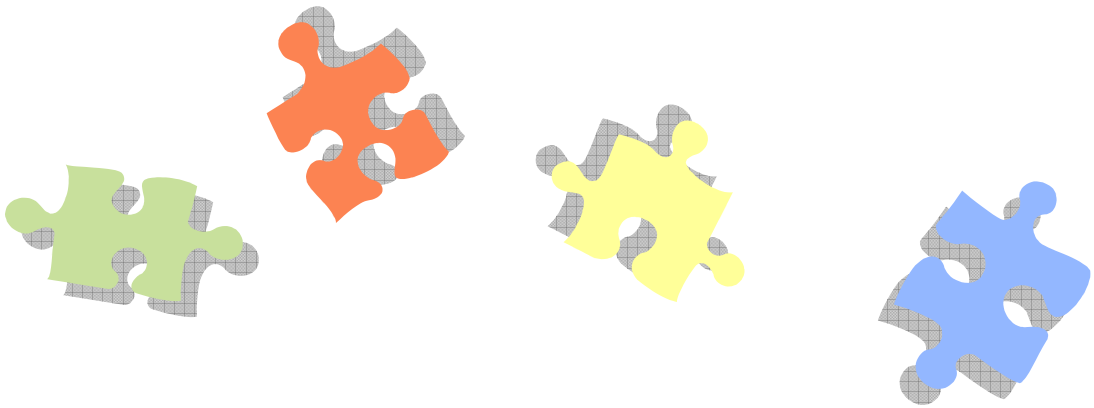
BrIM Update – Workflow for designing structures

Edmundo Herrera, P.E.
Bentley Systems, Inc.

Bentley
Sustaining Infrastructure

The Bridge Technology Obstacles

- Research found ...
  - Incomplete tools (and Fragmented)
  - Lack of interoperability between systems
  - Little reuse of data in major phases/functions
  - Insufficient data modeling



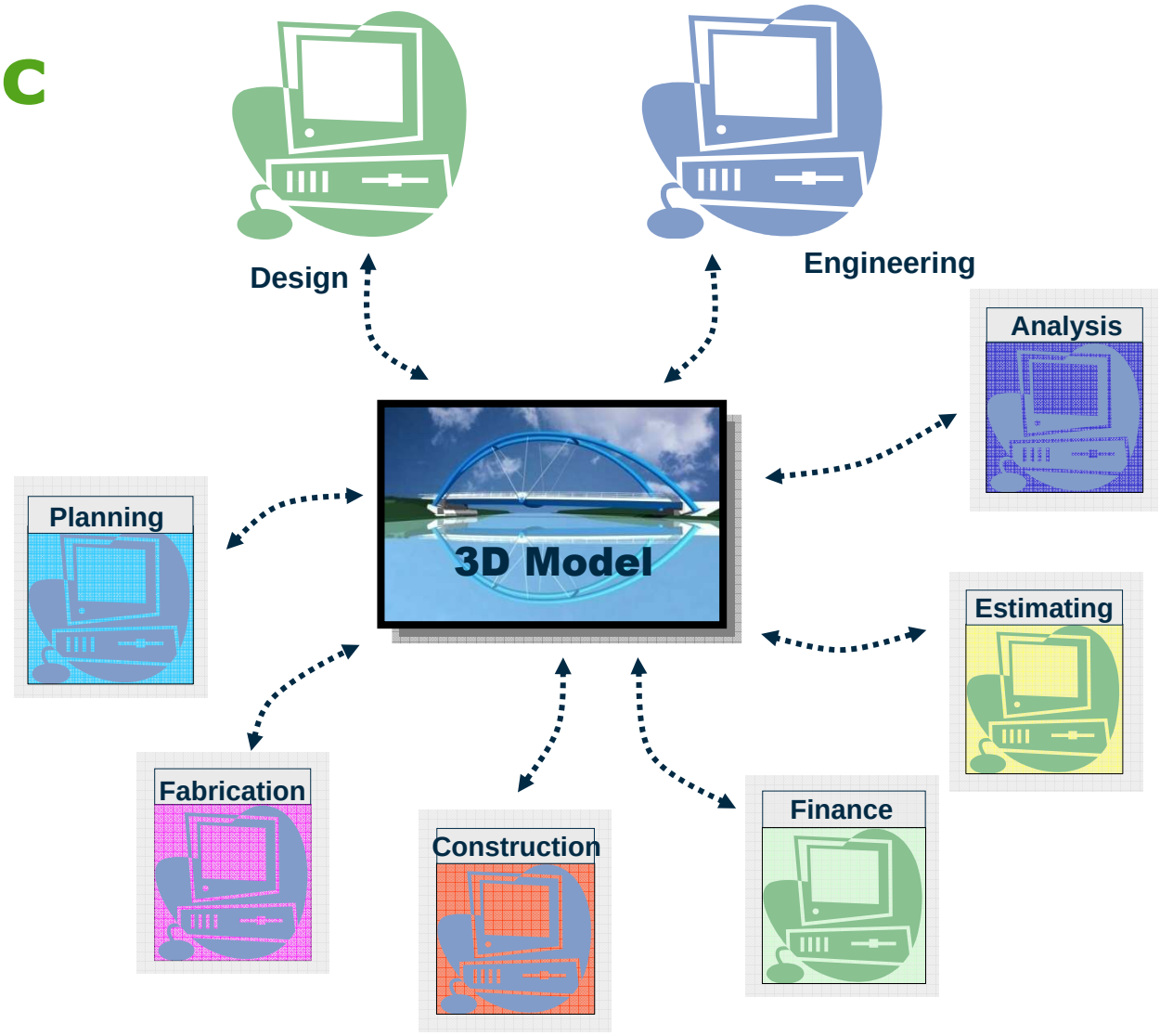
Project Delivery Innovation Challenges

- Many delivery scenarios
  - Design/Build
  - Joint Ventures
  - Engineer/Procure/Construction
  - Public-Private Partnerships

Risk reduction and timely project delivery are a must

Parametric 3D Bridge Modeling

"The principle advantage of utilizing a 3D model approach stems from the reusability of the design data during tasks that occur down-stream from initial design."
Stuart Chen



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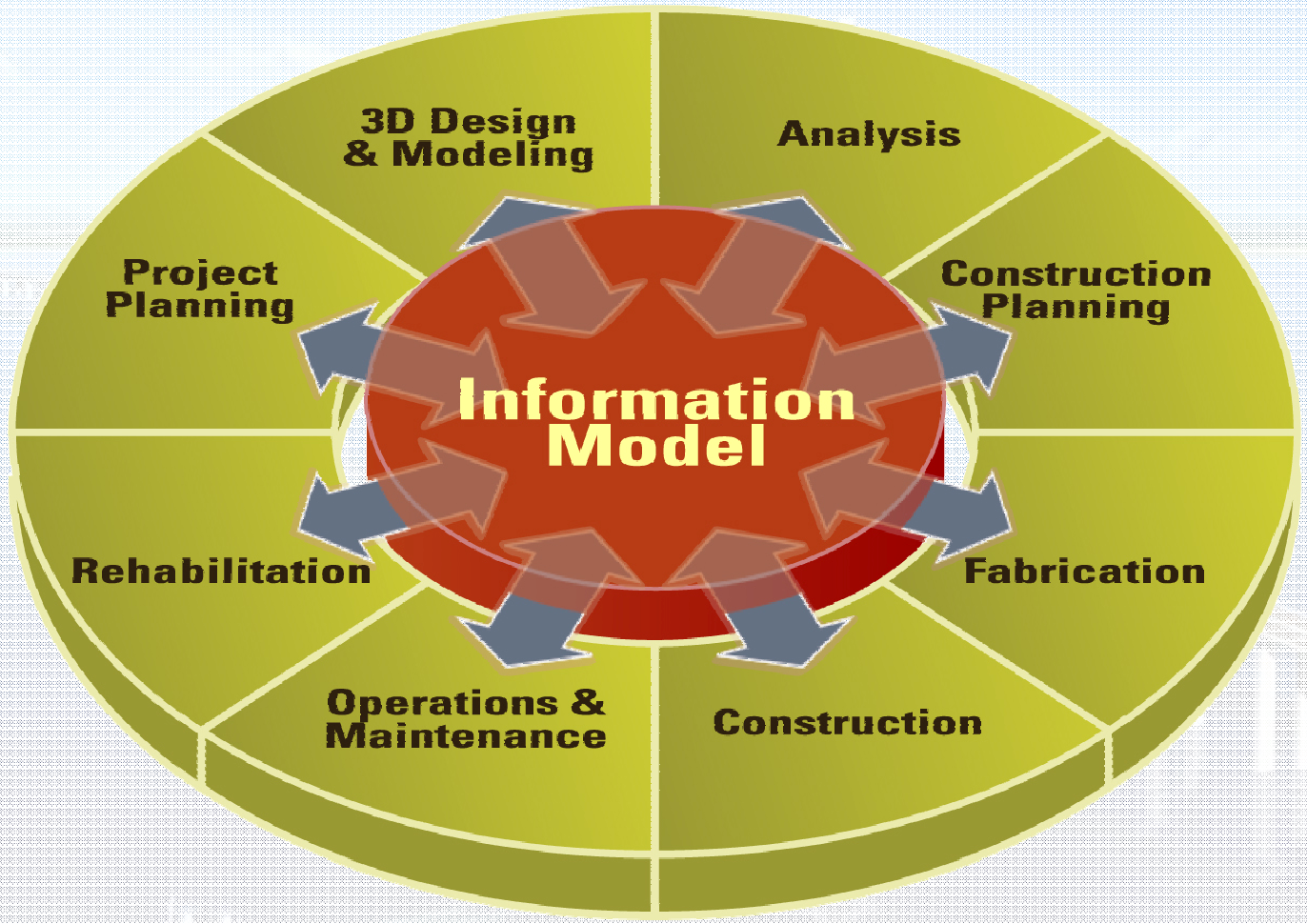
Scope of Bentley BrIM…



