CI13017-R
Understanding the Benefits of BIM for Civil Infrastructure: The Wisconsin Case Study

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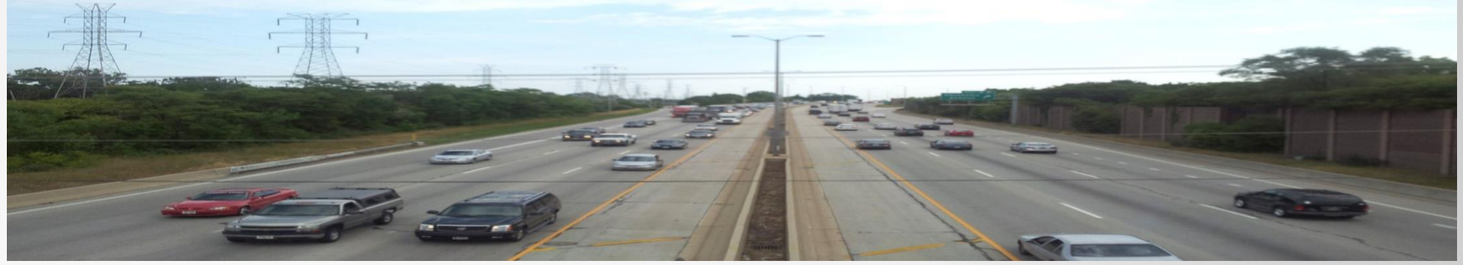
Speaker Bio



- **Lance Parve, MSEng, PG, GISP**

Mr. Parve works as a Sr. Project Engineer and BIM-CIM Coordinator for SE Freeways at WisDOT. His work involves planning, design, and construction for transportation projects greater than $500 million and also provides CIM-CAD-GIS, 3D technologies, and LiDAR integrated survey coordination and support. Working for WisDOT since 2007 involving public sector work, with 15 years previous involvement in private sector civil and environmental infrastructure work, he has been involved in numerous successful planning, design, and construction mega-major civil transportation projects at WisDOT. He is also involved on the SE Region Innovation Committee responsible for piloting, testing, and integrating new technologies at WisDOT. He has a MS Engineering degree, MS Certificate Urban Planning GIS degree, and a BS Geological Sciences degree from the UW-Milwaukee. Additionally, he serves as Co-Chairperson of the CIM-VDC Subcommittee of the National Academy of Sciences Transportation Research Board (TRB) ABJ95 Visualization in Transportation Committee.

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Southeast
Trust.Passion.Champions.

Class Summary

Is your organization fully embracing the BIM revolution and seeing a successful return on investment for your projects? Are you realizing the benefits and overcoming the challenges in deploying, implementing, and integrating BIM from Planning to Design to Construction to Life-cycle O&M?

This interactive roundtable session for innovation champions, leaders, and practitioners provides an open forum to discuss BIM in depth focusing on lessons learned, best practices, and costs-benefits involving comparative civil infrastructure transportation and AEC site design and construction projects. Join us as we candidly discuss both the benefits, costs, workflows, data flows, and challenges involving getting the most out of BIM.

Key learning objectives

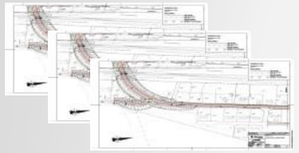
At the end of this class, you will be able to:

- Strategically plan civil infrastructure-AEC BIM-CIM implementation
- Integrate innovative BIM-CIM tools-technologies into organization workflows
- Incorporate multi-disciplinary workflows into BIM-CIM processes
- Develop effective BIM-CIM project execution plans (PxPs)
- Improve BIM-CIM return-on-investment (ROI) cost-benefits for projects
- Apply best practices for e-project delivery and lifecycle BIM-CIM

The Wisconsin Case Study: WisDOT SE Freeways

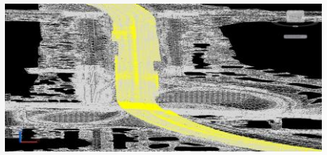
Where we are

2D CAD Models



Object Features
Objects Not Intelligent
No 3D TIN-DTM Surfaces
Geospatial
Multi Disciplinary 2D
Project-based

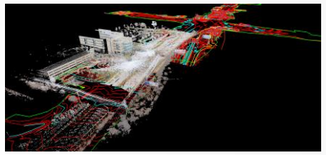
3D CAD Models



Object Features
Objects Not Intelligent
3D TIN-DTM Surfaces
Geospatial
Multi Disciplinary 3D
Project-based

Where we are going

3D CIM Collaboration Models

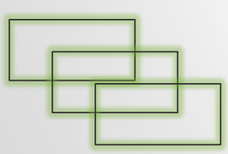


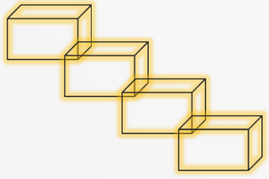
Intelligent Subassembly Features
Collaborative 3D CIM Databases
3D TIN-DTM-3D Face Surfaces
Geospatial
Collaborative Multi Disciplinary 3D
Project-based

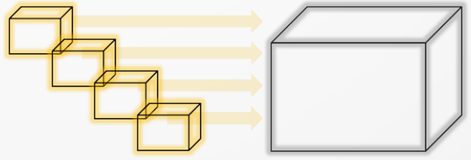
3D CIM Integrated Collaboration Models

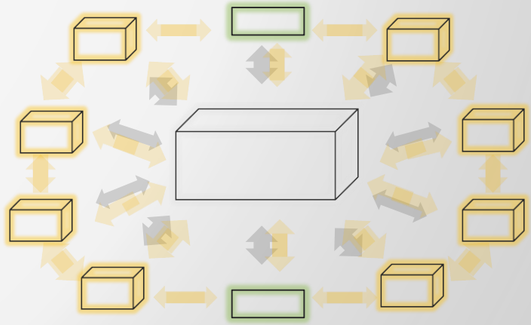
Intelligent Subassembly Features
Integrated 2D-3D-4D-5D-xD CIM Databases
3D TIN-DTM-3D Face Surfaces
Geospatial
Integrated Collaboration Multi Disciplinary 3D
Life-cycle-based

ISOLATED | COLLABORATIVE | INTEGRATED









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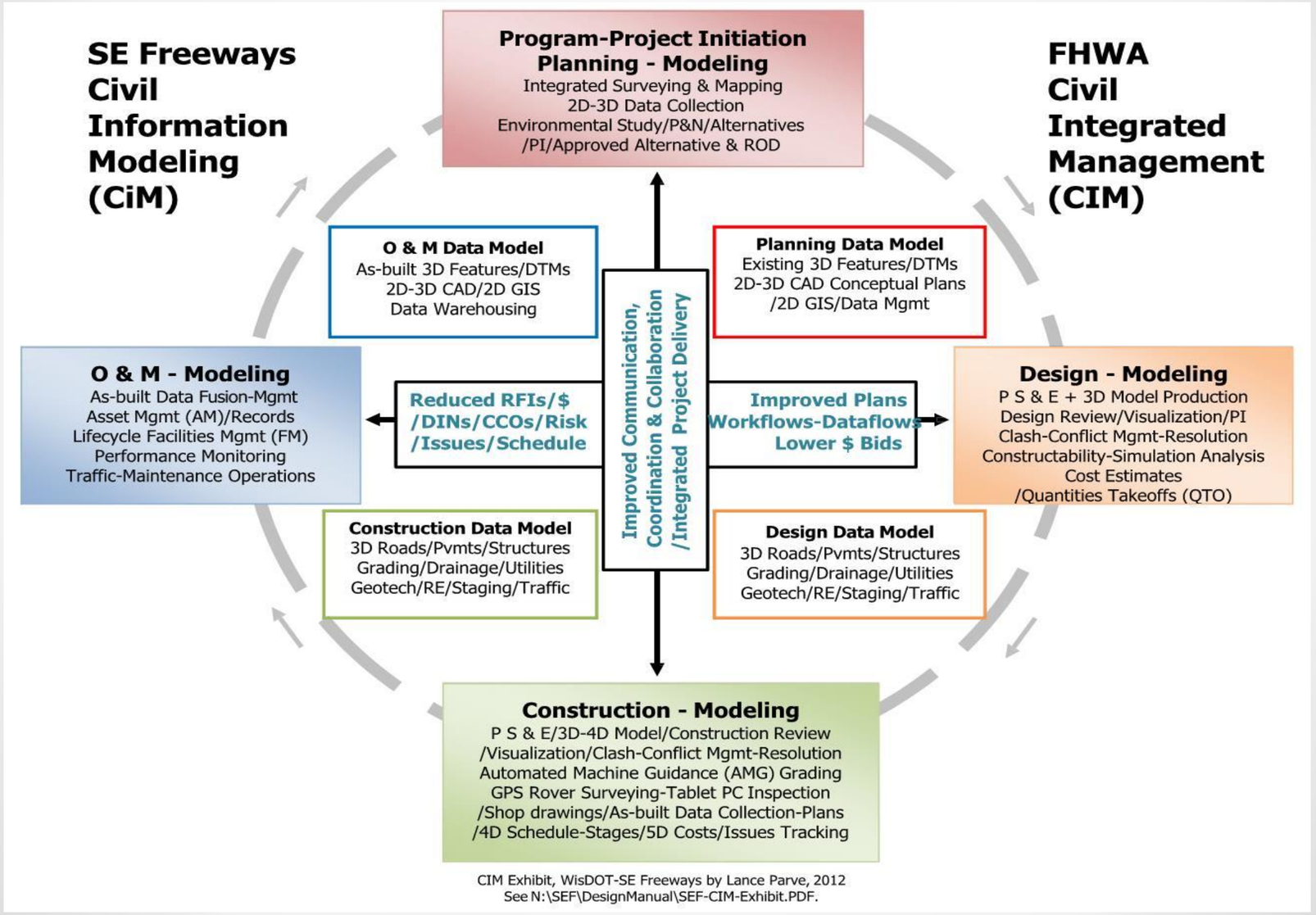

