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Autodesk



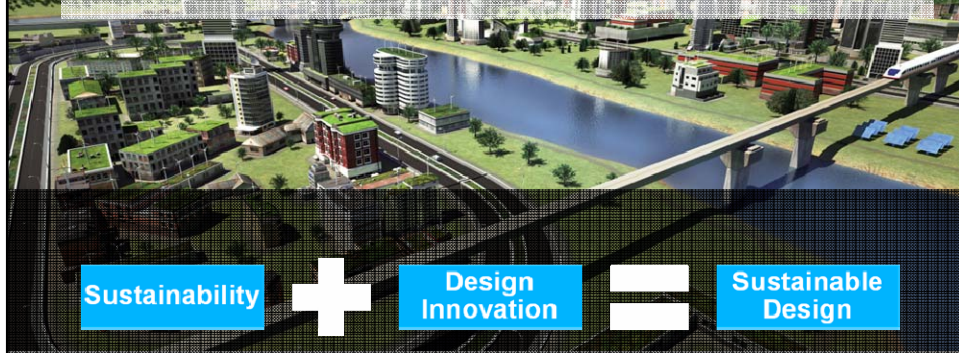
- 12+ years at Autodesk
- 28 years in professional practice - Civil Engineering, Surveying, Land Development and Sustainable/Natural Resource Mgt.
- Leads Autodesk's Industry Strategy and Relations around Transportation, Land Development, Environmental and Heavy Construction
- 20+ years as worldwide author/presenter around the impact of technology and sustainable practices into AEC and Geospatial firms and their processes

Discussion Topics

- Sustainability - Business Drivers
- Sustainable Design of Infrastructure
- BIM – The Geomatics Foundation
- Sustainable Infrastructure - Evolving Workflow

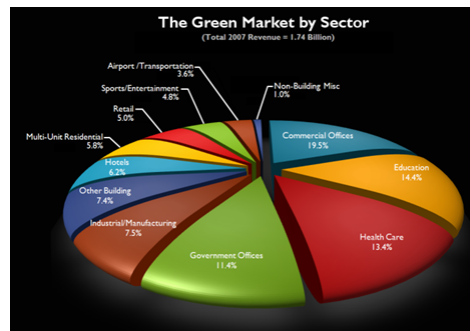
Sustainability

Meeting the needs of the present while **improving** the ability of future generations to meet their own needs.









Sustainable Design in Practice

- Engineering News-Record (ENR) now tracks the top 100 green firms
- In 2007, the worldwide green project revenue was \$1.74 billion (\$1.6 billion in the United States)
- Green building codes are now used in 28 percent of U.S. cities
- Sustainable design methods are now incorporated in commercial, education, and health care projects



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Sustainable Design – Outcome Not Prescriptive

	Energy Lighting and equipment Heating, cooling & ventilation		<ul style="list-style-type: none"> Minimize operating energy Utilize renewable energy Select and design site
	Water Potable supply for occupants Non potable supply for processes		<ul style="list-style-type: none"> Reduce water use Reclaim gray water
	Materials Structure, envelope & finishes Furnishings & equipment Construction Materials		<ul style="list-style-type: none"> Seek renewable resources Minimize embodied measures Less Waste
	Land Site Selection/Land Utilization Storm water run-off and quality		<ul style="list-style-type: none"> Site Selection & Optimization Manage Hydraulics & Hydrology

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Compelling Events Driving Sustainability

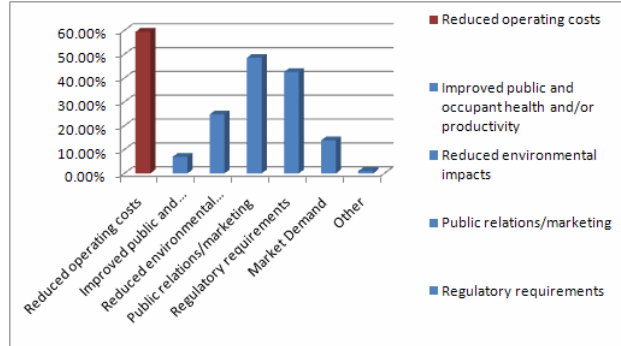
Challenges

- Water officials are keeping a close eye on a 70-mile stretch of the California [Aqueduct, which supplies drinking water](#) to the southern part of the state. The aqueduct [has sunk six feet due to increased pumping](#) from the underground aquifer running below the canal
- New York's Delaware Aqueduct may be [leaking millions of gallons](#) of drinking water, according to environmental group Riverkeeper. A [10-foot sinkhole](#) near the Danskammer power plant developed along the 85-mile aqueduct, and concerned residents contacted the Department of Environmental Protection

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Primary Business Drivers

- Importance of reducing operating costs
- Visibility currently tops regulations & environmental impact




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2009 Trends Survey

Compelling Events Driving Sustainability

Opportunities

- Engineers with New Jersey-based Axion International Holdings have [designed two bridges made of 170,000 pounds of recycled plastic](#) that are capable of supporting the crossing of a 70-ton Army tank.
- The owners of the Empire State Building have spent \$120 million to make the skyscraper [more environmentally friendly](#) as part of an effort to attract tenants, and others are doing the same.
- China will begin construction of a 120-billion yuan (\$17.6 billion) [20 GigaWatts \(GW\) wind power project](#) in about two weeks in Gansu province as part of a major push to boost renewable energy and cut the nation's reliance on coal