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Bentley BrIM Bridge Solutions

MicroStation

CloudWorx

MX/ Inroads and BRT

GEOPAK Bridge

InRoads Bridge

RM Bridge

LEAP Bridge

Bentley Rebar

STAAD.Pro

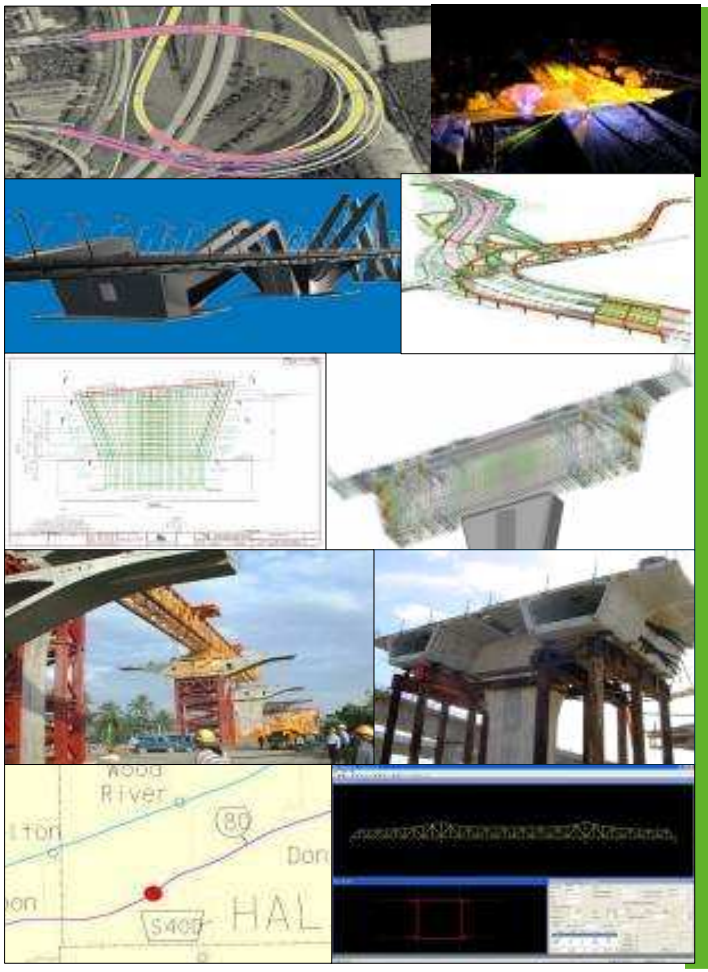
STAAD.foundation

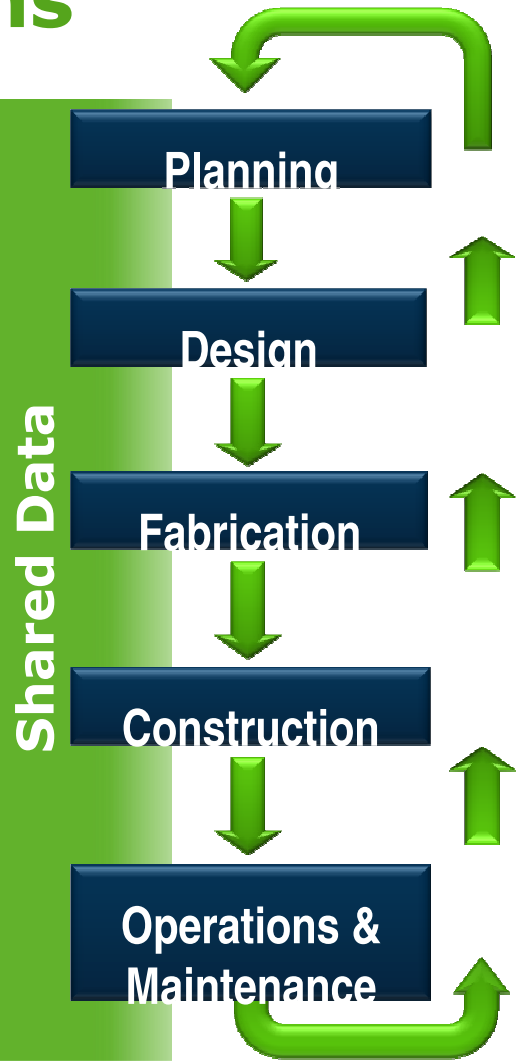
ProSteel 3D

Bentley OnSite

BridgeModeler/LARS

SUPERLOAD





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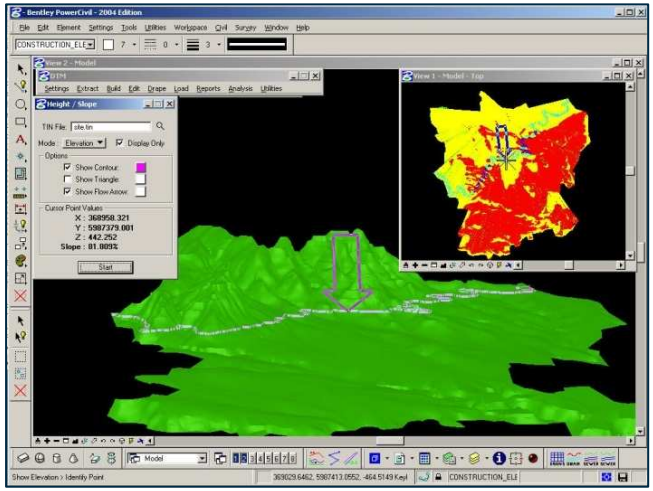
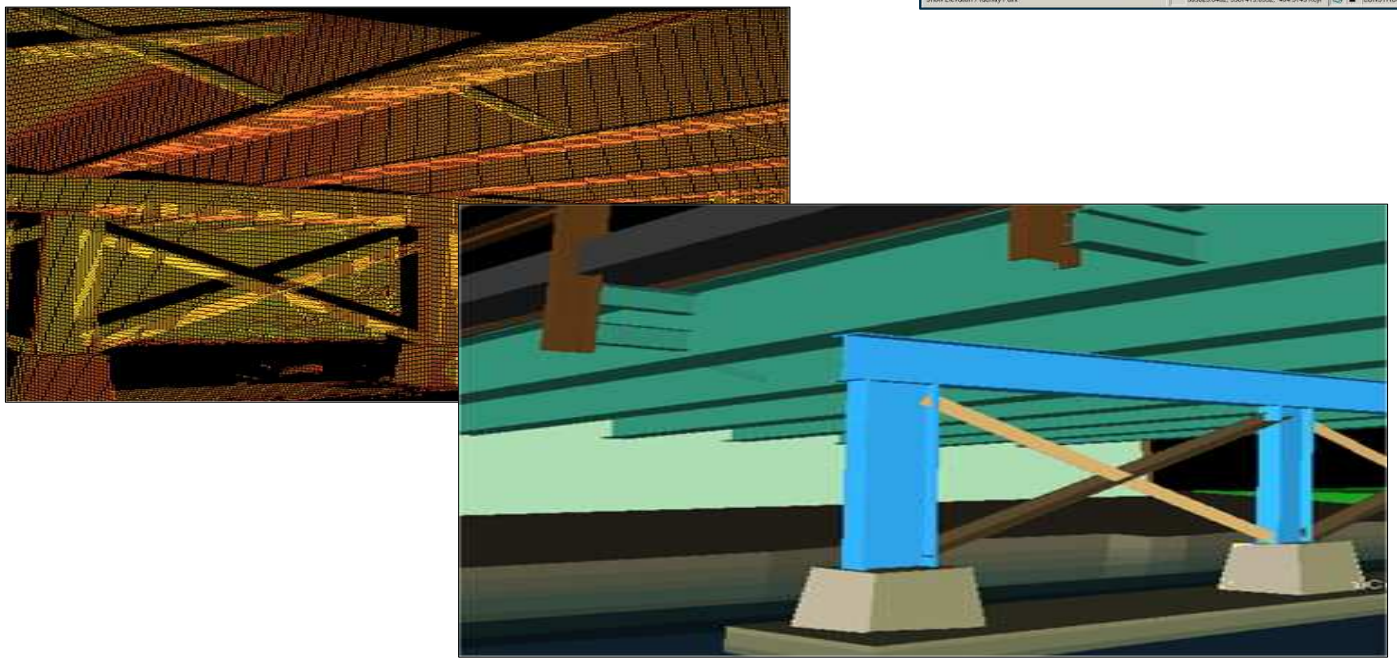
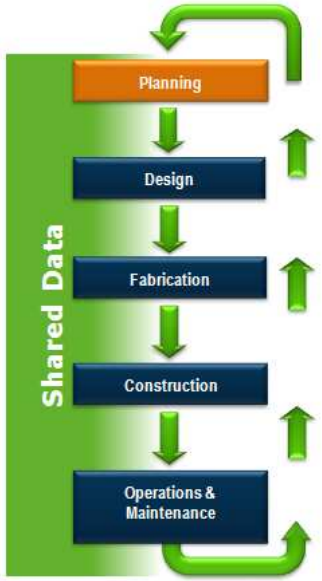
Start With Survey