CIM Exhibit, WisDOT-SE Freeways by Lance Parve, 2012
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CIM 2D/3D Modeling: Marquette IC Construction: 2004-2008

CBA/ROI involving Contract Change Order Issues:

Marquette IC Construction Project-$810.0 m (construction completed)

Field Issues - $31.25 m (1,486 Items)

- Plan Changes (RFIs, Plan Submittals, Plan Omissions, Plan Conflicts, Shop Drawings, Calc Sheets, etc) 62.7% (796 items-$19.6 m)
- Miscellaneous: 20.3% (195 items-$6.34 m)
- Design Issues (Plan Inadequacies, Quantity Calculations, Premium Costs, etc.): 6.8% (312 items-$2.14 m)
- Request by Others: 4.3% (50 items- $1.33 m)
- Change/Credit to Specifications: 3.9% (72 items- $1.23 m)
- Safety Enhancement: 1.1% (42 items- $0.333 m)
- Cost Reduction Incentive (CRI) Submittals: 0.9% (19 Items- $0.280 m)

CIM 2D/3D Modeling: I-94 N-S Construction: 2009-2021

CBA/ROI involving Contract Change Order Issues:

I-94 N-S Construction Project-$1.9 b (construction ~45% complete)

Field Issues - $41.92 m (3,463 Items to date)

- Design Issues (Plan Inadequacies, Quantity Calculations, Premium Costs, etc.):
  37.7% (693 items-$15.8 m)
- Plan Changes (RFIs, Plan Submittals, Plan Omissions, Plan Conflicts, Shop Drawings, Calc Sheets, etc)
  36.3% (1,715 items-$15.2 m)
- Request by Others:
  15.6% (216 items- $6.53 m)
- Safety Enhancement:
  5.3% (206 items- $2.21 m)
- Miscellaneous:
  2.5% (433 items- $1.07 m)
- Cost Reduction Incentive (CRI) Submittals:
  2.0% (41 Items- $0.844 m)
- Change/Credit to Specifications:
  0.6% (159 items- $0.263 m)

CIM 3D Modeling: I-94 Mitchell IC Construction: 2011-2012

- $294.4m reconstruction of Mitchell IC – part of the 35-mile $1.9 b I-94 N-S construction
- Handles over 195,000 avg. vehicles per day
- Mitchell IC is over 10 miles of construction
- Construction involves 3 tunnels, 29 bridges, 1 system/4 service interchanges (including
- Airport Spur), 52 retaining walls, 16 noise walls, 4 box culverts, 83 sign structures & numerous utilities
- Temporary roads/structures to accommodate 2 lanes of traffic during construction
- 3D/4D CIM is piloted for Mitchell IC post Design for Construction

CIM 3D Modeling: I-94 Mitchell IC Construction: 2011-2012

CBA/ROI involving Contract Change Order Issues:

I-94 Mitchell IC Construction Project-$294.4 m

Field Issues - $22.2 m or 7.5% (651 of 669 DINs/CCOs)

- Plan Changes (RFIs, Plan Submittals, Plan Omissions, Plan Conflicts, Shop Drawings, Calculation Sheets, etc.):
  42.1% (274 issues)
- Construction Changes (CRI Submittals, Non-conforming Items, Facilitation):
  32.4% (211 issues)
- Design Issues (Plan Inadequacies, Quantity Calculations, Premium Costs, etc.):
  16.1% (105 issues)
- Differing Site Conditions (Soil Conditions, Utility Mislocations, etc.):
  9.4% (61 issues)
- Interdisciplinary Conflicts VDC-BIM-CIM Opportunities:
  6.9% (45 issues)
- Withdrawn:
  2.7% (18 Issues)

CIM 3D Modeling: I-94 Mitchell IC Construction: 2011-2012

CBA/ROI involving Contract Change Order Issues:

I-94 Mitchell IC Construction Project-$294.4 m

Mitchell IC, CD Road, 27th St, Airport Spur, College/Grange Avenues

Field Issues:Total - 22.2 m or 7.5% (651 of 669) (avg - $33,180) for DINs/CCOs

• GN-General:	30.5%	(148-$6.8 m)	($45,674 per issue)
• RD-Roadway/Drainage:	25.5%	(66-$5.7 m)	($85,631 per issue)
• WU-Wet Utilities/Drainage:	11.1%	(90-$2.4 m)	($27,120 per issue)
• BR-Bridges:	8.0%	(114-$1.8 m)	($15,557 per issue)
• NW-Noise Wall:	8.0%	(14-$1.8 m)	($125,909 per issue)
• RW-Retaining Wall:	7.7%	(78-$1.7 m)	($21,818 per issue)
• EW-Earthwork:	4.5%	(17-$1.0 m)	($59,220 per issue)
• EL-Electrical/ITS/FTMS:	2.6%	(93-$0.6 m)	($15,557 per issue)
• TR-Traffic:	2.1%	(26-$0.5 m)	($18,174 per issue)
• SS-Sign Structures:	0.1%	(23-$0.02 m)	($738 per issue)
		669	DINs/CCOs

CIM 3D Modeling: Zoo Interchange Construction: 2012-2019

- 9 miles of freeway + RRs
- 6 service interchanges
  - North Avenue
  - Watertown Plank Road
  - Bluemound Road
  - 84th Street
  - Greenfield Avenue
  - STH 100
- Major Arterial Roadways
  - STH 100/Mayfair Road
  - Watertown Plank Road
  - Swan Boulevard
  - Glenview Avenue
  - Greenfield Avenue

CIM 3D Modeling: Zoo Interchange Construction: 2012-2019

- $1.7 b reconstruction of Zoo IC-Corridor
- Handles almost 350,000 avg. veh per day traffic
- Over 15 miles of construction including arterials
- Construction involves 68 bridges including 6 RR structures, 1 system/7 service interchanges,

  108 retaining walls, 15 noise walls, 2 box culverts,115 sign structures & numerous utilities
- Temp roads/structures to accommodate 2 lanes of traffic during construction
- 3D CIM for all disciplines is deployed throughout Zoo IC Design-Construction

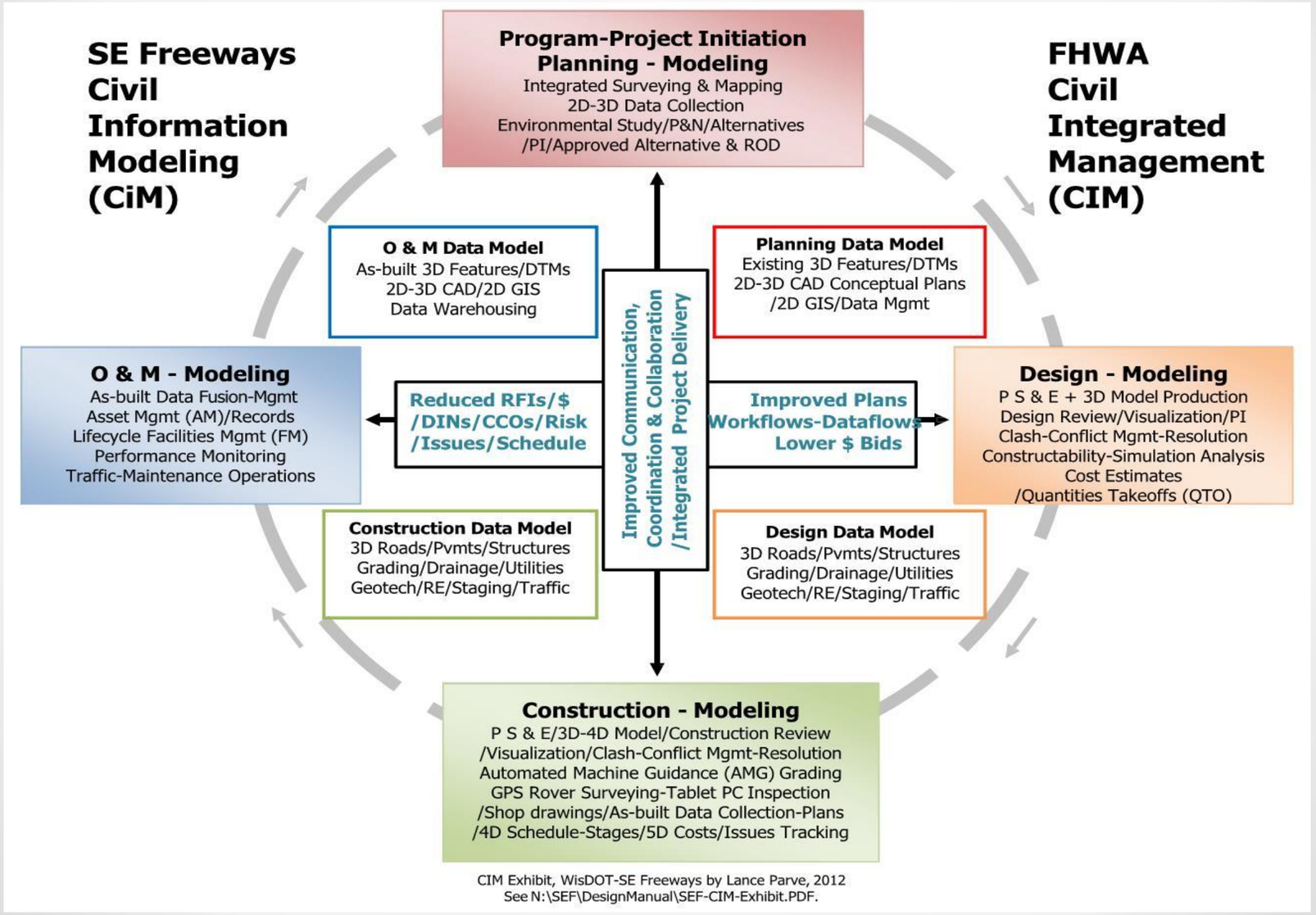
CIM 3D Modeling: Zoo Interchange Construction: 2012-2019

