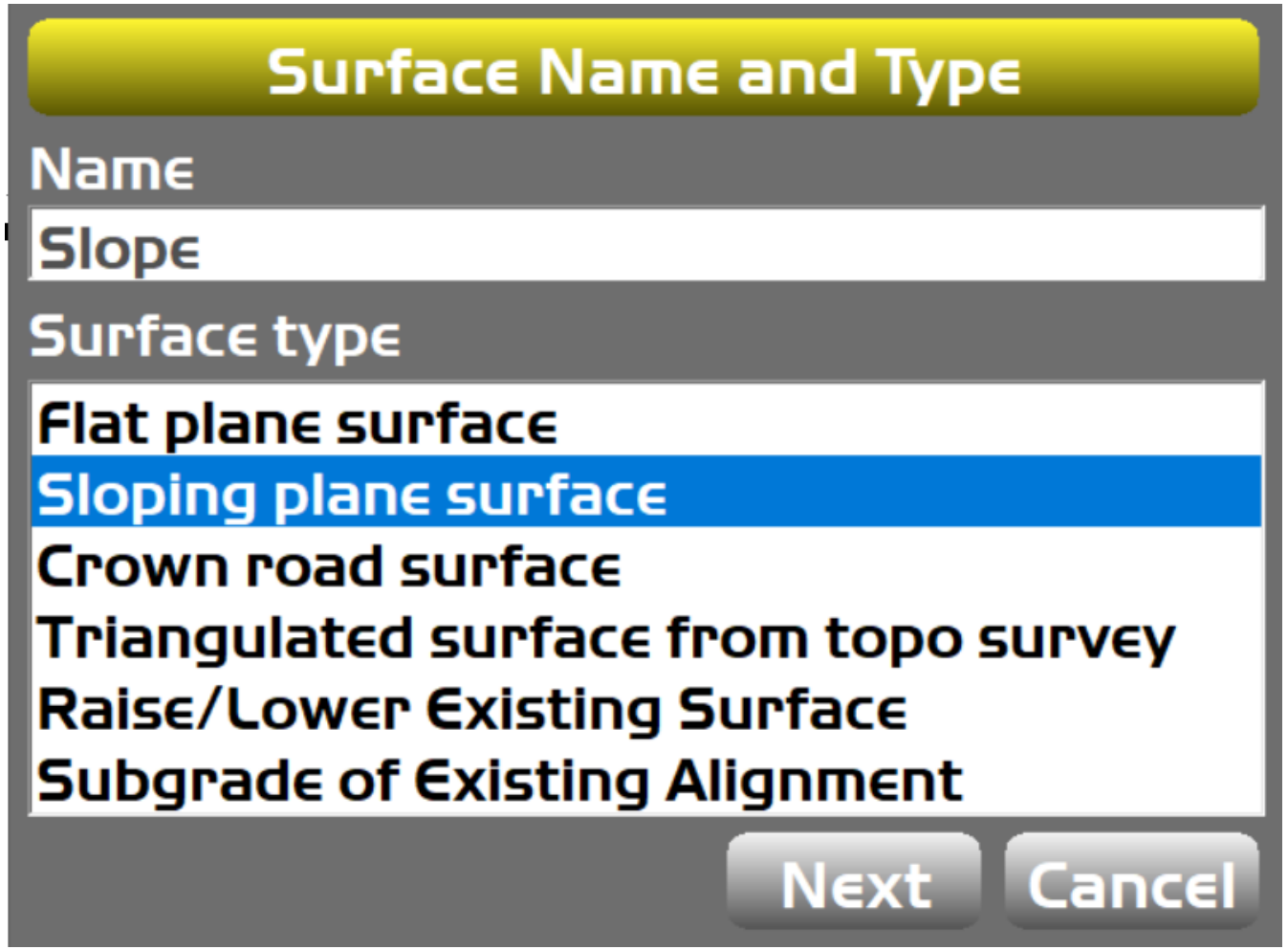
3D Surface without Modeling



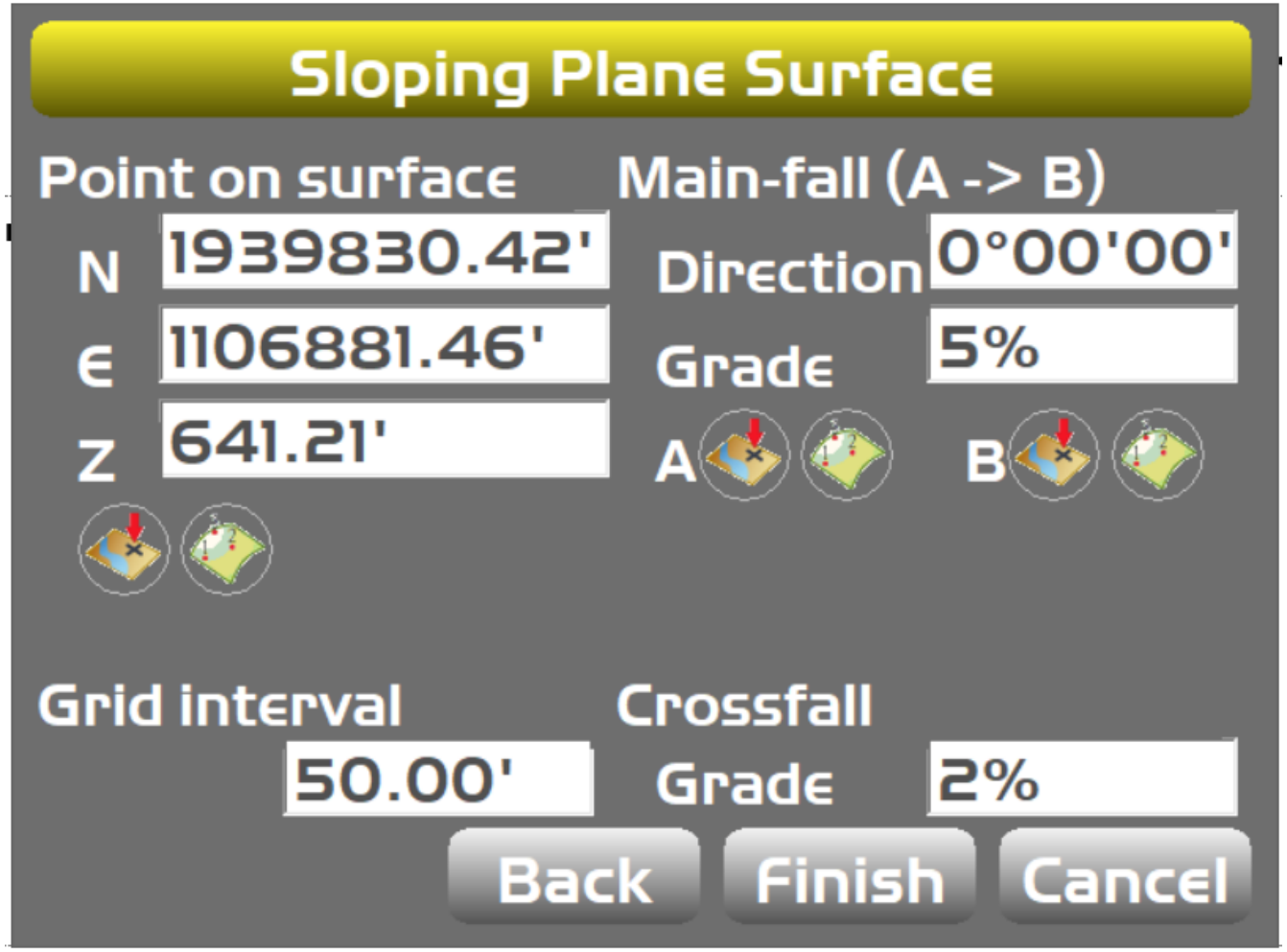
3D Surface without Modeling



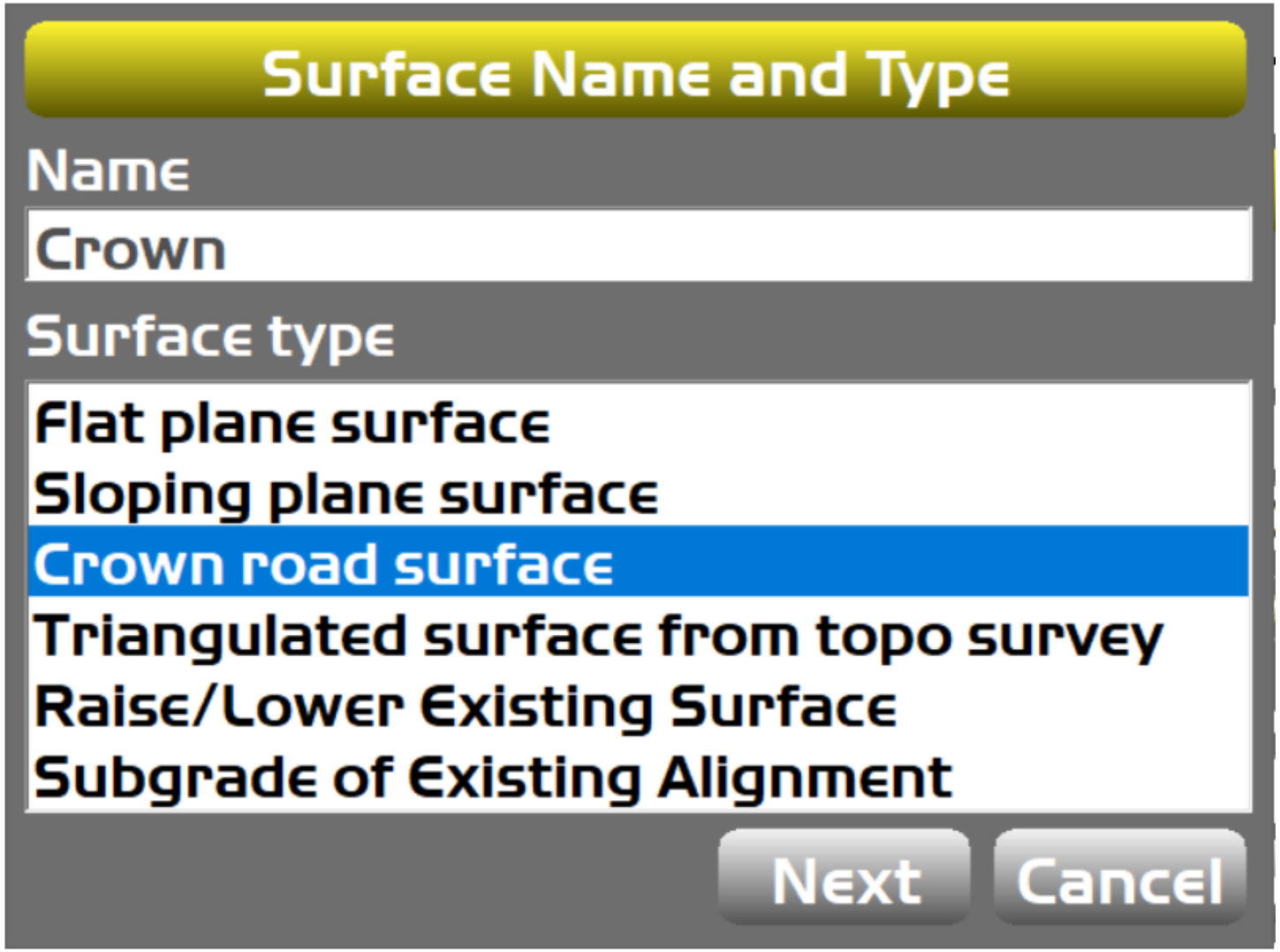
3D Surface without Modeling



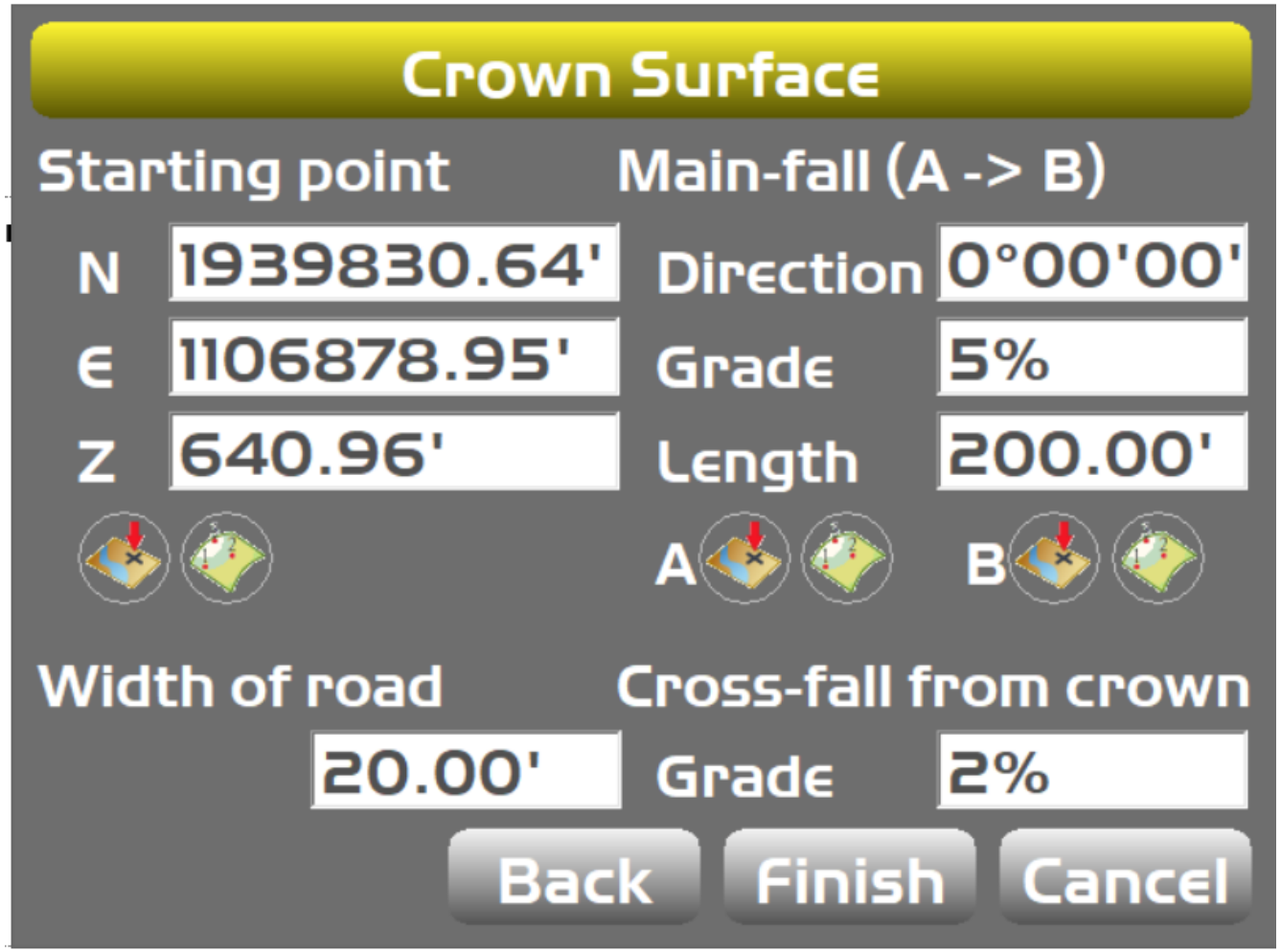
