

3D Modeling for Constructability in an Urban Area

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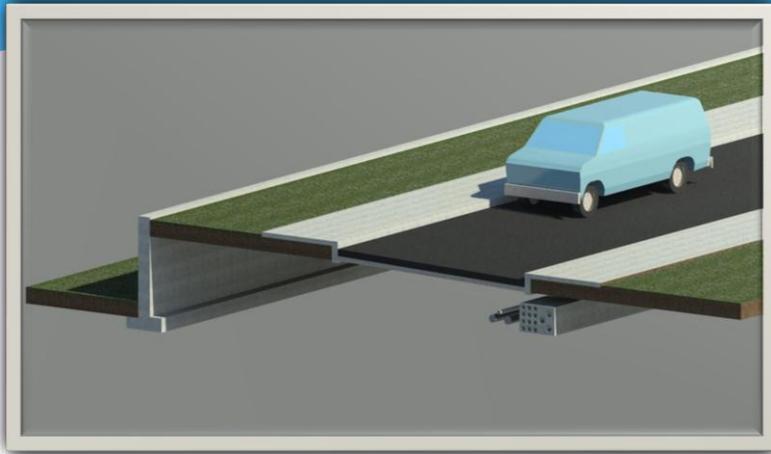
Sundt Construction, Inc

- Project Types
 - Highway / Infrastructure
 - Mining & Industrial
 - Commercial
 - Hospitality
 - Education
 - Laboratories
 - Military
 - Federal
- Self Perform Concrete, Civil, Piping (Mechanical and Yard)
- 90+ VDC Projects Completed



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Sundt Transition BIM to VDC



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Construction Cost Factors

- **Equipment**
 - Fuel
 - Maintenance
- **Labor**
 - Wages
 - Overtime
- **General Conditions**
 - Schedule
 - Safety
 - Supervision
- **Material**
- **Fee**



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VDC Focus

- **Equipment**

- Efficient Material Movement
- Accurate Material Placement

- **Labor**

- Early Work Plans
- Do it right the first time

- **General Conditions**

- Minimize Schedule
- Maximize Safety
- Keep Supervision in the Field

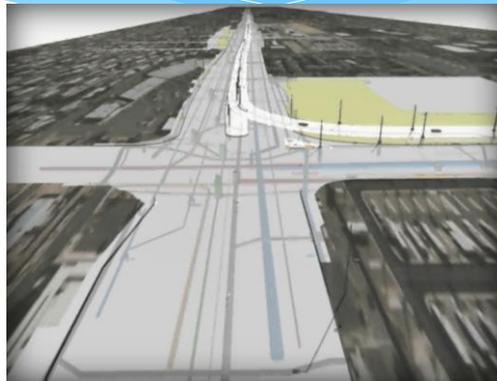


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Underground Utilities

Northwest Extension Lightrail (3.25 Miles - \$165 Million)

- CM@R Delivery
 - HNTB Design
 - Sundt / Stacy and Witbeck JV
 - Co-Located during Precon
- Communication
 - Design / Construction
 - City of Phoenix
 - Utility Companies
- Issue Resolution
 - Verification of Existing Utilities
 - Coordination of New Construction
- Accurate As-Built Data