CBA/ROI involving Contract Change Order Issues (to date):

Zoo IC Construction Project- $446.5 m of 1.7 b total (% - Complete in 2019 as of 06/30/15)
STH 100, Glenview Ave, WTP Rd, Swan Blvd, STH 100/UP RR Bridges, Greenfield Ave, 76th St Bridge, Temporary Salt Shed, Traffic Mitigation, Advanced Signing, & Integrated Corridors , Core 1, Core 2
Field Issues - $11.67 m or 2.6% (1,263 DINs/CCOs – avg $9,244) w/ $2.86m Overrun-Underun Balancing-Equalizing Mods
Plan Inadequacy Issues - $3.4 m (166 DINs/CCOs – avg $20,500)

- RD-Roadway/Drainage: 38.8% (211-$4.53 m) ($21,474 avg per issue)
- GN-General: 31.2% (234-$3.64 m) ($15,568 avg per issue)
- EW-Earthwork: 13.6% (67-$1.59 m) ($23,779 avg per issue)
- BR-Bridges: 13.4% (102-$1.56 m) ($15,299 avg per issue)
- WU-Wet Utilities/Drainage: 9.8% (199-$1.15 m) ($5,776 avg per issue)
- EL-Electrical/ITS/FTMS: 6.4% (147-$0.747 m) ($5,079 avg per issue)
- TR-Traffic: 4.4% (103-$0.518 m) ($5,030 avg per issue)
- RW-Retaining Wall: 3.1% (37-$0.361 m) ($9,759 avg per issue)
- NW-Noise Wall: 1.7% (7-$0.195 m) ($27,867 avg per issue)
- SA-Safety: 0.9% (7-$0.107 m) ($15,217 avg per issue)
- SS-Sign Structures: 0.7% (18-$0.085 m) ($4,730 avg per issue
- LD-Landscaping: 0.2% (7-$0.026 m) ($3,753 avg per issue)
- O-Other/Demo: 0.1% (4-$0.017m) ($4,302 avg per issue)
- Overrun-Underun Mods: 24.5% (120-$2.86 m) ($23,820 avg per issue)

The Wisconsin Case Study: WisDOT SE Freeways



CIM Exhibit, WisDOT-SE Freeways by Lance Parve, 2012
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The Wisconsin Case Study: WisDOT SE Freeways

CIM MODEL REQUIREMENTS:
PROJECT NAME/ID

ELEMENT	FORMAT	LOA-CD	LOD-CD	TEMP/STAGING	QA/QC
R/W and Environmental Areas					
R/W-Proposed	DGN/DWG	0.01'	2D	N/A	
Easements-Proposed	DGN/DWG	0.01'	2D	N/A	
Fences-Proposed	DGN/DWG	<0.06'	2D	2D	
Wetlands-Located/Surveyed-Existing	DGN/DWG	<0.06'	2D	N/A	
Non-roadway Surfaces					
Surfaces-Existing	DGN/DWG/XML	<0.06'	3D	N/A	
Grading/Non-roadway Surfaces-Proposed	DGN/DWG/XML	<0.06'	3D	3D	
Cut/Fill Areas-Isopachs-Proposed	DGN/DWG	<0.06'	2D	N/A	
Longitudinal Breaklines /Surface Points	DGN/DWG	<0.06'	3D	N/A	
Slope Intercepts/Surface Limits	DGN/DWG	<0.06'	2D	N/A	
Roadways/Roadway Features Surfaces-Proposed					
Roadway Pavement-Top Surfaces-Proposed	DGN/DWG/XML	<0.02'	3D	3D	
Roadway Pavement-Base Course Surfaces-Proposed	DGN/DWG/XML	<0.06'	3D	3D	
Roadway Pavement-Subgrade Datum Surfaces-Proposed	DGN/DWG/XML	<0.06'	3D	3D	
Roadway Curb and Gutter -Proposed	DGN/DWG/XML	<0.02'	3D	3D	
Roadway Barriers -Proposed	DGN/DWG/XML	<0.06'	3D	3D	
Roadway Pavement Marking -Existing	DGN/DWG	<0.10'	2D	N/A	
Roadway Pavement Marking-Proposed	DGN/DWG	<0.10'	2D	2D	
Roadway Stationing-Proposed	DGN/DWG	0.01'	2D	N/A	
Roadway Alignments /Reference Lines-Proposed	DGN/DWG	0.01'	2D	N/A	
Superelevation Transition Stations-Proposed	CSV	0.01'	N/A	N/A	
Drainage-Storm Sewer – Proposed					
Drainage Inlets/MHs/Outfalls/ Pipes/Culverts/Ponds	DGN/DWG	<0.06'	3D	3D	

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Bridges-Proposed					
Stone Base	DGN/DWG/XML	<0.06’	3D	3D	
Piles	DGN/DWG/XML	<0.06’	3D	3D	
Footings	DGN/DWG/XML	<0.06’	3D	3D	
Abutments	DGN/DWG/XML	<0.06’	3D	3D	
Piers	DGN/DWG/XML	<0.02’	3D	3D	
CI Beams	DGN/DWG/XML	<0.02’	3D	3D	
Seats	DGN/DWG/XML	<0.02’	3D	3D	
Deck Including Fillets	DGN/DWG/XML	<0.02’	3D	3D	
Light Blisters	DGN/DWG/XML	<0.06’	3D	3D	
Parapet Walls	DGN/DWG/XML	<0.06’	3D	N/A	
Retaining Walls-Proposed					
MSE-Proposed					
Straps	DGN/DWG/XML	<0.06’	3D	3D	
Footings	DGN/DWG/XML	<0.06’	3D	3D	
Top	DGN/DWG/XML	<0.06’	3D	3D	
Coping	DGN/DWG/XML	<0.06’	3D	3D	
Cast-in-Place-Proposed					
Stone	DGN/DWG/XML	<0.06’	3D	3D	
Piles	DGN/DWG/XML	<0.06’	3D	3D	
Top of Footings	DGN/DWG/XML	<0.06’	3D	3D	
Face of Wall	DGN/DWG/XML	<0.06’	3D	3D	
Coping	DGN/DWG/XML	<0.06’	3D	3D	
Pile and Lagging-Proposed					
CI Piles at Top and Bottom	DGN/DWG/XML	<0.06’	3D	3D	
Face of Wall/Face of Piles	DGN/DWG/XML	<0.06’	3D	3D	
Bottom of Wall	DGN/DWG/XML	<0.06’	3D	3D	
Top of Wall/Coping	DGN/DWG/XML	<0.06’	3D	3D	
Face of Piles	DGN/DWG/XML	<0.06’	3D	3D	
Top and Toe of Sheets	DGN/DWG/XML	<0.06’	3D	3D	
Sign Bridges-Proposed					
Footings	DGN/DWG/XML	<0.06’	3D	N/A	
Piles	DGN/DWG/XML	<0.06’	3D	N/A	
Structure	DGN/DWG/XML	<0.06’	3D	N/A	

The Wisconsin Case Study: WisDOT SE Freeways

Other Structures-Proposed					
Noise Walls	DGN/DWG/XML	<0.06'	3D	N/A	
Screening Fences	DGN/DWG/XML	<0.06'	3D	N/A	
Tunnels-Utility	DGN/DWG/XML	<0.06'	3D	N/A	
Structures-Existing					
Bridges	DWG/XML	<0.06'	3D	N/A	
Walls	DWG/XML	<0.06'	3D	N/A	
Sign Bridges/Tunnels/Other	DWG/XML	<0.06'	3D	N/A	
Special Foundations-Proposed					
Drilled Shafts	DGN/DWG/XML	<0.06'	3D	3D	
Driven Piles	DGN/DWG/XML	<0.06'	3D	3D	
Bored Piles	DGN/DWG/XML	<0.06'	3D	3D	
Caissons	DGN/DWG/XML	<0.06'	3D	3D	
Special Foundation Walls-Proposed					
Foundation Anchors	DGN/DWG/XML	<0.06'	3D	3D	
Underpinning	DGN/DWG/XML	<0.06'	3D	3D	
Pile Caps	DGN/DWG/XML	<0.06'	3D	3D	
Grade Beams	DGN/DWG/XML	<0.06'	3D	3D	
Tiebacks	DGN/DWG/XML	<0.06'	3D	3D	
Lighting-Proposed					
Poles/Masts/Bases	DGN/DWG	<0.06'	3D	3D	
Conduit/Cabinets/Pull Boxes	DGN/DWG	<0.06'	3D	3D	
FTMS-Proposed					
DMS/CMS	DGN/DWG	<0.06'	2D	N/A	
FTMS Fiber Optic lines	DGN/DWG	<0.06'	3D	N/A	
FTMS Huts/Cabinets	DGN/DWG	<0.06'	2D	N/A	
Signs-Proposed					
Signs-Type 1	DGN/DWG	<0.06'	2D	2D	
Signs-Type 2	DGN/DWG	<0.06'	2D	2D	
Traffic Signals-Proposed					
Poles/Heads/Bases	DGN/DWG	<0.06'	3D	3D	
Conduit/Pull Boxes	DGN/DWG	<0.06'	3D	3D	
Water Main Proposed					
Pipes	DGN/DWG	<0.06'	3D	N/A	
Hydrants/Valves/Fittings/ Standpipes	DGN/DWG	<0.06'	3D	N/A	
Sanitary Sewer-Proposed					
Pipes	DGN/DWG	<0.06'	3D	N/A	
Manholes	DGN/DWG	<0.06'	3D	N/A	

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The Wisconsin Case Study: WisDOT SE Freeways

Utilities - Existing/Relocated/Abandoned *					
Drainage/Storm Sewer	DGN/DWG	<0.10′	3D	N/A	
Water Main	DGN/DWG	<0.10′	3D	N/A	
Sanitary Sewer	DGN/DWG	<0.10′	3D	N/A	
Lighting	DGN/DWG	<1.5′ *	2D	N/A	
FTMS	DGN/DWG	<1.5′ *	2D	N/A	
Traffic Control	DGN/DWG	<1.5′ *	2D	N/A	

*2D and 3D existing/proposed/abandoned utilities are approximate and other utilities may not be shown. 2D and 3D existing/proposed/abandoned utilities are generated from a variety of sources and formats including: from plans with line and grade, from plans without line and grade, from surveys, from Digger's Hotlining, from as-builts, from municipality records, from pot holing/hydrovac, and from RD/EMI/GPR/SPAR) and are provided in the model, for purposes of information only, requiring confirmation from Digger's Hotline and Utility Providers.