3D Surface without Modeling



3D Surface without Modeling



3D Surface without Modeling

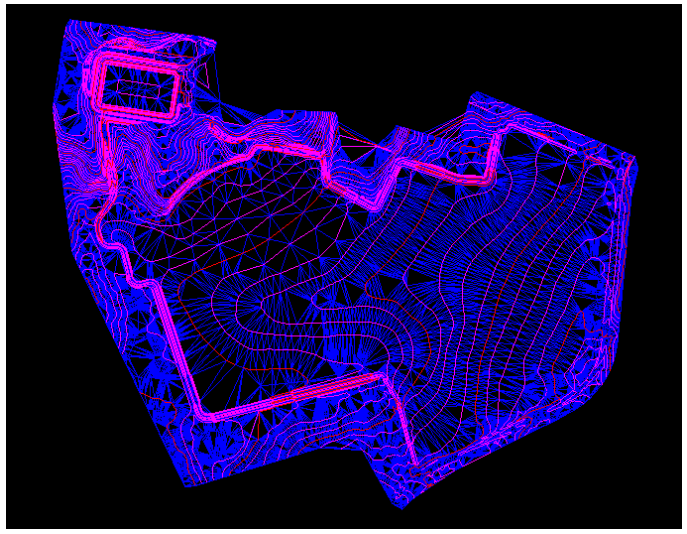


3D Machine Control

3D Processes

Survey

Design



Machine Control

3D-GPS
Machine Control

3D-GPS
Machine Control