- **InRoads Survey**







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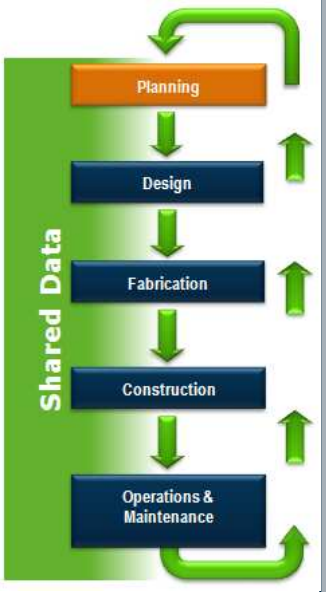
Road and Rail Geometric Modeling

- InRoads
- MXROAD
- Bentley Rail Track



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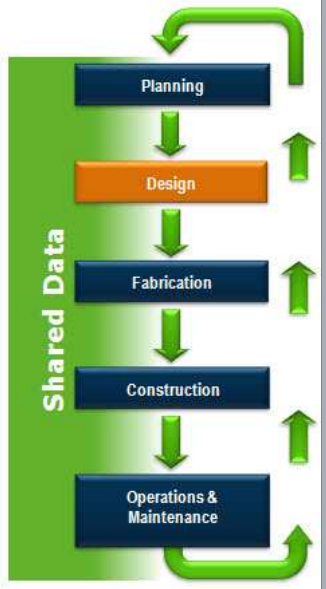
Proceed With Bridge Design

LEAP Bridge

RM Bridge



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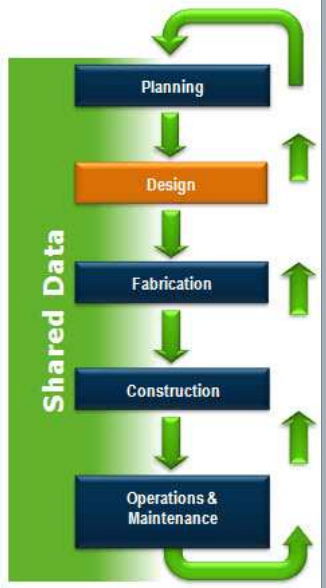
LEAP's Product Focus

- Small to medium prestressed/precast and long-span post-tensioned concrete bridges in North America and Middle East
- Most widely used solutions for design of concrete bridges in North America: more than 2000 Users in North America, 38 DOTs.
- Component or platform (LEAP Bridge based)



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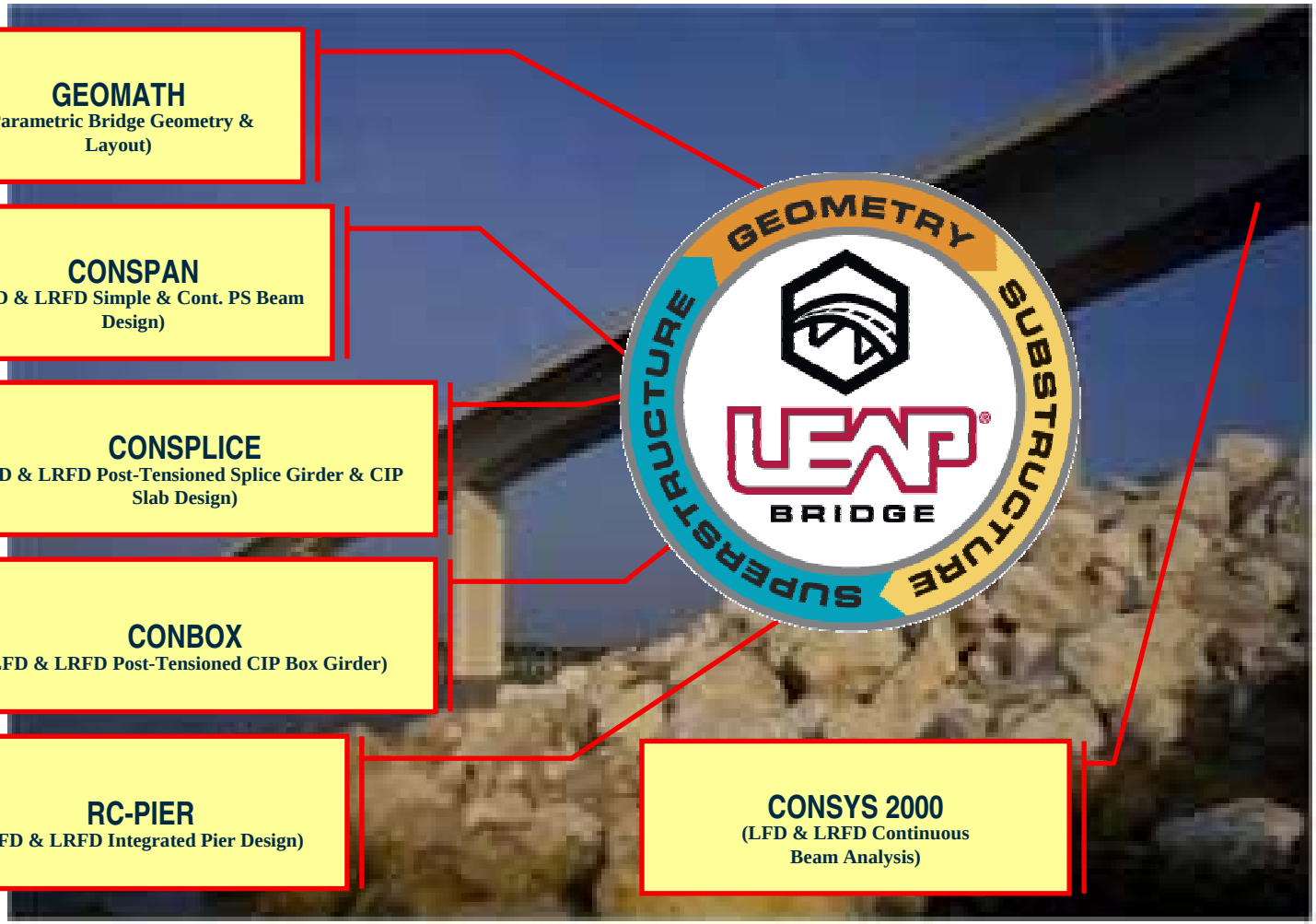
LEAP Products



GEOMATH
(Parametric Bridge Geometry & Layout)

CONSPAN
(LFD & LRFD Simple & Cont. PS Beam Design)

CONSPLICE
(LFD & LRFD Post-Tensioned Splice Girder & CIP Slab Design)

CONBOX
(LFD & LRFD Post-Tensioned CIP Box Girder)

RC-PIER
(LFD & LRFD Integrated Pier Design)

CONSYS 2000
(LFD & LRFD Continuous Beam Analysis)

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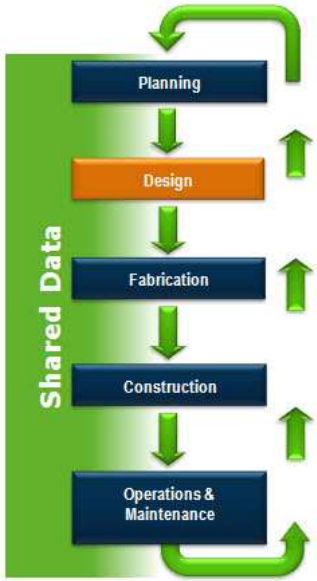
RM Bridge

- Internationally applicable
- All types of medium/ large bridges
  - Reinforced and pre-stressed concrete
  - Steel, concrete and composite
  - Cable-stayed bridges
  - Suspension bridges
- Any erection method
  - Span-by-span
  - Advanced shoring
  - Incremental launching
  - Balanced cantilever bridges
  - Pre-cast segmental



RM2006 Erection Control used for the project.