Other Utilities - Existing/Relocated/Abandoned *					
Gas	DGN/DWG	<1.5′ *	2D	N/A	
Steam	DGN/DWG	<1.5′ *	2D	N/A	
Electrical	DGN/DWG	<1.5′ *	2D	N/A	
Communications	DGN/DWG	<1.5′ *	2D	N/A	
Fiber Optic	DGN/DWG	<1.5′ *	2D	N/A	
Telephone/Data	DGN/DWG	<1.5′ *	2D	N/A	
CATV/Data	DGN/DWG	<1.5′ *	2D	N/A	

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LOA = Level of Accuracy
LOD = Level of Development (2D/3D/4D/5D/xD) – 3D delivery would also include 2D
LOD w/Metadata included

For Checklist:
X = Completed
IP = In-progress
* = Incomplete (not in 3D)

The Wisconsin Case Study: WisDOT SE Freeways

CIM Model Disclaimer

The Department and/or Consultant Design are providing, by agreement with Contractor and Subcontractors, materials stored electronically. The Contractor and Subcontractors ("parties") recognize that data, plans, specifications, estimates, reports, documents, or other information recorded on or transmitted as electronic media (including but not necessarily limited to "CAD, CIM, BIM, GIS or other electronic documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, all such documents are provided to the parties for informational purposes only and not as an end product or as a record document. Any reliance thereon is deemed to be unreasonable and unenforceable. The signed and/or stamped hard copy of the Design Engineer's plans, specifications and estimates or other contract documents are the only true contract documents of record.

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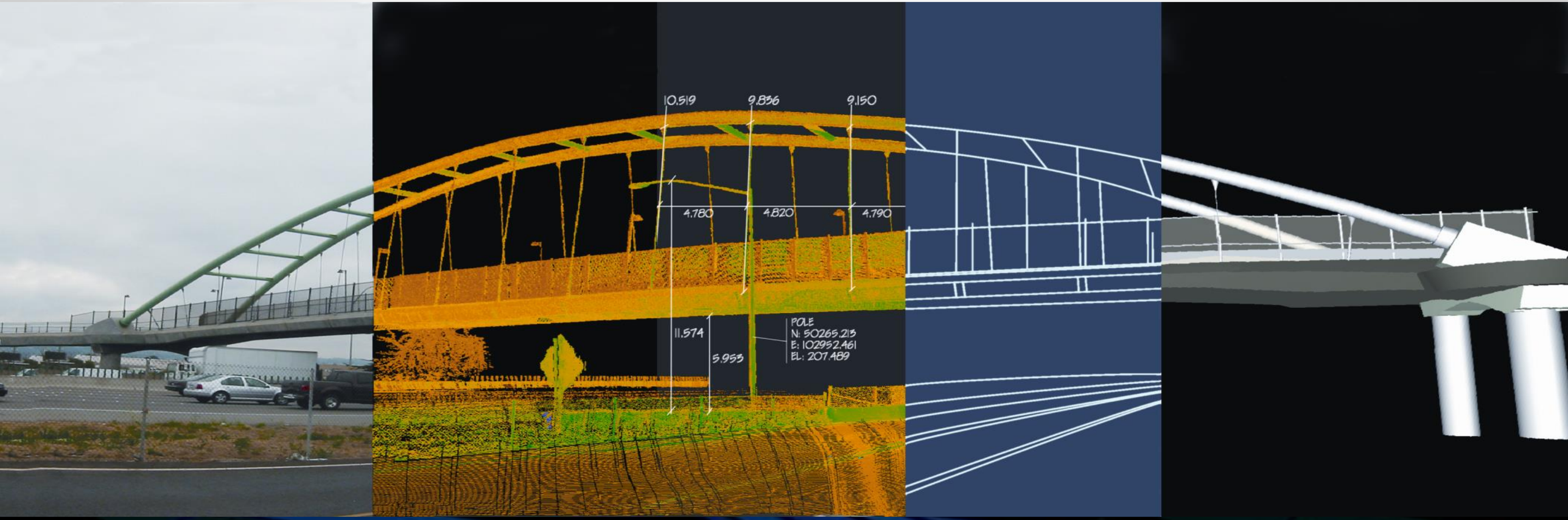
CIM 3D Modeling: Zoo Interchange Design-grade Survey

3D Survey Integrated Mapping using LiDAR-Static/Mobile/Aerial Scanning with Supplemental RTK GPS/Digital Leveling/TS/UAV Existing Conditions