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Problem Overview

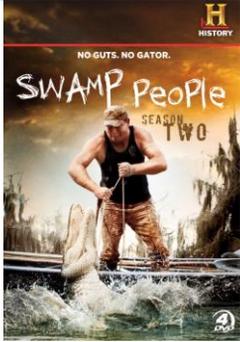
11,000 LF Sewer — 45 Feet Deep




28 Days



16 Minutes





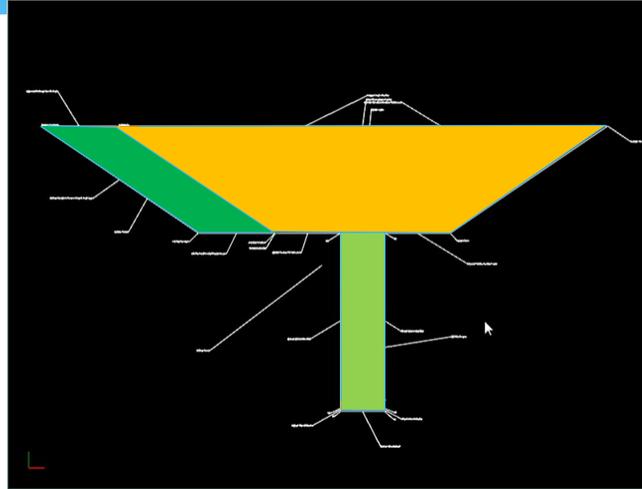
Problem Overview

- OSHA 20' Deep Trench Limit
- Dirt Volume Moved

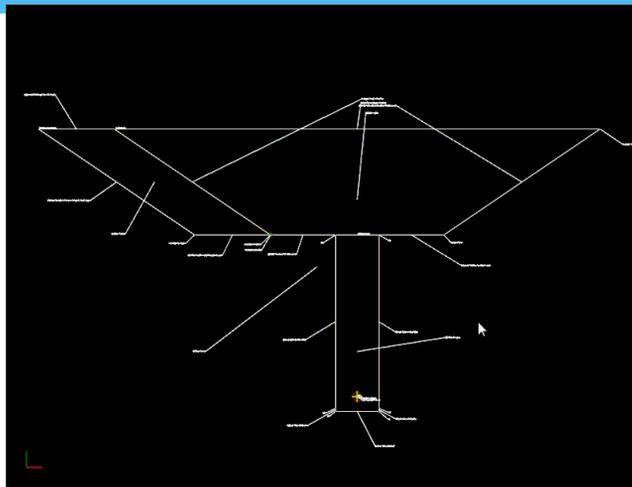
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Smart Idea from the estimator

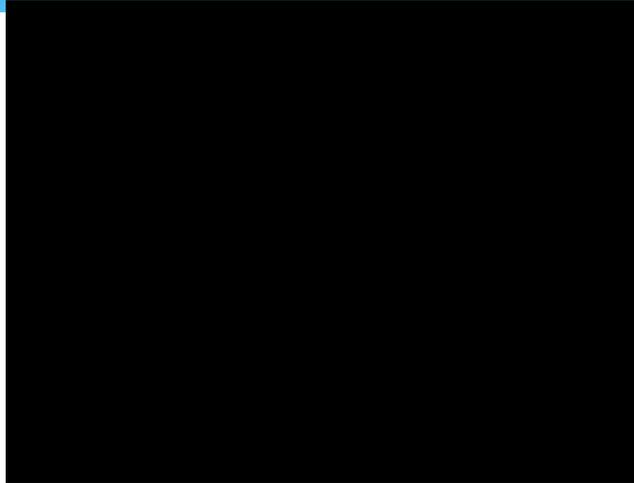
Work Planning and Estimating



Automated Material Quantities

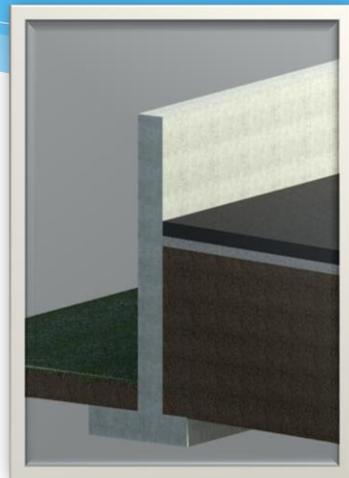


Proper Planning and Pricing



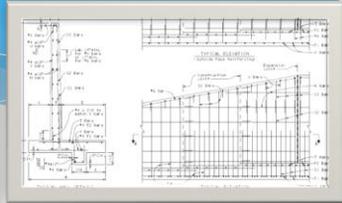
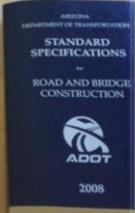
Trench Automation Worked, Let's try other Applications

