3D Modeling for Contractors
The Constructible Model

Joel Brown
Established in 2012 in Columbus Ohio
Specializing in:
- Automated Machine Guidance
- Site Positioning & Control Systems
- Constructible Modeling Software

SITECH Ohio – a construction technology partner for the 21st Century

- Major brand vendor
- Work with hundreds of Civil Contractors
- Sales
- Support
- Training
1990’s Construction Technologies…
30 years later… its here… all of it.
The Construction Continuum

1. Feasibility Planning
2. Detailed Planning
3. Detailed Design
4. Estimating & Bidding
5. Planning & Scheduling
6. Execute Construction
7. As-Built Sign Off
8. Maintenance
The Constructible Model
The Constructible Model

What is a “Constructible Model”? 
The Constructible Model – Why?

- Using Outdated Methods in Specs.
- 2D paper plans do not show 3D construction reality
- Errors in CAD Data or Paper (PDF) Plans (BAD CAD)
- Inaccurate Level of Detail in Plans (Missing Critical Information)
- Design issues discovered after excavation has started. (Conflicts)
- Existing ground quantities issues discovered after excavation has started.
- Construction site progress not linked to plans (Scheduling/Workrates)

How much would be saved if these issues can be eliminated on future projects?
The Constructible Model – Why?

- Constructible modeling for the Contractor is the secret to HOW ATC’s can harness construction Contractor expertise
- With Constructible modeling software a Contractor has foresight into
- Shortening construction time
- Reducing Project Costs
- Advancing new and more effective designs, technology, materials and construction methods
The Constructible Model - Data

Ohio Department of Transportation Files

PID84868.zip
The Constructible Model - DATA
The Constructible Model - Benefits
Data Prep & 3D Model Conversion

- Automated File Clean Ups
- Elimination of Duplicate Lines
- Elimination of Empty Layers
- Mass Joining of Entities
- Mass Elevation of Entities
- Layer Standardization & Org.
- Field to Finish Mapping
- More…
The Constructible Model - Software

Built in “Holistic Civil Super Systems” for Contractors

- Survey Data Reduction
- Civil Design & Drafting
- Construction Takeoff/Estimating
- Construction Data Prep
- Construction Planning
- Project As-builts/GIS
- More…
The Constructible Model - Benefits

Survey Data Reduction

- Total Station Data Reduction
- RTK Data Reduction
- GNSS Post Processing
- Level Data Reduction
- UAS Data Processing
- Photogrammetry/Scanning
- Field to Finish Mapping
- More…
The Constructible Model - Benefits

CAD Functionality

- Create/Edit Objects:
  - 2D/3D Linestrings
  - Arcs/Circles
  - Text
  - Layers
  - More…
The Constructible Model - Benefits

Surface Tools

- Create DTM/TIN/TTM:
- Using any 3D Data:
- Points
- Linestrings
- Contours
- Point Clouds (LIDAR)
- More…
The Constructible Model - Benefits

Site Design

- 3D Linestring
- VPI Commands
- Vertical Curves
- Elevate Objects
- Lines
- Pads
- Contours
- Variable Offset
- Surface Tie
- Surface Slicer
The Constructible Model - Benefits

Corridor Design

- Runways, Roads, Rails, Paths, Ditches/Trench
- Horizontal/Vertical Alignments
- Typical Sections Built from instructions
- Including Layers of Materials
- Automatically creates Finished Surface
- Dynamic
The Constructible Model - Benefits
Intersections, Roundabouts, Cul-de-Sacs

- Dynamic
- Parametric
- Turn Lanes
- Islands
- Surface Models
The Constructible Model - Benefits

Image Management

- Dynamic
- Import Images
- JPG, TIFF, PDF, More…
- Georeference Images to site location
- Import Vector PDF
- Drape over Surface Model
The Constructible Model - Benefits

Site Quantity Takeoff Tools

- Apply Materials/Site Improvements Areas
- Strata/Boring Data
- Subsurfaces
- Digitize
- Area /Length Count Reports
- Takeoff Reports
- Mass Earthwork
- Material Quantities
The Constructible Model - Benefits

Road Quantity Takeoff Tools

- Create Stored Sections
- Digitize PDF Cross Sections
- Create From CAD Cross Sections
- Generates a Corridor from the Cross Sections
The Constructible Model - Benefits
Plan Production & Drafting Capabilities

- Publish Plan Sets
- Plan Sheets
- Grid Sheets
- Profile Sheets
- Cross Sections
The Constructible Model - DATA

MACHINES – capture Topo/Performance/Productivity

- Passive Survey
- Machine Mapping Enabled
- Import Data from the Machine
- Productivity Monitoring
- Cut/Fill
- Coverage
- Elevations
The Constructible Model - DATA

DRONES/SCANNERS LiDAR – Photogrammetry & Point Clouds

- Import Point Cloud Files
- Create Regions
- Classify/Clean Data
- Build Surfaces
The Constructible Model - DATA

SURVEY INSTRUMENTS – Base Stations / Rovers / Total Stations

- Rover & TS Topography
- Mapping
- As Built / Feature Coded
- Select Quantities
The Constructible Model - Evolution

CURRENT

2D Drawings
Single discipline
Manual and CAD
Discipline approach

3D Models
Single discipline
Limited intelligence
Discipline approach

3D Collaboration Models
Multi-discipline
VR visualization
Project collaboration

BIM for Infrastructure
Multi-discipline and workflow support
Intelligent object model
Lifecycle value

FUTURE

ISOLATED

COLLABORATIVE

INTEGRATED
The Constructible Model - FUTURE

- More than surfaces, points and lines
  - Infrastructure management
  - Design, construct, as-built
  - Field collected / office generated
  - Sub models
    - Geology, imagery, GIS, structures, tunnels, rail, road, point clouds, utilities
    - Features and processes
  - Centrally managed
  - Mixed Reality Visualizations
The Constructible Model - FUTURE