CIM 3D Modeling: Zoo Interchange Design-grade/Post-construction Surveys



Georeferenced

Hi-res Digital

Images

3D

XYZ Return

LAS Point Clouds

2D -3D Feature Lines

3D DTMs-TINs

X-Sections

3D

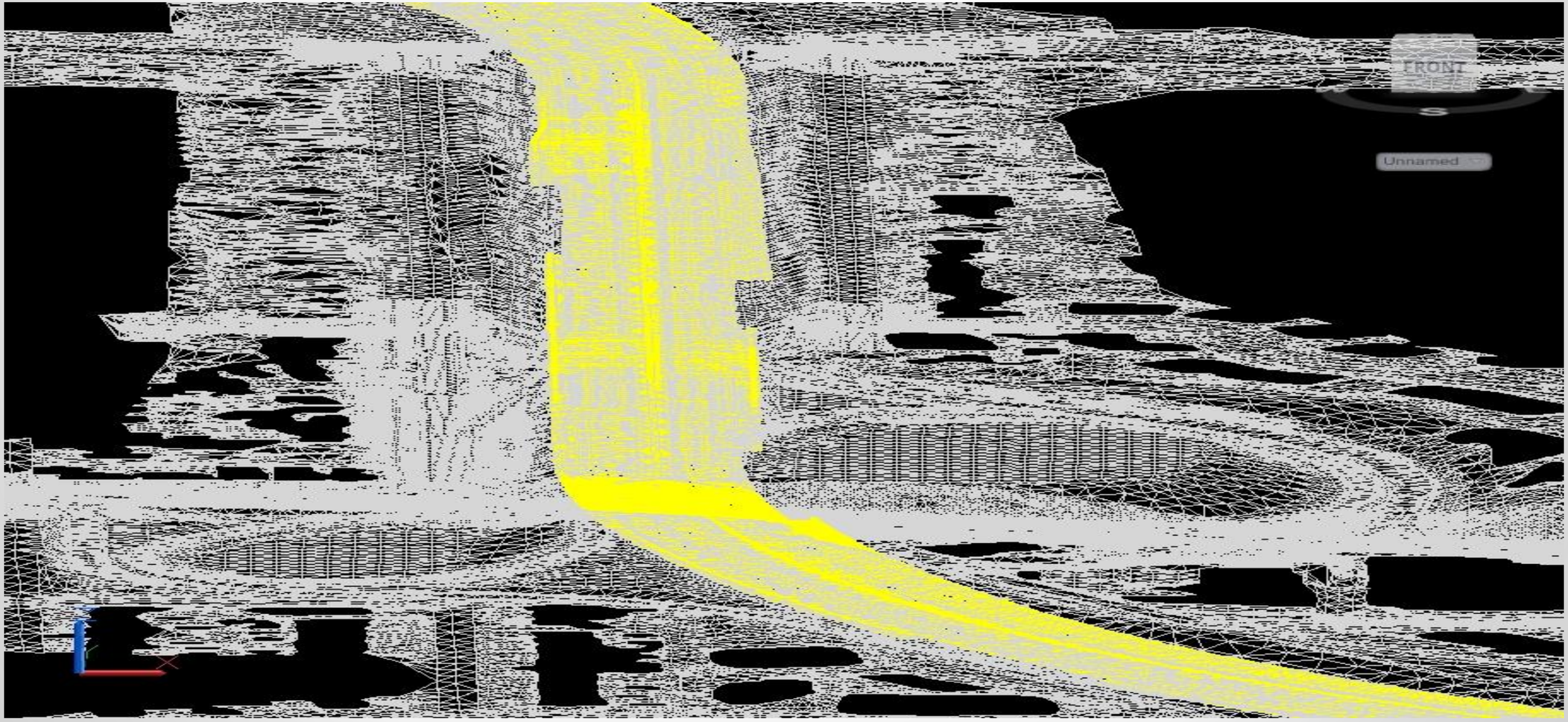
CIM-BIM

DSMs

CIM 3D Modeling:
Zoo Interchange 3D Model of Core

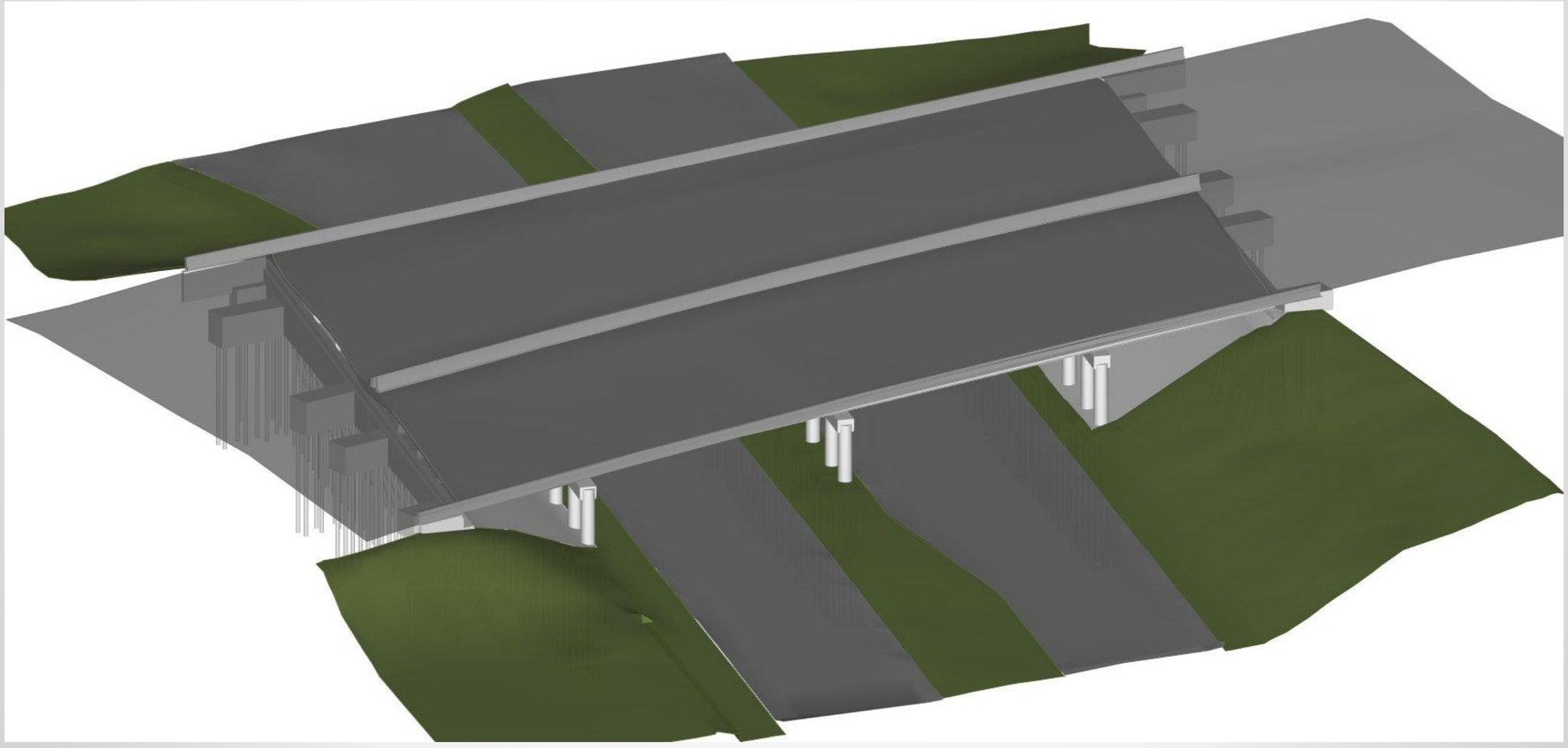
CIM 3D Modeling: Zoo Interchange SE Freeways Design

3D Roads/Drainage/Surfaces/Subsurfaces



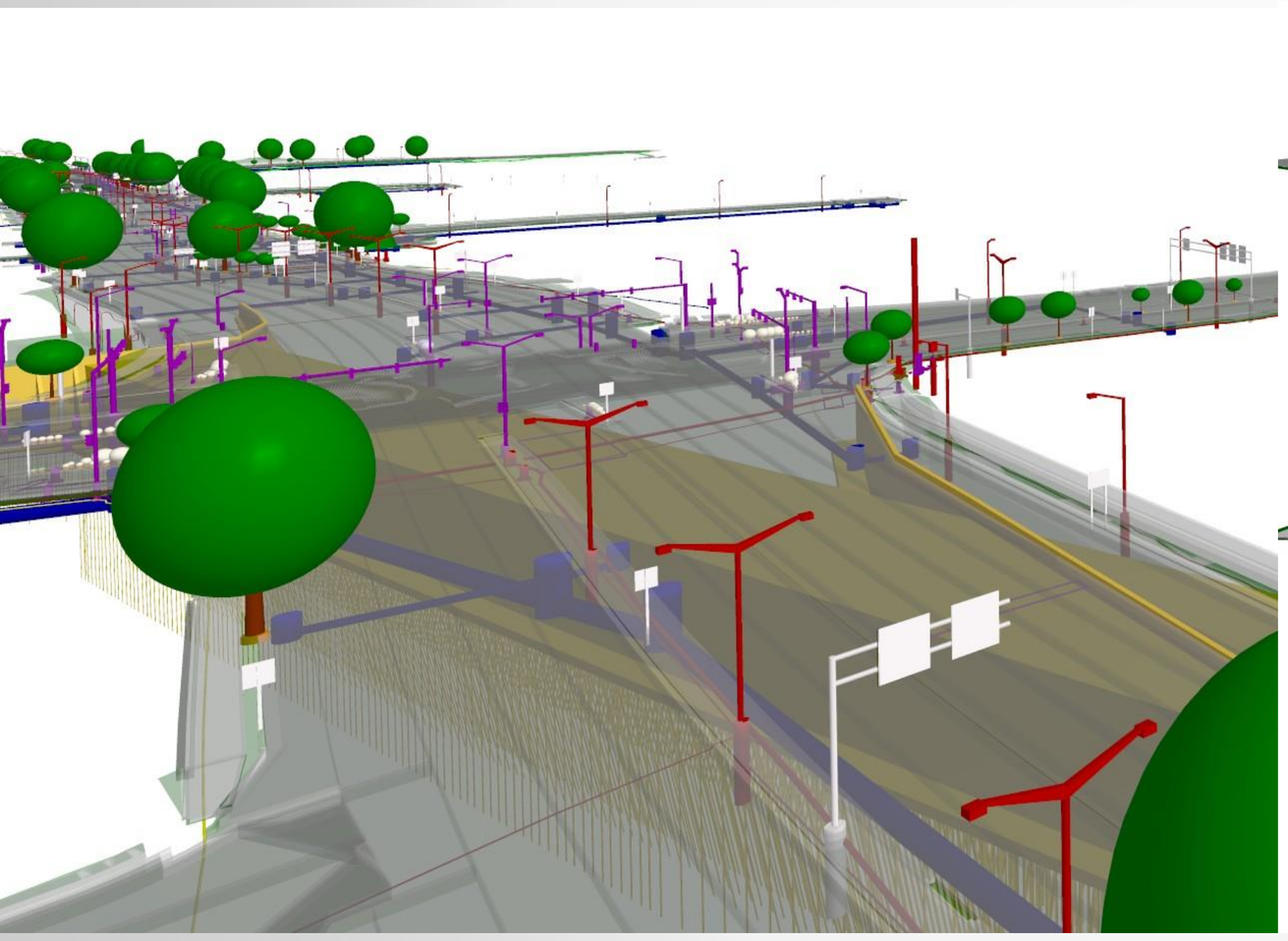
CIM 3D Modeling: Zoo Interchange
SE Freeways Design

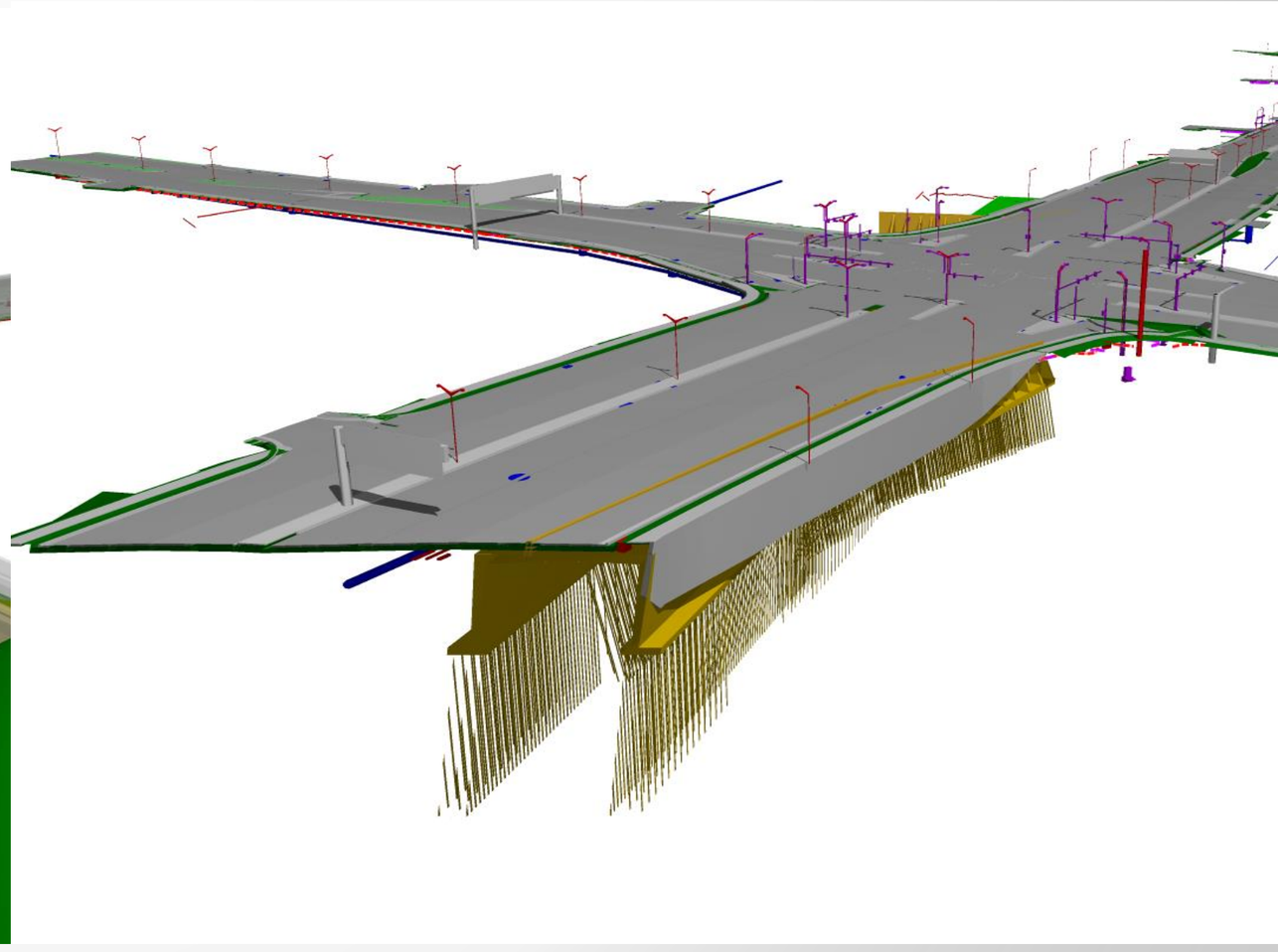
3D Structures-Bridges, Ret Walls, Noise Walls, Tunnels, Sign Bridges, Other