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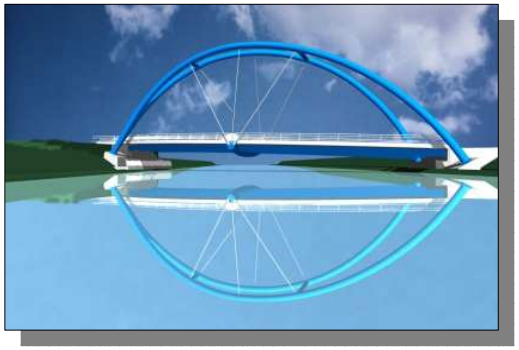
Bentley Bridge RM Differentiators

- No limits on geometry or combined load combinations
- Stage-by-stage erection and full 4D time axis
- High speed rail rolling stock analysis
- Wind dynamics analysis
- Linear & non-linear materials and dynamics and Eurocode compliant
- Construction Control
- Seismic analysis
- 35 years engineering experience
- Over 400 customers



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RM User Example: Medium Bridges

Carter & Burgess

Bentley

RM User Example: Medium Bridges

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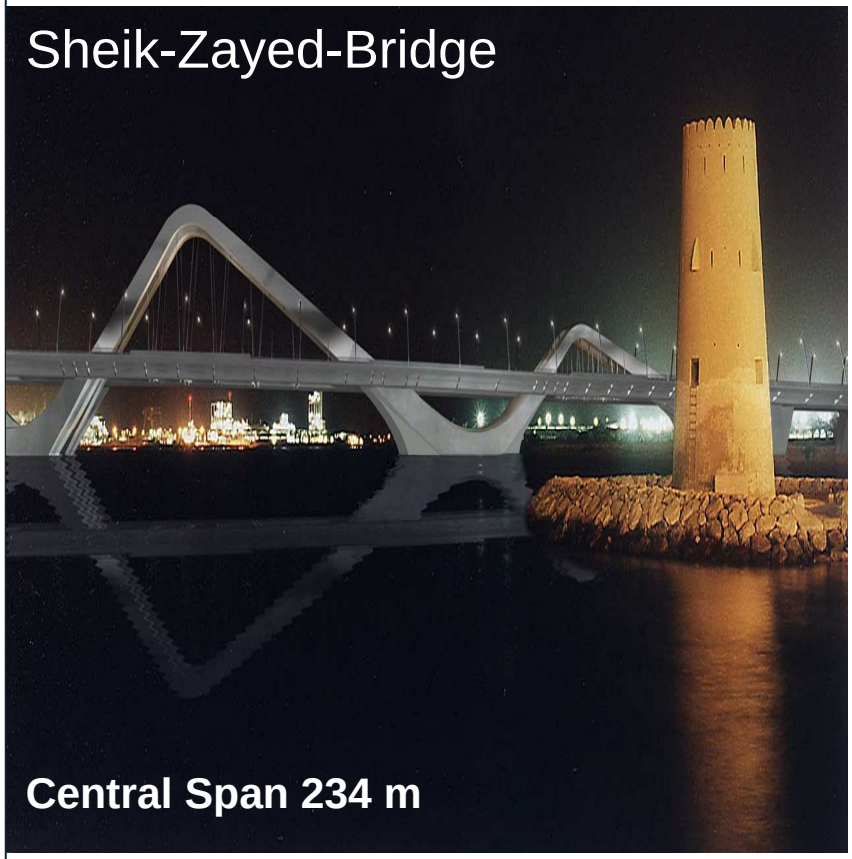
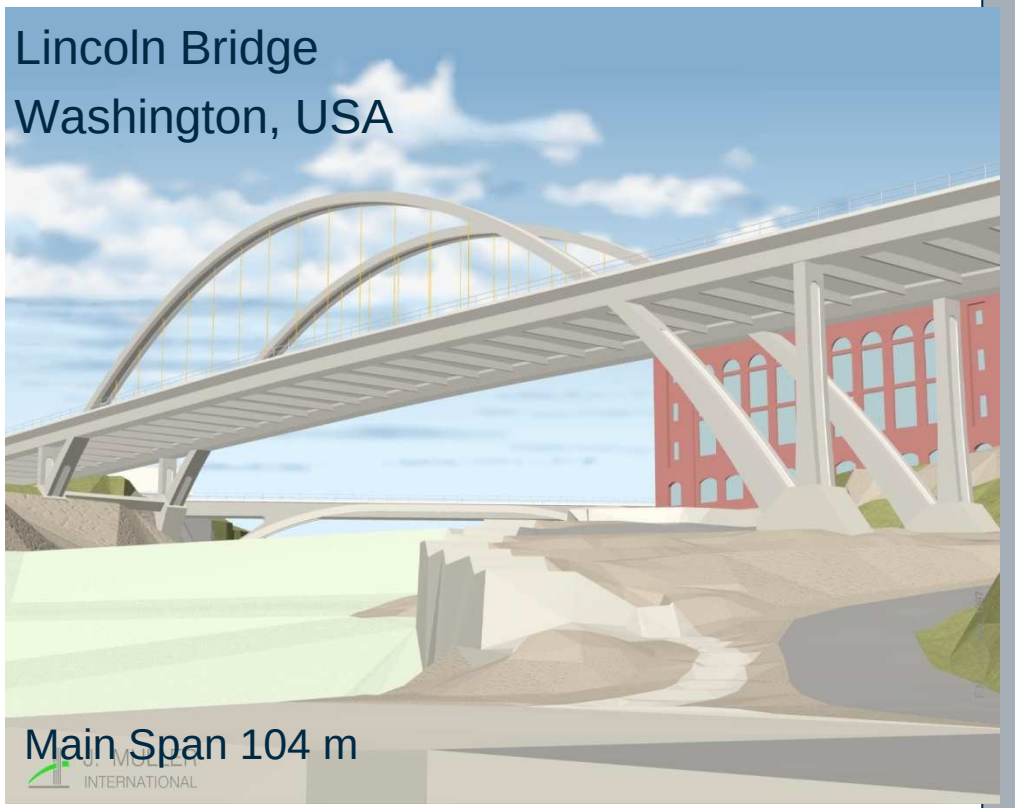
User Examples: Signature Bridges