Mast vs Mastless

3D-GPS
Machine Control

- No installation of antennas or cables
- Turn on and go

Mastless

3D-GPS
Machine Control

- More input choices
- GPS Antenna
- mmGPS Antenna
- LPS Prism
- Laser Receiver

Mast Systems


File
Control
Tools
View
1.0'
0.0'
1.0'
+0.00'
0.00'
3.0%
3D
TOPCON

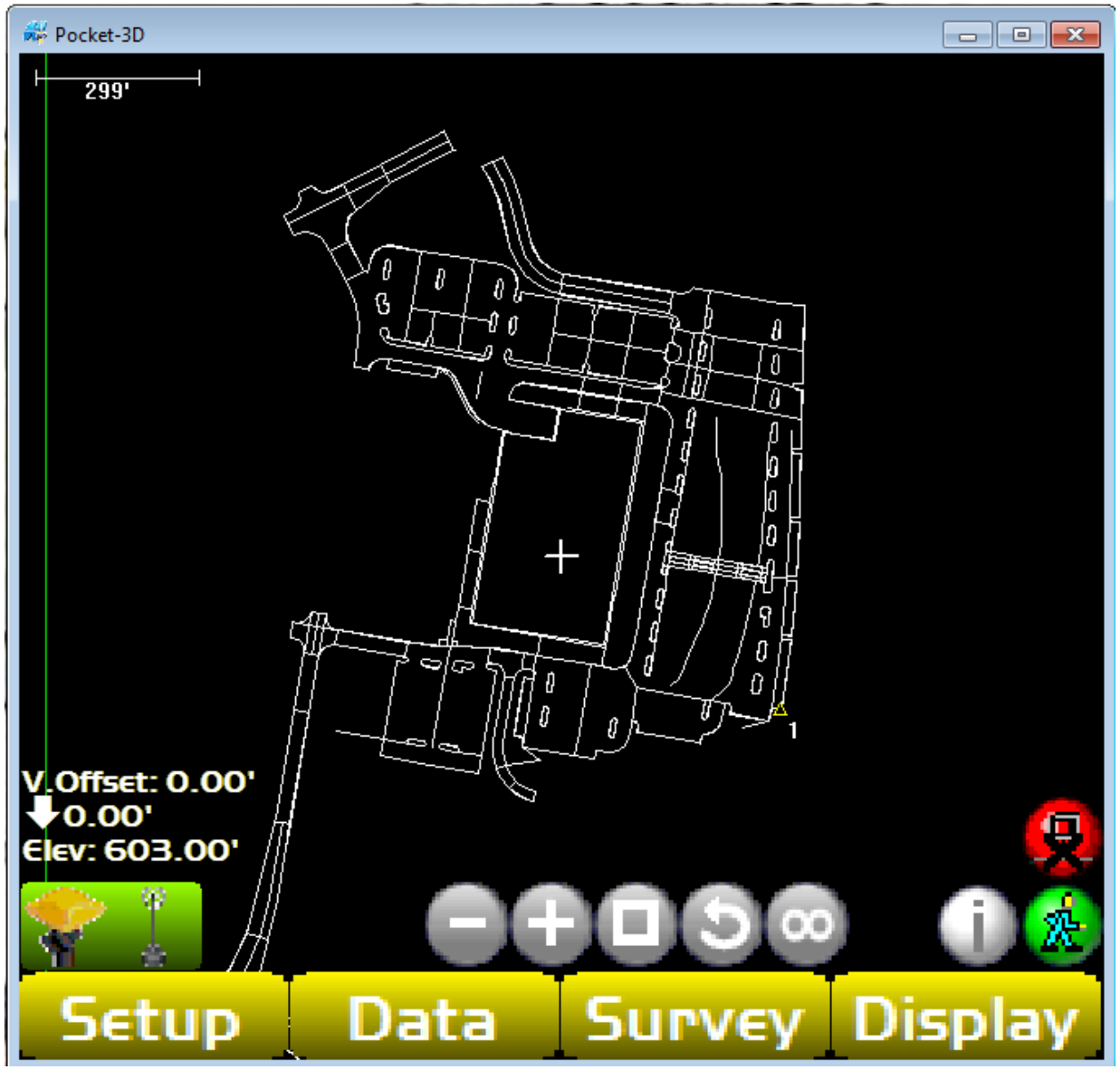
Machine Utilization




Grade Checking
Pocket 3D

Grade Checking

- Grade checking can be easily done by one individual with minimal training
- Grades can be quickly checked anywhere on the 3D surface at any time
- Easily apply offsets to account of pavement and sub-base thicknesses


Pocket-3D
299'
V.Offset: 0.00'
0.00'
Elev: 603.00'
Setup
Data
Survey
Display

Questions?

TOPCON

Thank you.

TOPCON