CIM 3D Modeling: Zoo Interchange
SE Freeways Design

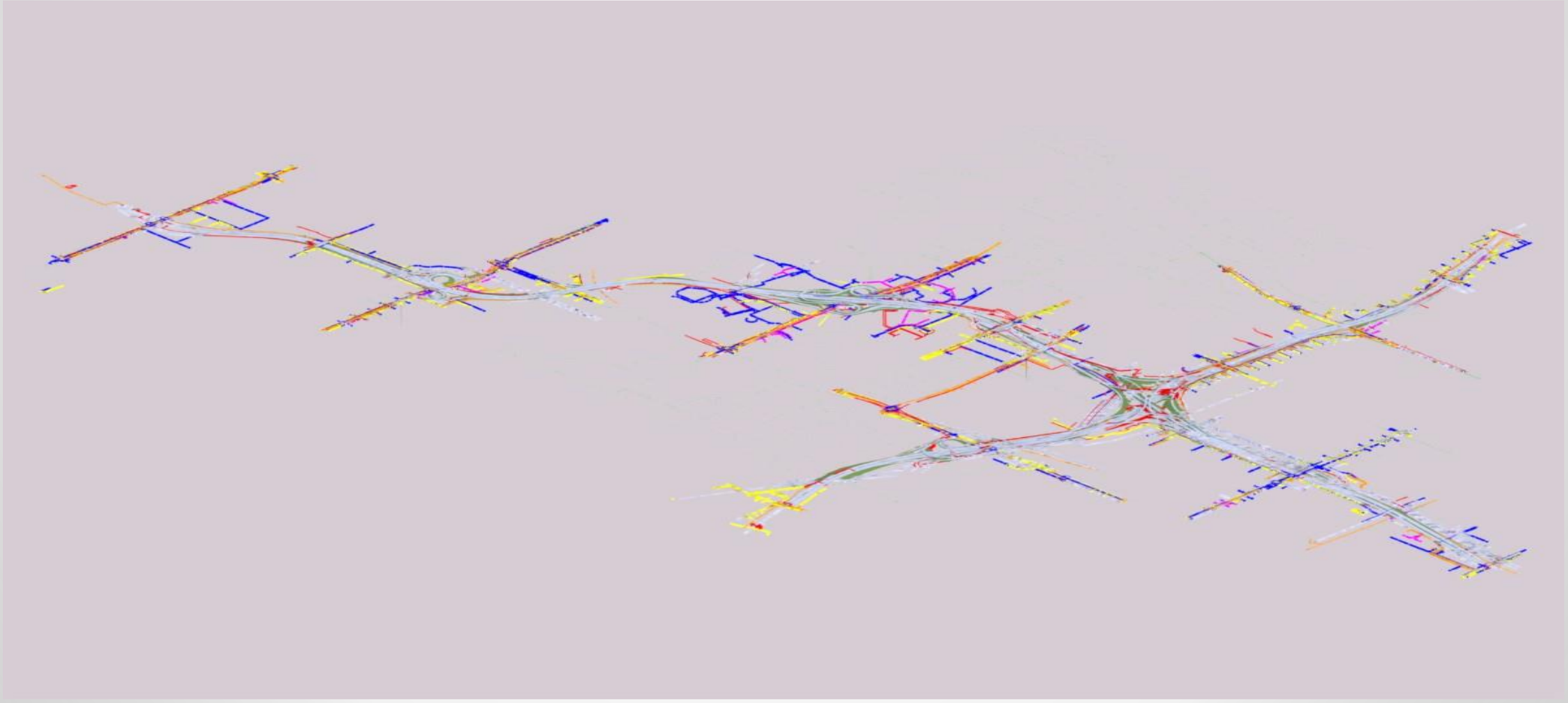
3D ITS/FTMS, Lighting, Signs, Signals, Geotech, Landscaping, Water, Other





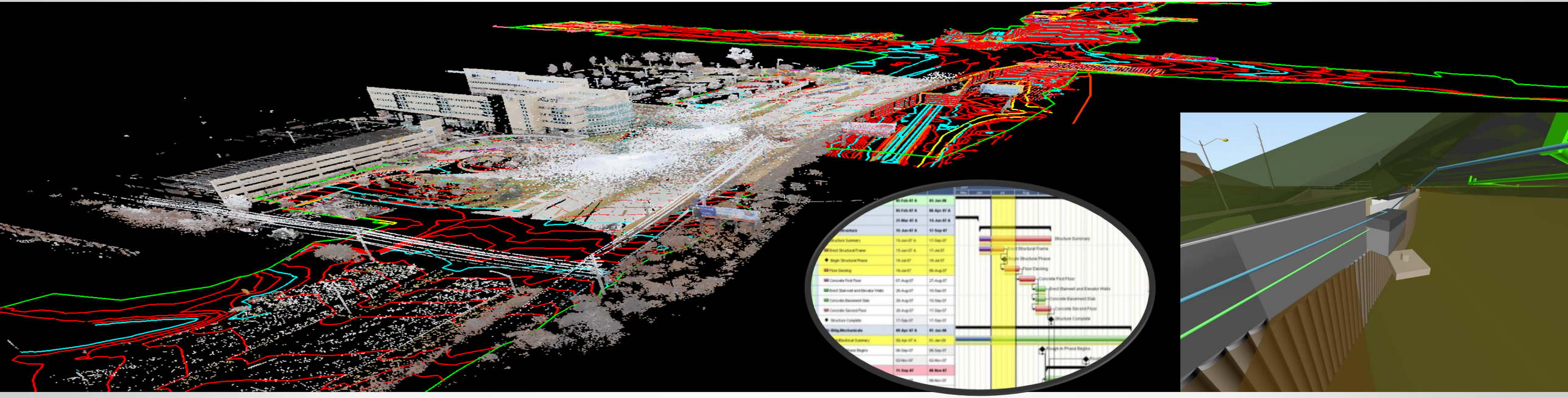
CIM 3D Modeling: Zoo Interchange SE Freeways Design

3D Utilities-Gas, Steam, Electrical, Communication, Fiber Optic, Tel/Data, CATV/Data, Water, Sanitary Sewer, Other



CIM 3D Modeling: Zoo Interchange SE Freeways Design

3D Model Updates (Plan Revs/Addendums) / Staged Models vs 4D WBS / Clash Detection w/Temp Surfaces, Roads, Drainage, Structures



Tools Used:

- Autodesk C3D 2014-2016 / Bentley Microstation + In-roads (Design) SS2
- Autodesk Navisworks 2014-2016/Viasys (Clash Detection) / Bentley Navigator (Clash Detection)
  Challenges: Rules-based Clash Detection and Workflows Improvements/Enhancements Needed

CIM 3D Modeling: Zoo Interchange SE Freeways Design

3D Photorealistic-PR/Augmented Reality-AR/Rendered Models

Tools Used:

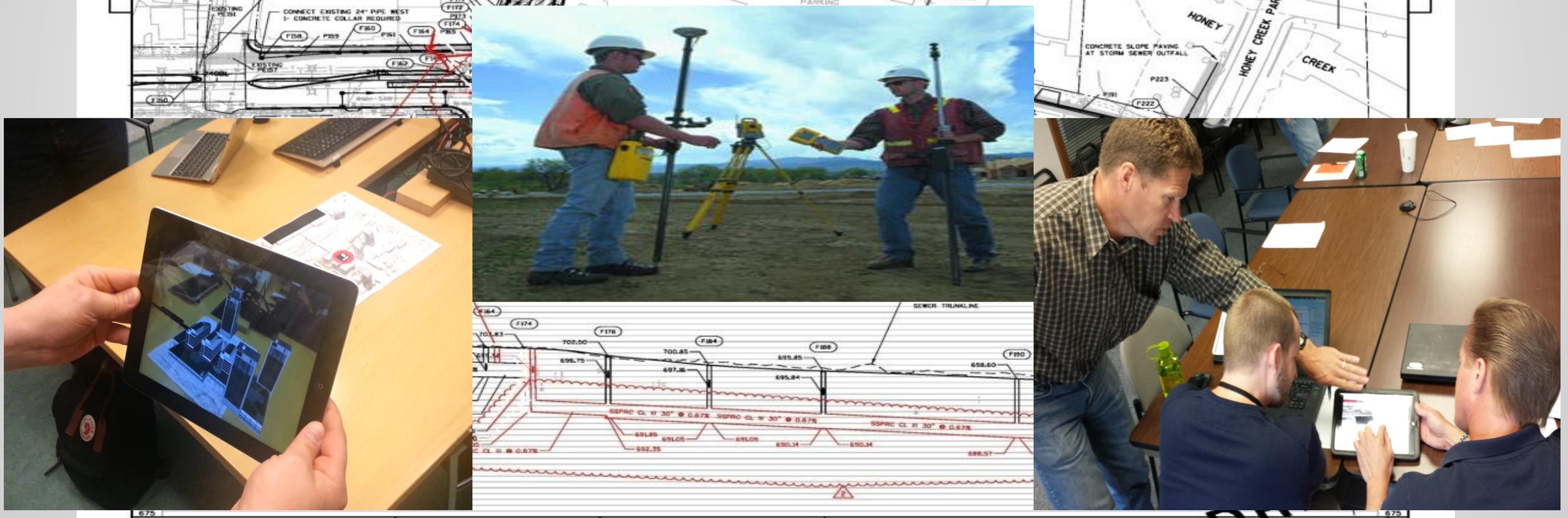
- Autodesk C3D 2014-2016 / Bentley Microstation SS2 / for Exhibits-Simulations for Public Info from 3D
- Autodesk 3DS Max for PR/AR Exhibits/Simulations