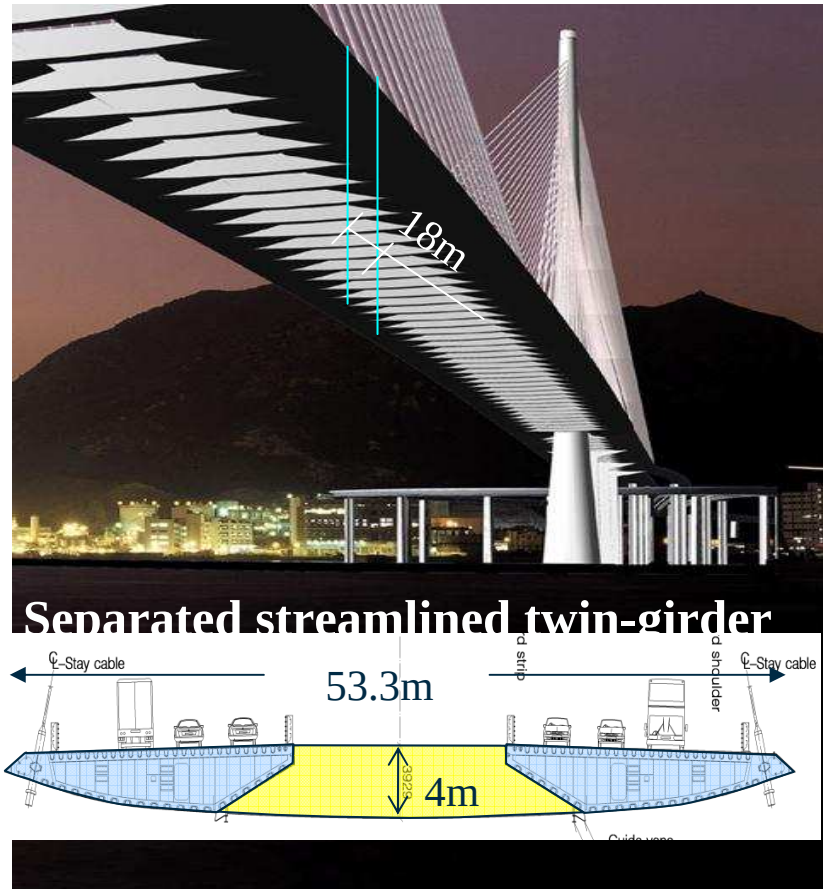


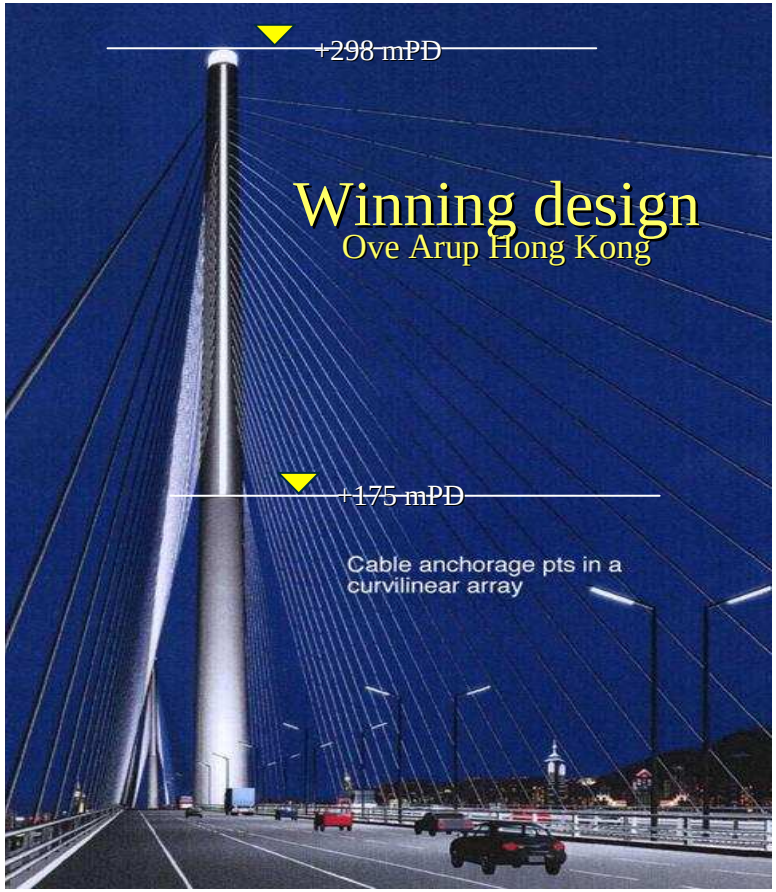
Zaha Hadid Architects,
High Point Rendel

Jean Muller International



Bridge RM Projects: Stonecutters Bridge, Hong Kong





RM Bridge Proven Worldwide

Design Leader

Used in more than 30 countries

Proven on thousands of bridge projects worldwide

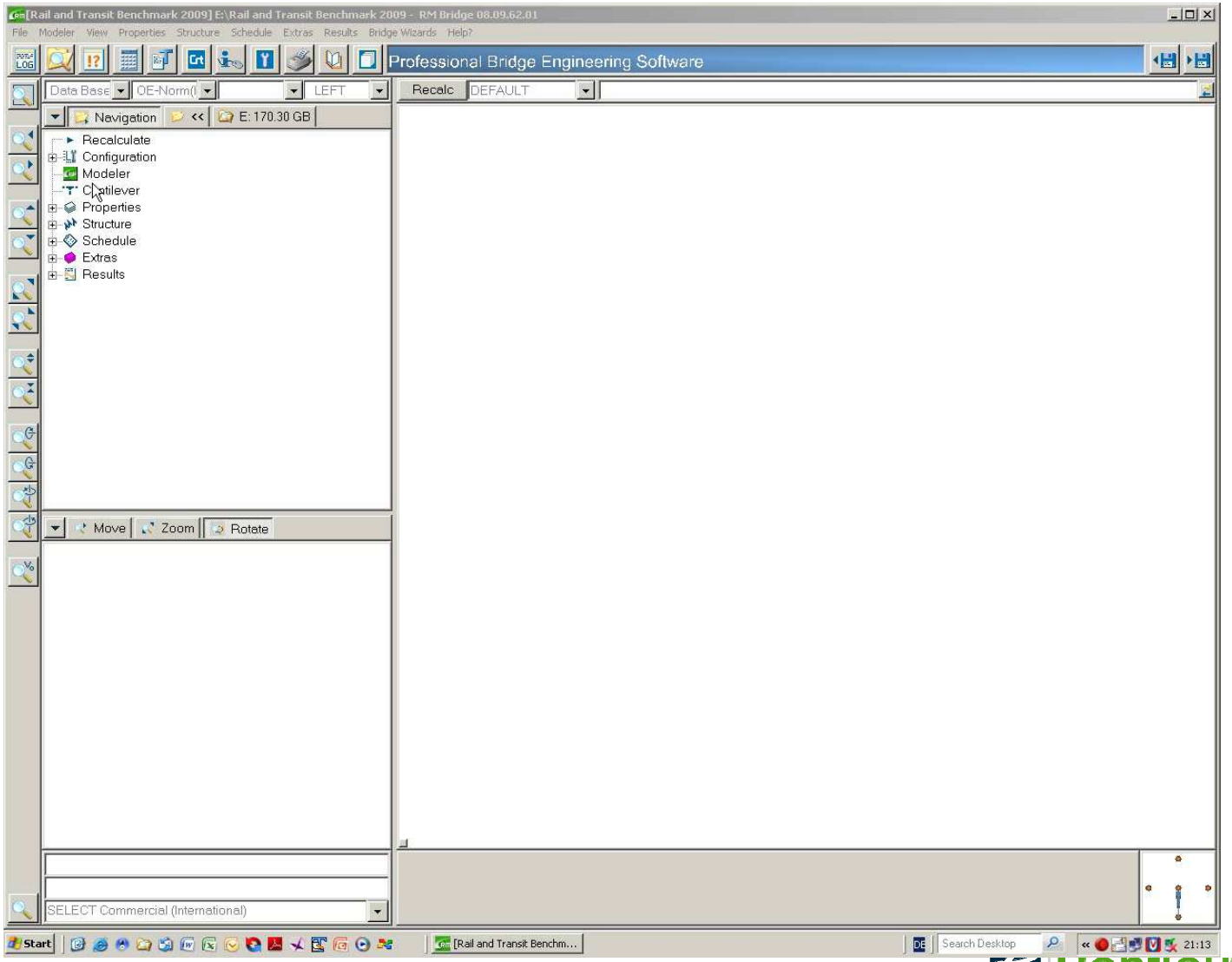
Supports 21 International Design Codes, including AASHTO LRFD

Some organizations that use RM Bridge

- Mott MacDonald
- Arups
- Faber Maunsel
- Arcadis
- Ingerop
- Vinci
- Bilfinger Berger
- Skanska
- Vectura
- Carter & Burgess
- Colorado DOT
- David Evans and Associates
- Earth Tech
- Finley Engineering Group
- Jacobs Engineering
- Parsons Transportation Group
- T.Y. Lin International

MXROAD/InRoads Integration With RM Bridge

- Horizontal and Vertical alignments
- Terrain data
- 3d DGN
- Automatic drawing creation