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Civil Engineering Sustainable Design

Transportation	Land Development	Environmental
Green Highways Partnership Transit Orientated Development Context Sensitive Design	LEED – ND/NC Low Impact Development New Urbanism	Rural Land Stewardship Wetland Remediation Environmental Impact
		
“Market redefinition from compliance driven to driven by need for sustainability”	“Site Selection and Site Optimization to minimize ecological impacts”	“Environmental streamlining & stewardship in all aspects of the highway lifecycle”

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The Triple Bottom Line

Economic Benefits


- Reduces the overall operating cost
- Improves productivity in employees

Environmental Benefits

- Enhances local ecosystems
- Increases biodiversity for natural species
- Reduces greenhouse gas emissions

Social Benefits

- Enables environmentally conscious construction
- Improves the health of staff
- Reduces strain on landfills



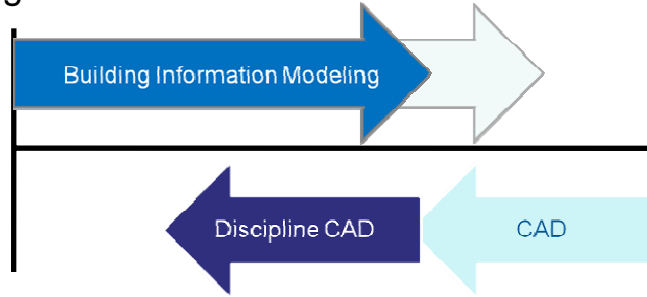
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BIM – a Cultural Change

There's more to a project than just drafting

Design

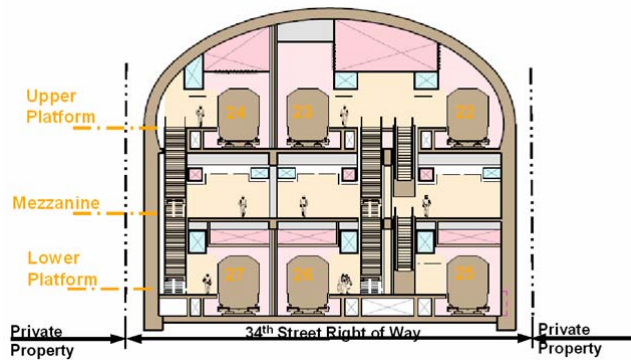
Documentation



BIM is a holistic design approach that focuses on design support for visualization, simulation, analysis and collaboration

Traditional 2D to 3D CAD Design

NJ Transit – Trans Hudson Express



Images Courtesy of Parsons Brinkerhoff

Model Based Station Design & Visualization

NYCT #7 Extension



Images Courtesy of Parsons Brinkerhoff

Model Based Station Design & Visualization

NJ Transit – Trans Hudson Express



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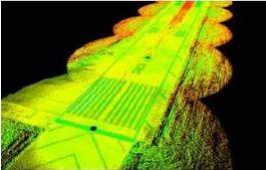
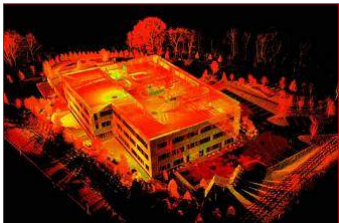



Sustainable Infrastructure



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Impact of Terrestrial Scanners






Traditional Survey

- Total Station Survey
- One 2-man crew
- 25 Crew Nights

Laser Scanning Survey


- 3D Laser Scanning
- Two 2-man crews
- 8 Nights (16 Crew Nights)



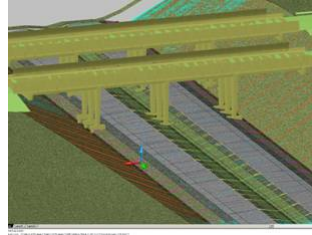
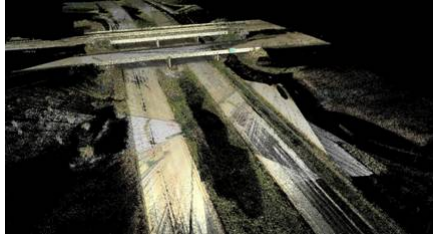
Source: Metco Services

	Scanning	Conv.
Field days	4	12
Field staff	2	4
Office man-hrs	60	80
Duration	8 days	15 days
Other costs	\$0	\$15,000 for lane closures