Challenges: 3D Rapid Modeling Software Tools Improvements/Bi-directional Needed for Streamlining Workflows

WisDOT/Consultant Demo of Zoo IC RAB with Dynamic 3D Model Adding Design Yr VISSIM Traffic

CIM 3D Modeling: Zoo Interchange SE Freeways Construction

3D Models in Construction: Real-time Information, Location, & Collaboration



CIM 3D Modeling: Zoo Interchange SE Freeways Construction

3D Models in Construction: CIM to Field, AMG, Glued 2D/3D Models, and Issues Tracking

Tools Used/Pilots: Autodesk BIM 360 Docs, Field, Glue, Raxar, AASHTOWare, Contract Manager, Other
Challenges: Visualization footprint is smaller for Tablet PCs, Real time inspection, images, and issues management with 2D-3D visualization integration is needed

WisDOT Business Perspective: Life Cycle Approach

Planning & Programming

Project Delivery Planning, Design & Construction

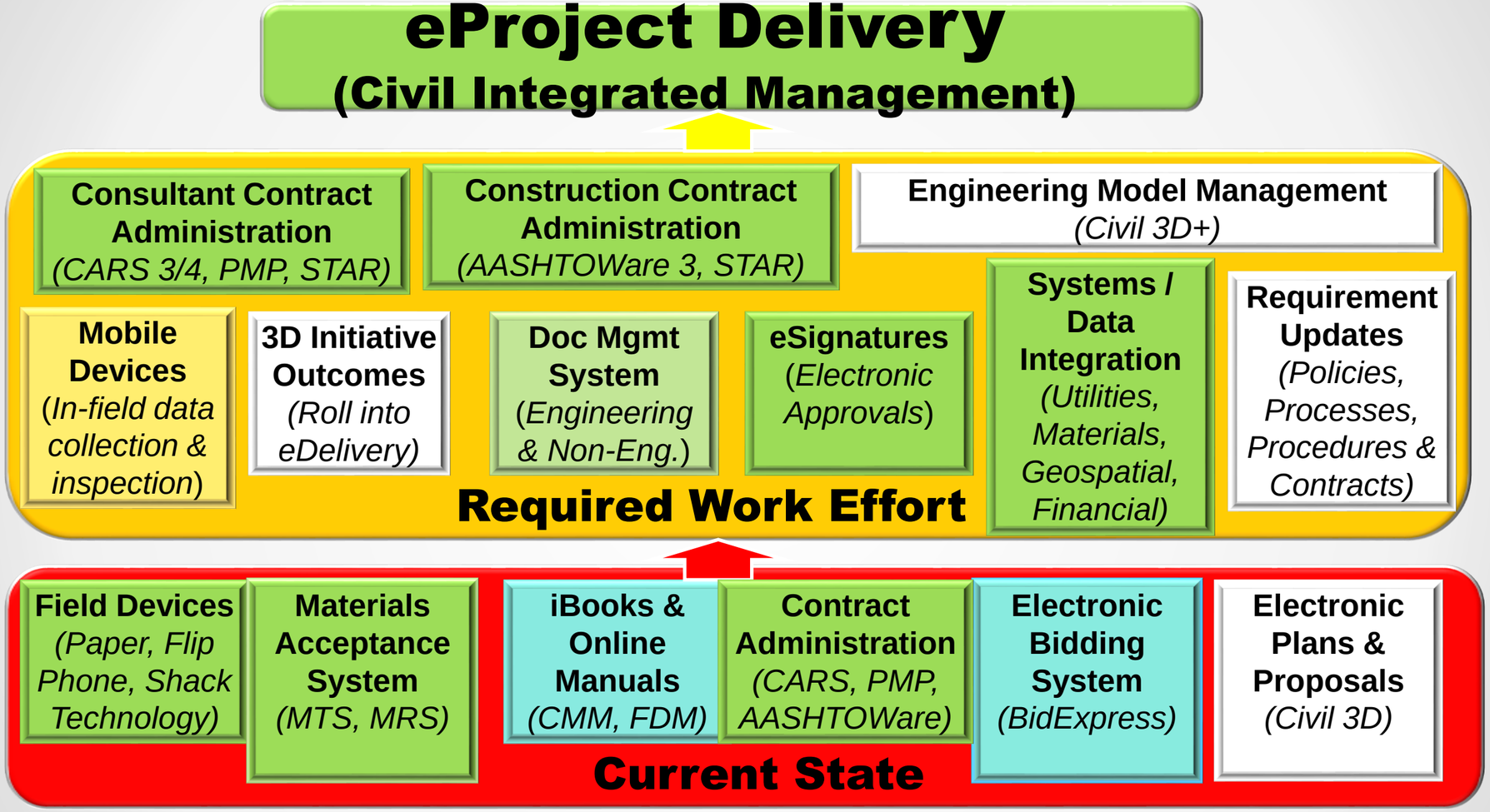
Maintenance Operations

Traffic Operations

DTSD CIM/BIM Initiatives

- ePproject Delivery (CIM/BIM)
- PS&E/Models Production (CIM/BIM)
- eConstruction/Inspection (Mobile Devices)
- Life Cycle Asbuilts/Models (Operations & Maintenance)
- Data Warehousing Content Management System

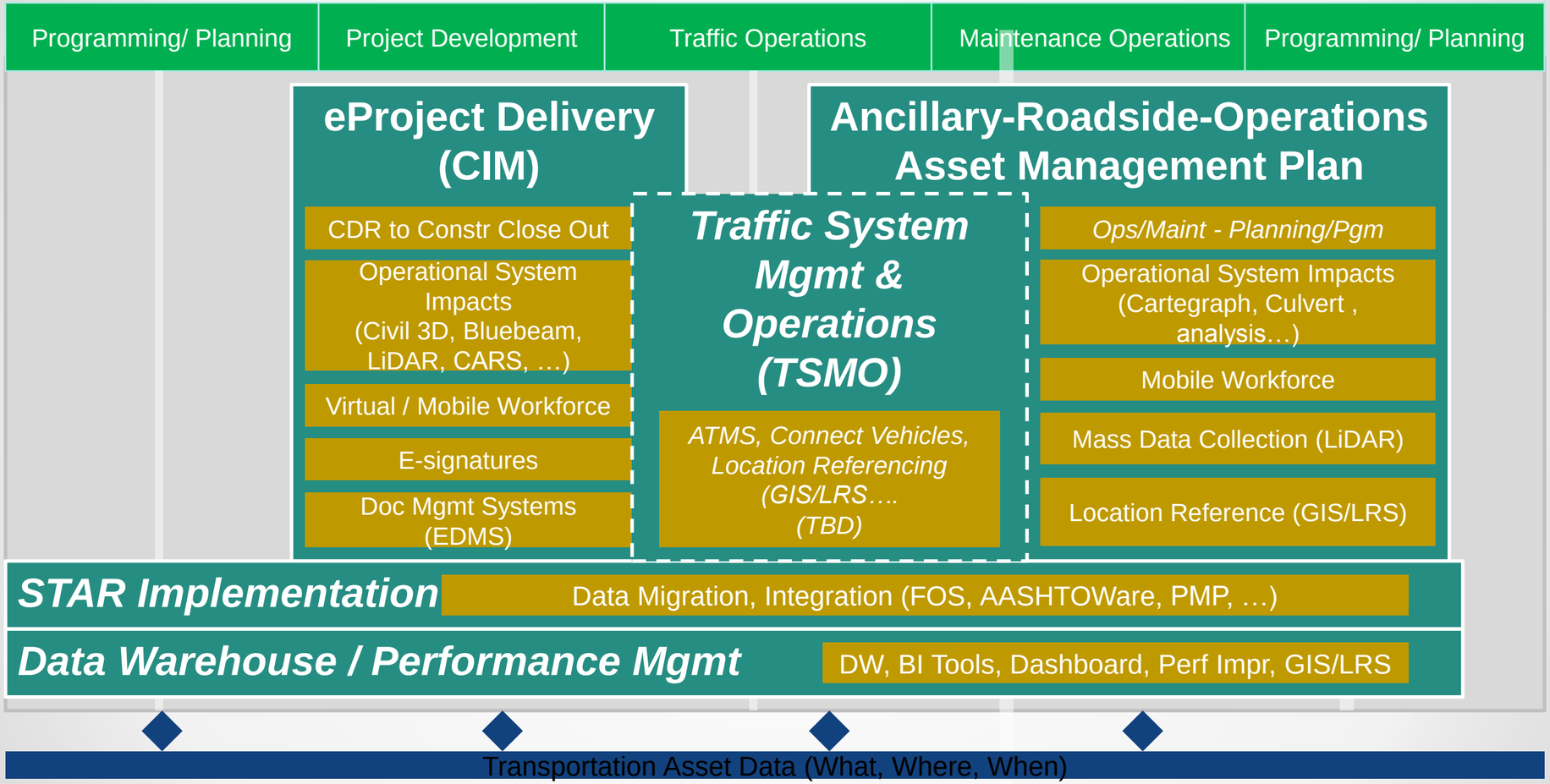
eProject Delivery Implementation: Concept to Construction to Closeout