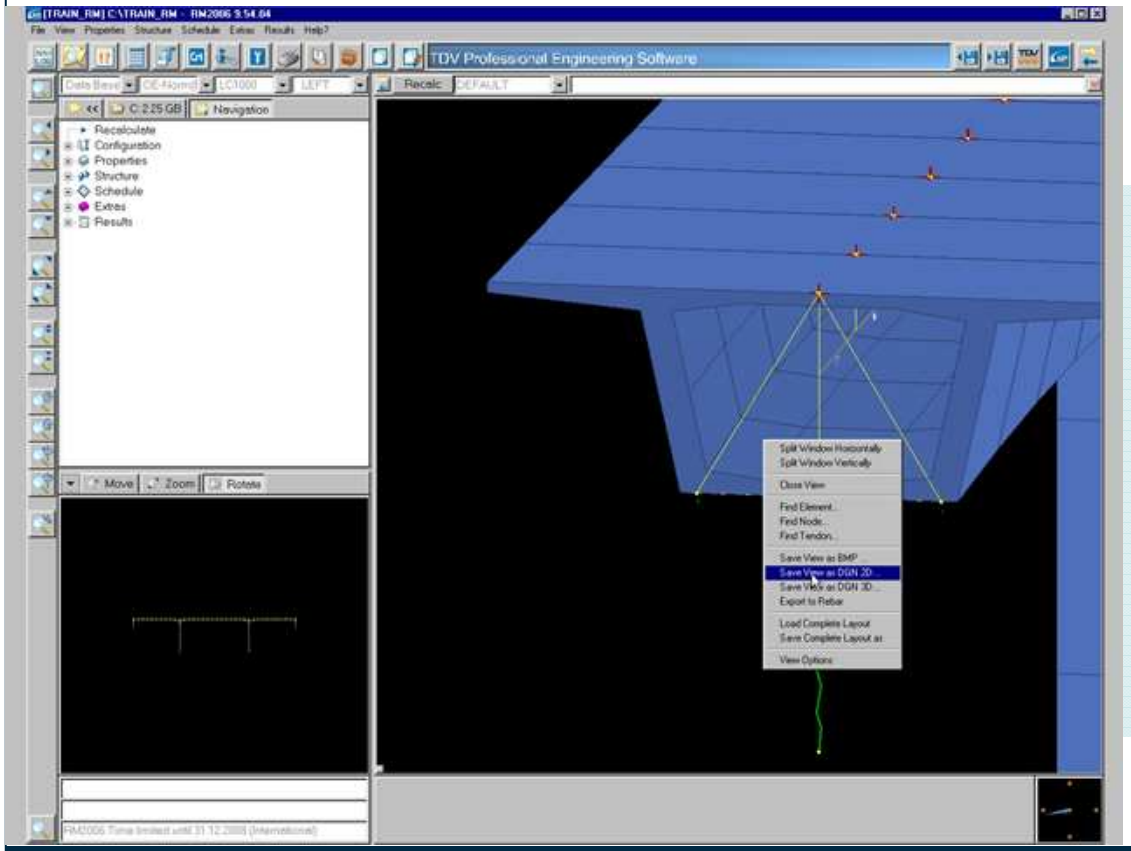


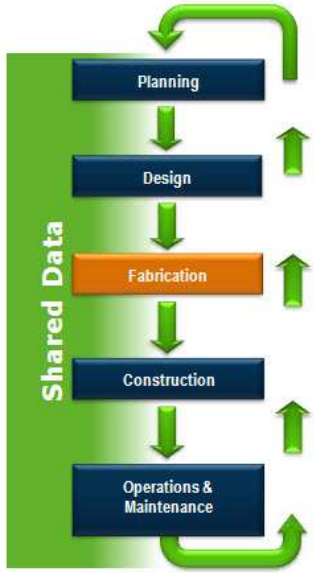
Bridge Feasibility Design.wmv

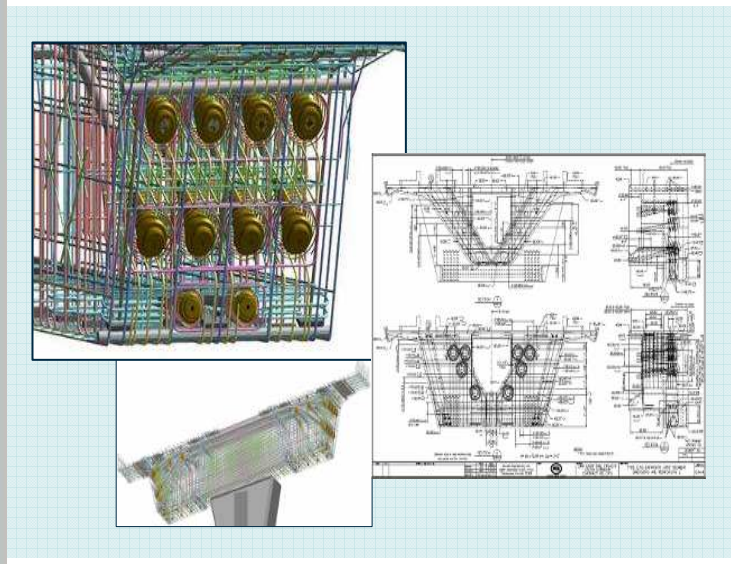
Bentley BrIM: Detail & Fabrication

- Bentley Rebar
- ProSteel

Direct Creation of Shop Drawings







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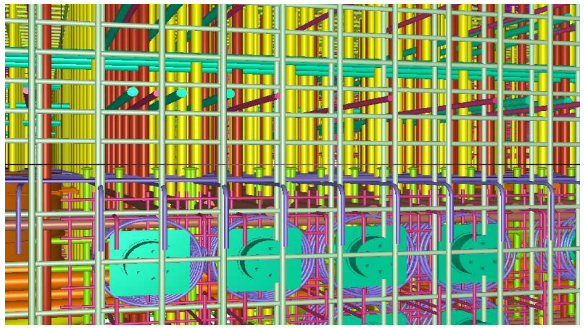
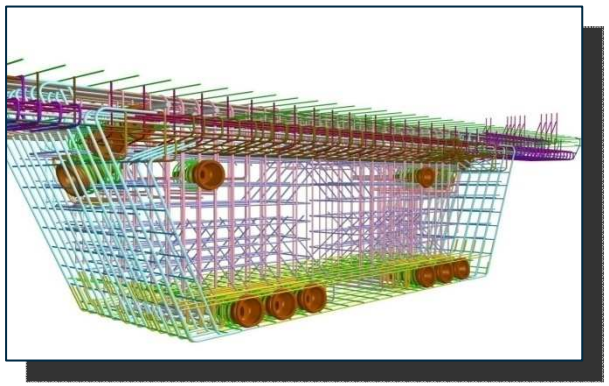
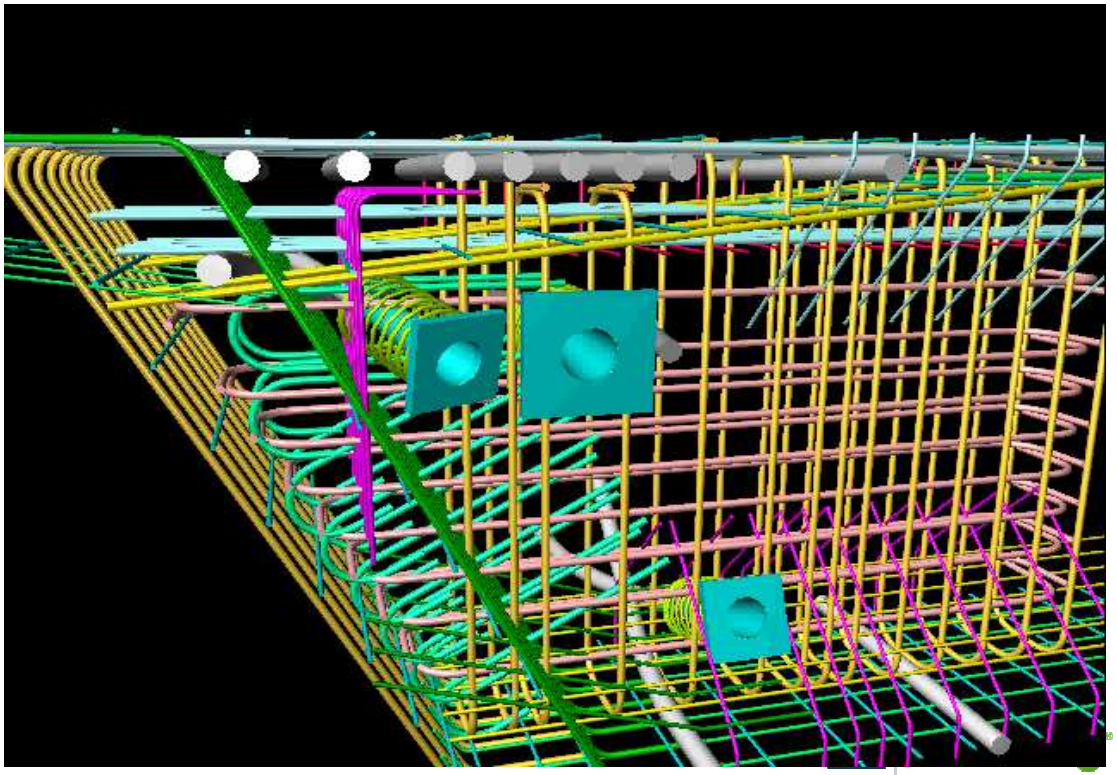
Bentley Rebar:
Automatic Creation 3D Models from 2D

Rebar automatically produces 3D models from the details contained in your normal 2D section, elevation, and plan views