- Retaining Walls
 - Standard DOT Details
 - Multiple Configurations
 - Table Based
- Quantifiable
 - Excavation
 - Backfill
 - Concrete Volume
 - Formwork Material



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Historic Estimating Tools



Dimensions		Steel List												Quantities	
H	#	S1	S2	S3	H	V	B	F1	T	F2			Fr.	Pr.	
													Lbs.	Lbs./Sq. Ft.	
6'	6'-3"												38	1450	
5'	6'-3"												40	1520	
6'	6'-3"												40	1640	
7'	6'-3"												45	1740	
8'	6'-3"												50	2110	
9'	6'-6"												55	2210	
10'	6'-6"												60	2540	
11'	7'-3"												65	2504	
12'	8'-0"												75	2410	
13'	8'-6"												85	2510	
14'	9'-0"												105	2740	
15'	9'-6"												110	2880	
16'	10'-0"												120	3160	
17'	10'-6"												145	3300	
18'	11'-0"												160	3580	
19'	11'-6"												170	3730	
20'	12'-0"												200	4000	
21'	12'-6"												220	4150	
22'	13'-0"												235	4430	
23'	13'-6"												260	4600	
24'	14'-0"												270	4920	
25'	14'-6"												285	5110	
26'	15'-0"												330	5470	

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Retaining Wall Assemblies

Technical drawing showing cross-sections of retaining wall assemblies. It includes labels for 'Retaining Wall', 'Exit Ground', 'Finished Grade (FF) Shown On Plans', and 'LEGEND'. The drawing shows the wall's profile and its relationship to the ground and finished grade. A 'Steel List' and 'Quantities' table are also present.

Dimensions		Steel List												Quantities	
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Planning the Work (or NOT)



Not Planning the Work (Case Studies)

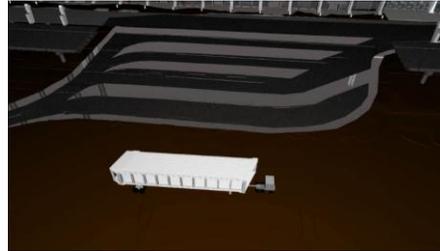
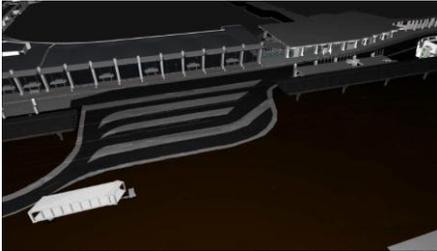
- Project 1
 - Rework Costs
- Project 2
 - Underground Utilities @ Intersection



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Planning the Work (San Diego Airport Landside Improvements)

- Install Pedestrian Bridges
 - Each bridge approximately 120' long
 - Bridges span active roadway
 - Install each bridge in 1 night



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Planning the Work (San Diego Airport Landside Improvements)

- Successful Plan



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Planning the Work (Fort Worth's Seventh Street Bridge)

- The Project
 - 150 Calendar Days to Close Existing and Open New Bridge
 - 981 Feet Long – 6 Spans
 - 88 Feet Wide
- The Plan
 - Cast Arches Offsite
 - Construct New Piers
 - Use Existing Bridge to Transport and Install Arches
 - Demo Existing Bridge, Install Precast Beams and Planks, Pour Deck



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Team Concerns (Fort Worth's Seventh Street Bridge)

- Arches cast offsite
 - Size and Weight
 - Transporting
 - Installing
- Geometry
 - Post Tensioning
 - Rebar
 - Cable Embeds
 - Embedded Lights
- **Each Arch = \$850,000**