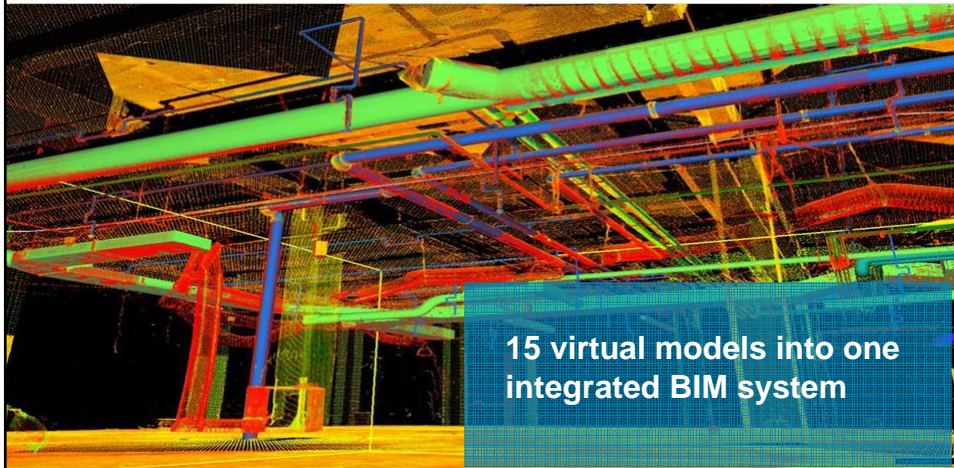
Source: SparPoint 2005 Case Study



Bridge & Other Above Ground Structures



BIM Utilization: Laser Scan for Existing Conditions



15 virtual models into one integrated BIM system

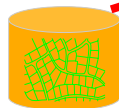
Site Selection – Conceptual Design

- Buffering/Filtering analyses of wetlands, soils, topology, demographic, etc. information to optimize location of infrastructure on site
- Site Solar/Shading for Heat Island effects
- Network Analysis to determine proximity to assets

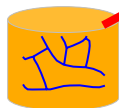


Spatial Analysis for Site Selection

Data from multiple spatial sources for site selection and optimization



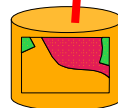
Parcel data



Utility data



Property Data



Zoning data



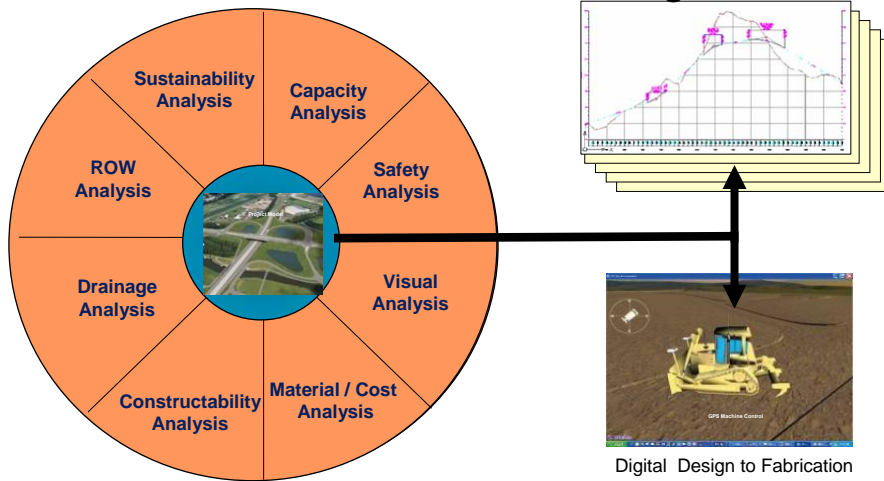
Aerial photos

Detailed Design – Site Optimization

- Erosion Control
- Slope Gradient analysis to minimize run-off
- Maximize Water Infiltration– swales, pipes, ponds, ditches, dry river beds, permeable pavements
- Maximize Storm water re-use - Staged water storage analysis
- H&H Storm water analysis
- Pipe Network Design

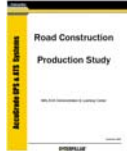


BIM - Model Centric Design



Digital Design to Fabrication

McAninch Construction Company



- McAninch: Reduce fuel consumption by **43%** GHG emissions
- RCPS:
 - Fine grading **214 passes down to 60** – 1 mile of road
 - Providing our clients with a more accurate product – base course grade checking **45% accurate vs 98%**

“Traditional processes of paper plans, stakeout sheets and grade stakes used to take up to a week to implement. Now with GPS machine control and 3D models from designers, that same size project can take hours “

- Tim Tometich, GPS division manager, McAninch Corporation

Malphrus Construction Company

- 2 million-square-foot building pad
- 50 acres of parking lot
- Moving approximately 600,000 cubic yards of material
- A four-acre section graded in **2-1/2 days**. Conventional way with driving hubs every 25 feet, **would have taken 6 days**
- Finished pad **consistently within a 1/2” of the plan** throughout the whole expanse, **1/3rd of the mandated tolerances**.



“We’re completing projects sooner, and we’ve literally cut our rework by 70% by using the GPS system.”

Joey Keiffer, General Superintendent –Malphrus Construction

Geomatics & Sustainable Infrastructure

Geomatic Types

- Geospatial data support and analysis (utility, zoning etc.)
- Topographic, earthwork analysis & GPS
- Environmental, Hydrology and hydraulics analysis



Role in Sustainable Infrastructure

- Identify best sites for infrastructure development/redevelopment
- Minimize impact of infrastructure development on environment
- Incorporate efficient water management systems