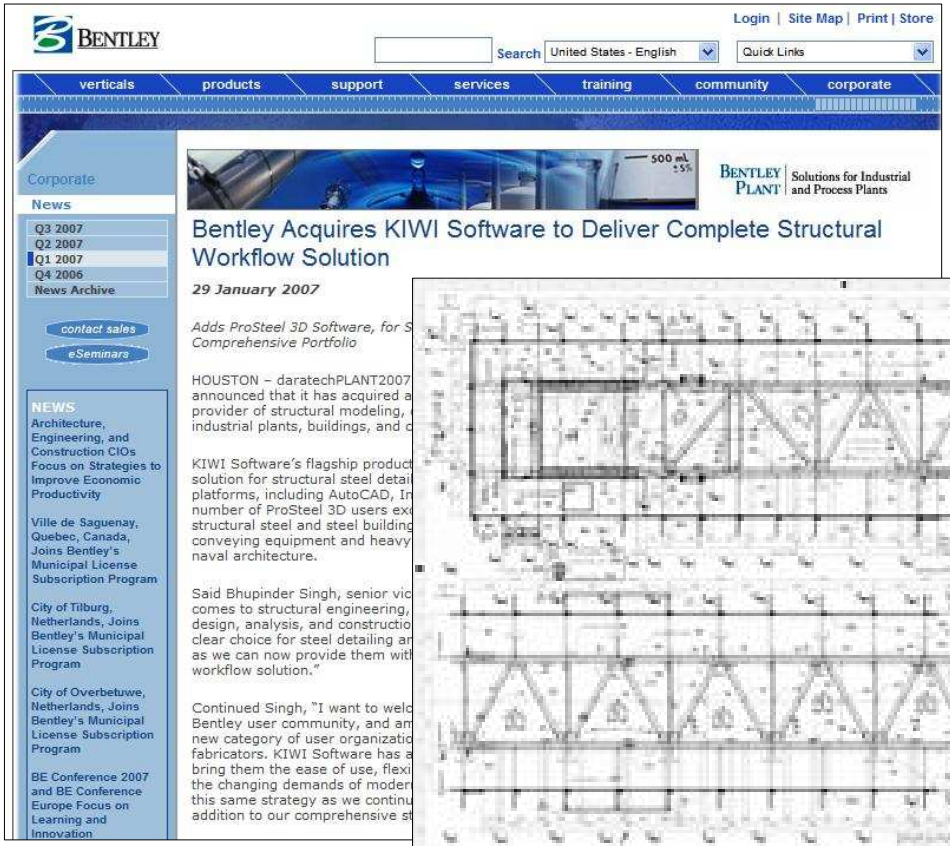


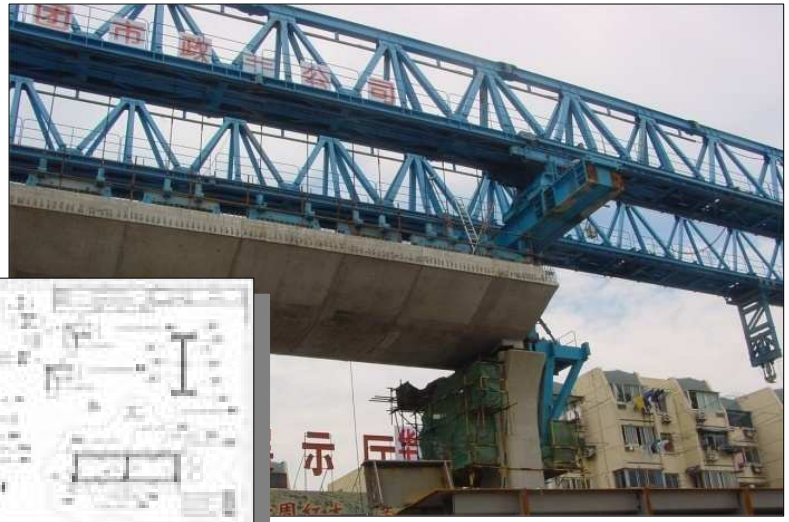


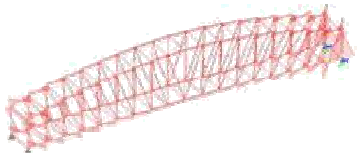
Bentley Rebar Modeling Benefits

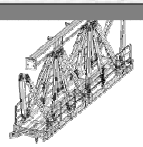
- Automated data entry from sections
- Productivity increases in drafting
- Productivity increases in scheduling
- Productivity increases in the checking phase
- No casting errors

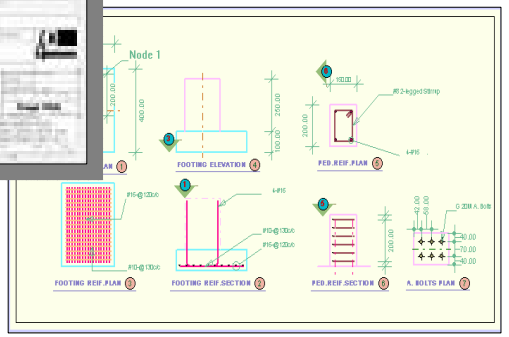
ProSteel 3D











Produce general arrangement and full steel detailed shop drawings with all information about connections and full erection/scheduling details

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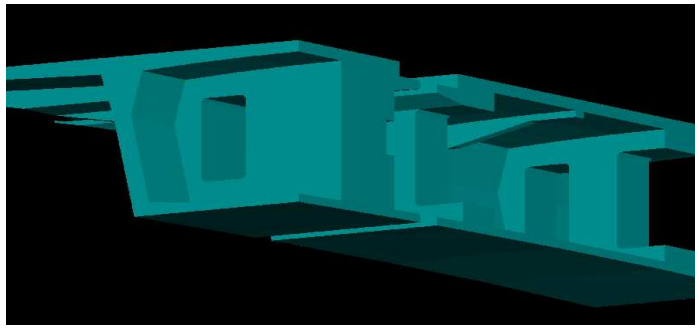
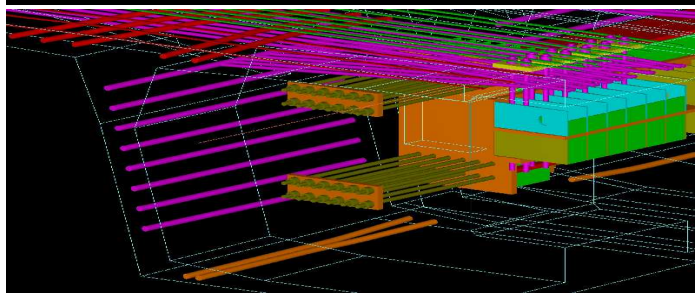
3D CAD Modelling

- 3D Terrain data
- RM Geometry
- MicroStation
- GenerativeComponents
- Rebar
- 3D road geometry
- Bentley ProjectWise Navigator

Giving ….

- Scheduling
- Constructability
- Communication





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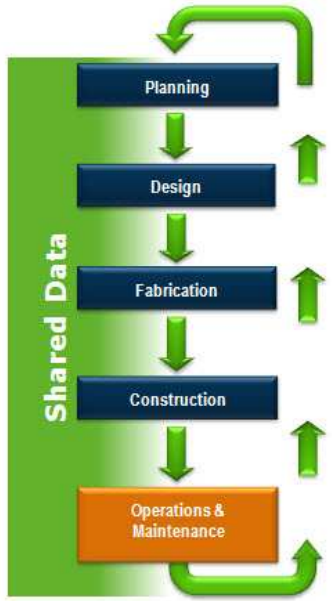
Bentley BrIM: Operations & Maintenance

- BridgeModeler/LARS (BridgeKey)
  - Bridge load rating
- Superload
  - Intelligent routing and permitting for oversized over weight vehicles



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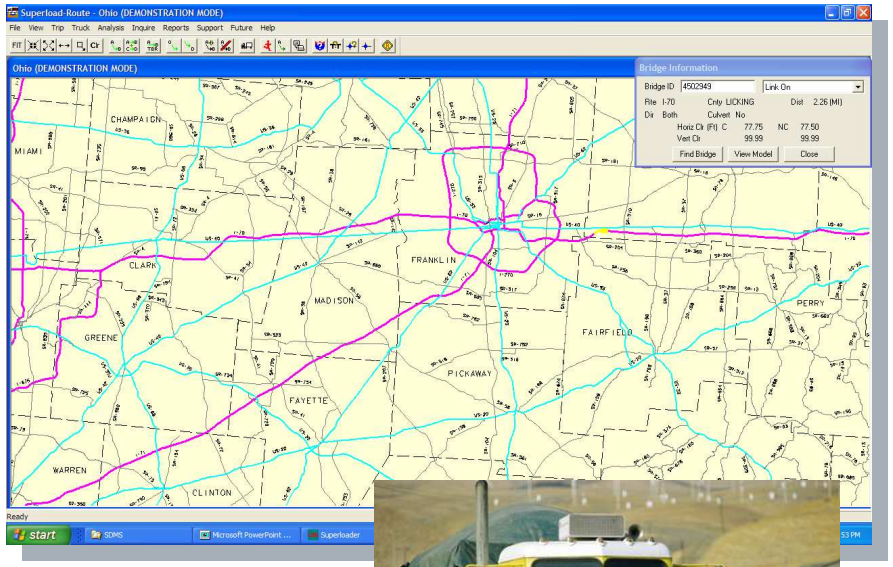
SUPERLOAD
Intelligent Routing and Permitting