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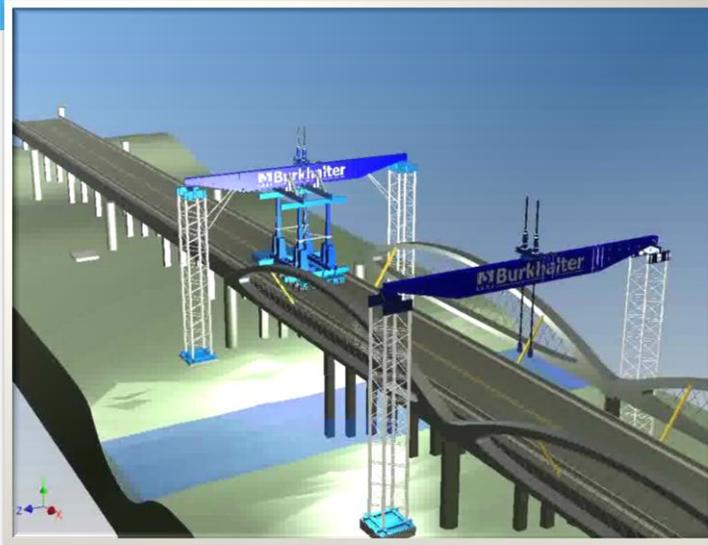
Stand Up Tall



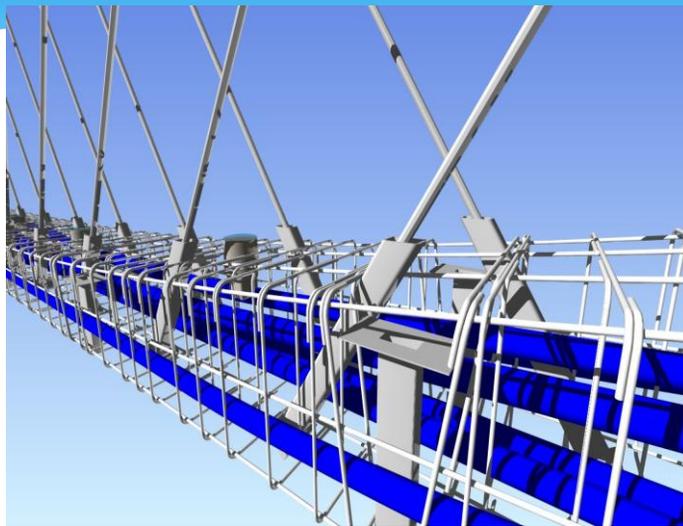
Making the Move



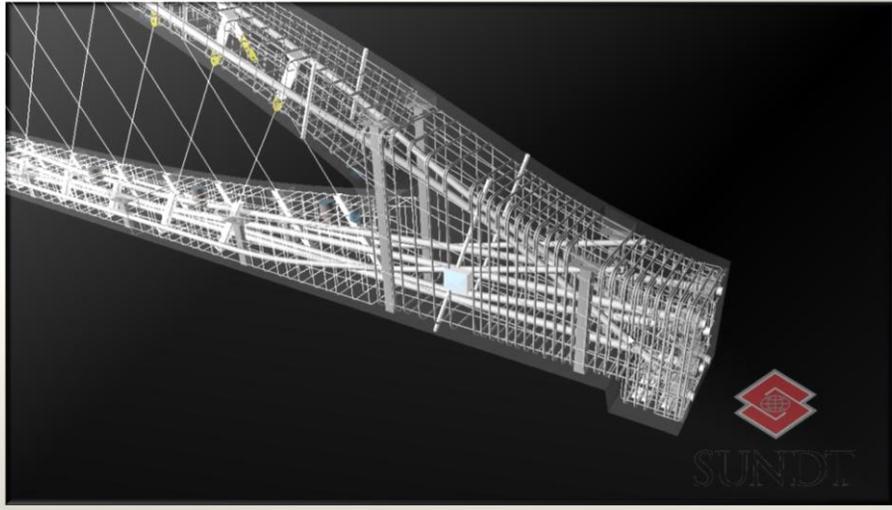
Moving the Movers



Geometrically Speaking



Spatial Validation



Conclusion VDC = Planning

- Planning
 - Design Validation
 - Coordination of Items
 - Efficient Construction Methods
 - Reduced Schedules
 - Lower Construction Costs



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