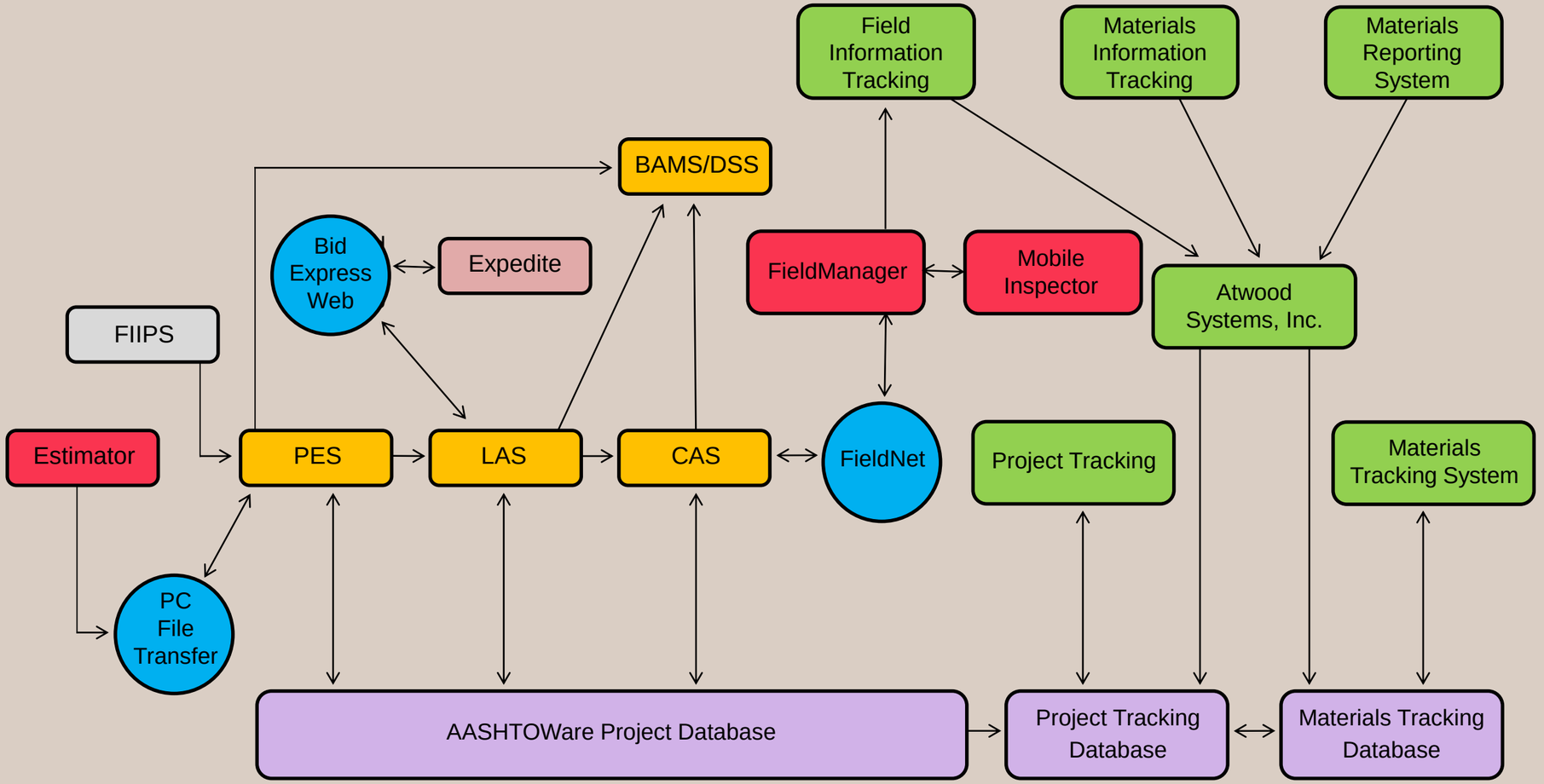
DTSD IT Program – Strategic Initiatives*

(DRAFT - Initiative priorities will be based on Business Strategies)

**Diagram for illustrative purposes and not exact*



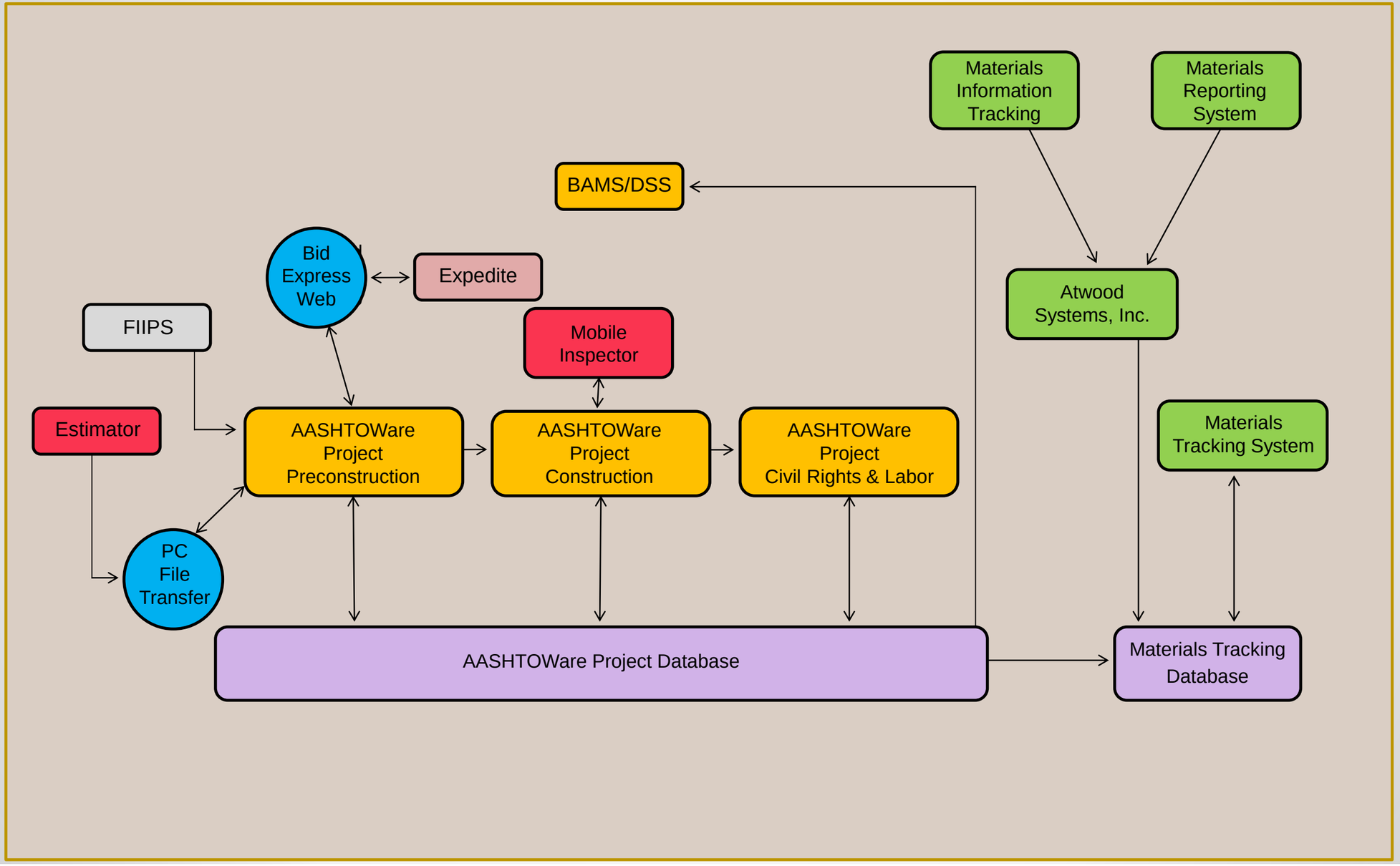
WisDOT Contract Management System - Current



PES - Proposal and Estimates System
LAS - Letting and Awards System
CAS - Construction Administration System

BAMS/DSS - Decision Support System
FIIPS - Financial Integrated Improvement Programming System

WisDOT Contract Management System - Future

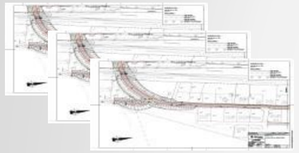


The Wisconsin Case Study: WisDOT SE Freeways

Where we are

Where we are going

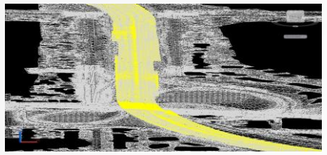
2D CAD Models



Benefits/Advantages:

- Automate drafting/standards
- Draw efficiently/accurately
- Layout scale model-paper space
- Layout dimensions/text/notes
- Visualize/view drawing
- Layers/attributes/properties
- Vector & raster/custom libraries
- Modify/revise to reduce updates
- Link CAE/CAD tools to CADD
- E-construction stakeout
- Organize/access project data

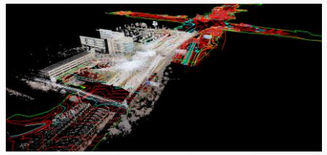
3D CAD Models



Benefits/Advantages:

- Modify, reuse, & revise in 3D to reduce updates
- 3D geospatial & rapid prototyping shop drawings
- 3D visualizations using walk/drive-through simulations/animations
- GPS stakeout/3D QA-QC
- Subgrade grading/string -less paving using AMG up to 30% savings

3D CIM Collaboration Models



Benefits/Advantages:

- Multi-disciplinary collaboration
- Identify/reduce issues earlier by clash detection/resolution
- Reduce redesign, rework, DINs, & CCOs cost savings/avoidance opportunities up to 25%
- Staged-temporary construction
- Constructability analysis
- Optimize/visualize design-construction with VDC-CIM
- Link 3D to 4D & 5D/BOM

3D CIM Integrated Collaboration Models

Benefits/Advantages:

- Multi-disciplinary collaboration
- Clash detection/resolution to eliminate issues to reduce redesign, DINs & CCOs
- Database lifecycle mgmt for O & M with data warehousing
- PLM link to PDM/CRM/BPM/ERP
- Process/workflows management
- Enterprise LAN + WAN & Cloud
- E-design/e-construction use of 3D models/tools with mobile devices

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