Oversize/ Overweight Vehicles

Uses Load Rating information to determine live-load analysis for permit vehicle

- High speed map-based route determination
  - Horizontal and vertical clearance checking
  - Restriction checking
- Web-based implementation
  - Gotpermits.com

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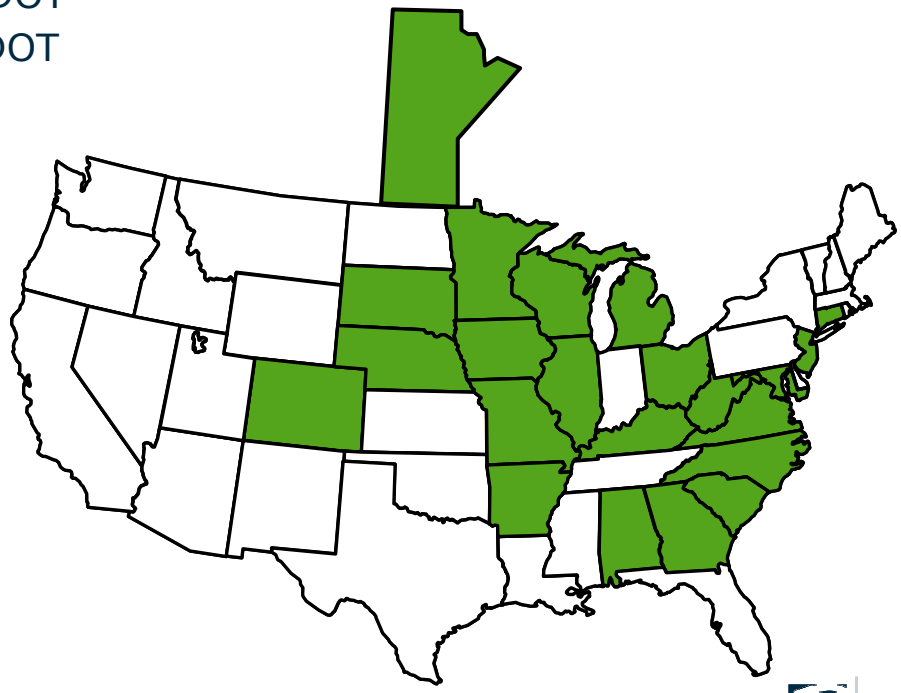
Bentley's OS/OW Experience

Users

- Alabama DOT
- Arkansas DOT
- Connecticut DOT
- Colorado DOT
- Georgia DOT
- Illinois DOT
- Iowa DOT
- Kentucky TC
- Manitoba TGS
- Maryland SHA
- Michigan DOT
- Minnesota DOT
- Missouri DOT
- Nebraska DOR
- New Jersey DOT
- North Carolina DOT
- Ohio DOT
- South Carolina DOT
- South Dakota DOT
- Virginia DOT
- West Virginia DOT
- Wisconsin DOT

☑ *Issuing Permits Since 1990 !*



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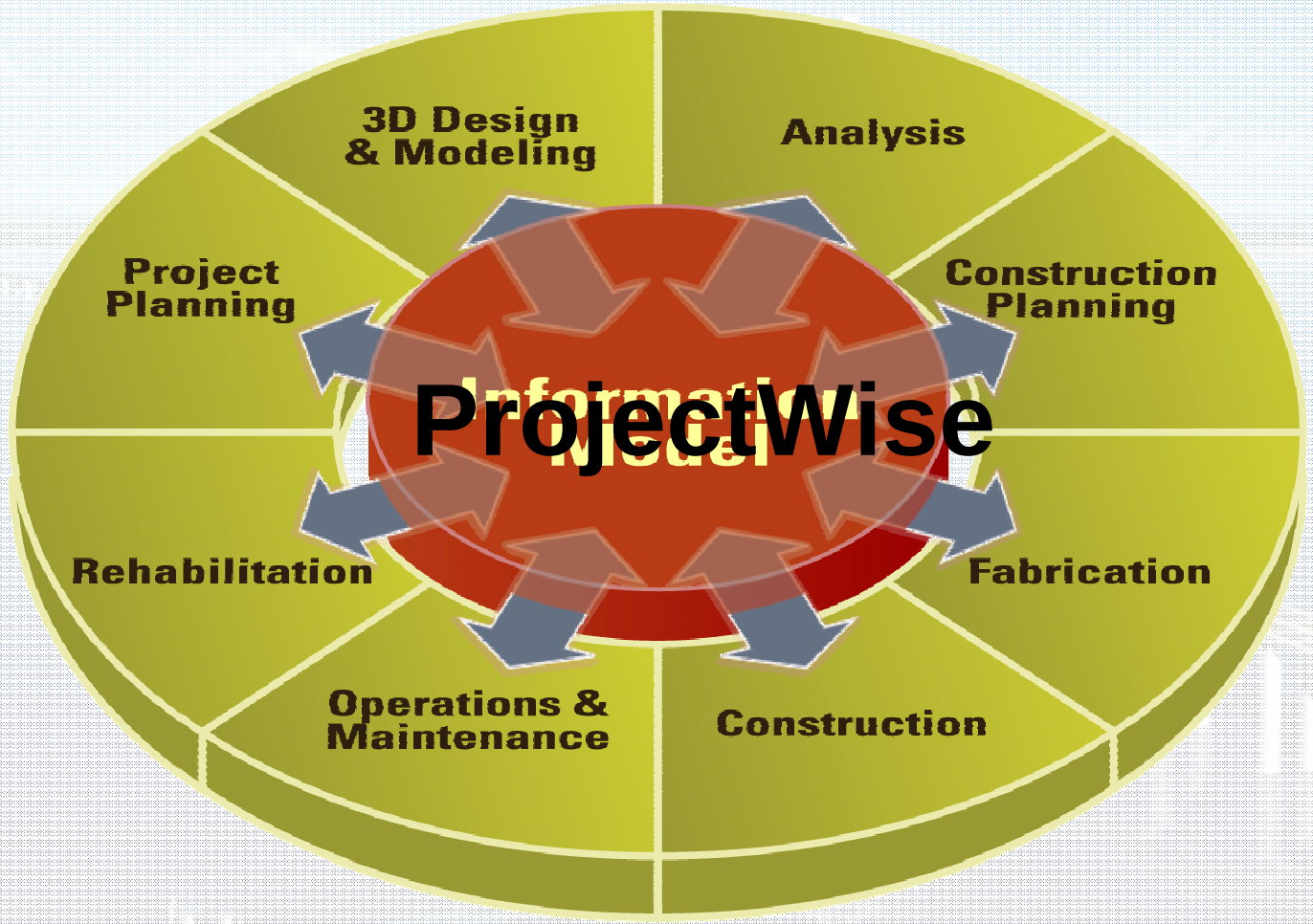
Bentley BrIM…..

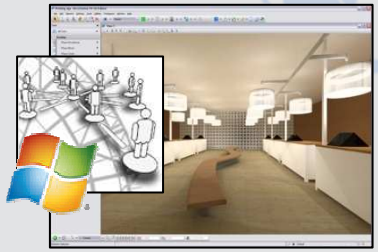
What holds it all together?



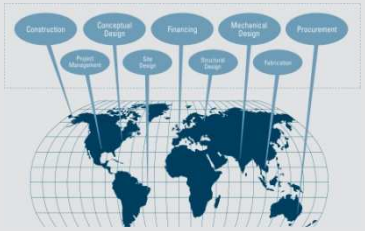
PROJECTWISE V8 XM edition | COLLABORATION SYSTEM

ProjectWise is a scalable collaboration system for
connecting people and information across a distributed enterprise

ProjectWise is used by 42 of the 50 leaders in the ENR500. The ProjectWise system now includes desktop applications, full-featured clients, and servers for connecting people & information.



ProjectWise Navigator delivers visual collaboration for immersive design review and analysis. **ProjectWise StartPoint** extends Microsoft SharePoint to enable collaboration for MicroStation & AutoCAD® users.



ProjectWise Integration Server delivers federated engineering content management, connects to servers for caching data, for automating & managing plotting, and for connection to SharePoint.

Integration flowchart