



Summer Conference  
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It's time for learning.

**Development of BIM contract  
language for USACE**

Shawn Foster - HNTB



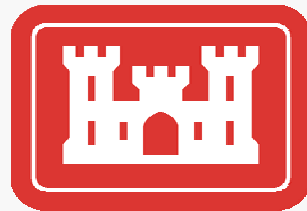
# Public Service Announcement

**WARNING!**

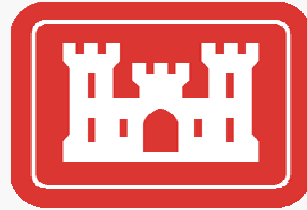
**WARNING!**

**WARNING!**

There are no images, soundtracks,  
or animations in this presentation –  
just a lot of words.



# Thanks!



Thank you to Steve Hutsell, SWD BIM  
Manager for the content of this presentation

Originally presented at USACE Infrastructure  
Conference, Detroit, 2007

# Development Team

## In the Beginning...

- In Fall of 2006 a dialog was established with five BIM-aggressive AE firms in joining me in conducting discussions and workshops on mutually beneficial BIM issues.
- They are a mixture of TriForma, REVIT and ArchiCAD users.
- Collaboration on best practices, contract language, standards, etc. provides a tremendous opportunity to partner in strengthening federal and private sector BIM initiatives.
- Participation is strictly voluntary and all costs incurred to participate are the responsibility of the firms.
- We conduct monthly on-site workshops and weekly conference calls and also use a Groove workspace for ongoing discussions and data sharing.

# Development Team

- Our first project was to establish BIM contract language that addressed the Corps' vision yet was application-neutral. This was driven by HFPA projects coming into SWF that contained customer-driven BIM requirements. Initial focus was on AE design requirements.
- About the same time there was an initiative in the BIM Sub-COP to develop USACE contract language in support of the CoS program and it just made sense for the team to contribute whatever is developed toward that effort.
- The BIM Sub-COP effort required language that covered both DB and DBB scenarios, so about two months ago a search began for General Contractors that are experienced and aggressive in implementing BIM to join us.
- Along with five GC's we were also able to incorporate members of the AGC to include a couple of associates that work with legal matters.



# Development Team

- Much discussion went into balancing the expectations in the USACE BIM Roadmap for building life-cycle BIM implementation against current design/construction experience for what is **practical, fair and reasonable within the existing state of the technology and standards, while yet trying to push for innovation** within a BIM application-neutral context.
- We had planned on continuing with the AE development to produce GC language for the DBB scenario and then integrate where needed to produce DB language.
- As we got deeper into discussions from both AE/GC perspectives it became apparent that there are some very difficult issues that would need to be addressed but there wasn't enough time within the schedule constraints needed by the CoS and MT Model RFP initiatives.

# Development Team

- Stepped back and focused on the DB context to produce RFP language and SOW language, then pushed it forward to the CoS Board and BIM Sub-COP for review.
- The SOW is very much a work in progress that will continue to be fine-tuned to reflect developments in the industry, and to incorporate lessons learned as projects are awarded and executed.
- In coordination with the BIM Sub-COP we will continue to develop language in support of other contract options such as DBB, CM@Risk, Integrated Project Delivery and as-needed, language that is application-specific.

# Development Team

- The SWF/AE/GC BIM Team Members are:
  - AE's:
    - »CH2M Hill - Robert Barber
    - »CUH2A - Ben Ferrer
    - »HDR - Mark Butler and Jim Yount
    - »HNTB - Shawn Foster
    - »Jacobs - Gary Koah
    - »Mason & Hanger - Lee Ezell and Eric Baker

# Development Team

- GC's:
  - »CG Schmidt - Dan Klancnik
  - »Holder Construction - Mike LeFevre
  - »Sundt - Dan Russell
  - »Swinerton - Dan Gonzales
  - »Tocci - John Tocci
  
- AGC and Associates:
  - »AGC - Brian Perlberg
  - »Hurtado, S.C., Counselors at Law - Kim Hurtado
  - »Duane Morris LPP Law Firm - Rick Lowe

# Contract Language

- Why it is important
  - Defines customer expectations.
    - » Expectations vary wildly based on intended use of BIM input, processes and output.
  - Defines interoperability and collaboration requirements to maximize benefits of technology and processes.
  - Defines minimum AE and GC services and implementation requirements such as model content and usage.

# Contract Language

- Defines compliance with standards and initiatives
  - » National BIM Standard
  - » COBIE
  - » IFC

# Contract Language

- Enhanced communication and coordination improves the overall experience, quality and risk for the owner, designer, builder and operator.
  - » Owner/Operator gets improved product and financial risk mitigation.
  - » Designer gets improved processes for design and performance sensitive decisions.
  - » Builder get improved project quality and significant improvement in trade flow issues.

# Contract Language Structure

## Design/Build Scenario

- Establishes a collaborative effort between owner, designer and constructor.
- Input by General Contractor early on in process.
- Similar advantages in CM@Risk and Integrated Project Delivery

## Design/Bid/Build Scenario

- No collaboration between designer and GC.
- GC to meet BIM requirements based on model(s) created by others.
- Liability concerns

# DB Scenario

- Submittal Format
  - Design Development Drawings. All drawings will be developed using Building Information Modeling (BIM) software and CAD software.

# DB Scenario

- Drawings
  - All CAD files used for the plan set will be delivered in [specify CADD format] and prepared in conformance with A/E/C CADD Standard Release 3.0.
  - **CAUTION!** A specified CAD format DOES NOT by default specify the BIM application to be used.
- Building Information Modeling (BIM).
  - BIM software will be utilized as a superset of CAD during the Design phase and the BIM model will be used to produce Construction Documents.
  - The BIM product(s) selected by the Design-Build Project Team must be certified in the IFC Coordination View (2x3 or better).

# DB Scenario

- The Design-Build Project Team implementation plan
  - Leveraging BIM modeling, design and analysis technologies using a common data model from concept development through Drawings of Record as a design, production, coordination, construction, and documentation tool.
  - How BIM will be used to extract quantities and systems data to be used in cost analysis, value management, estimate validation, project scheduling, interference management and design-change tracking.
  - **Plan will include BIM interoperability methodology and will be submitted to District BIM Manager for approval. Team will conduct a BIM Interoperability charrette to demonstrate the effective interaction of all parties for project processes and requirements.**

# Highlights

- Modeling Granularity
  - Models may vary in level of detail for individual elements within a model, but at a minimum must include all features that would be included on a ¼-in to 1-ft, 0-in. scaled drawing.
  - Mechanical/Plumbing systems will include piping larger than 1.5” diameter.
  - All fire protection piping will be modeled.
- Estimating
  - The BIM model will provide a common estimating material take-off basis to provide validation for quantities, and support a single quantity basis for all parallel estimating activities.

# Highlights

- BIM will be used to perform Design and Construction Reviews.
  - Visual Check to ensure design intent has been followed and that there are no unintended elements in the model.
  - Interference Management (Clash Detection) is used to locate problems in the model where two objects are occupying the same physical space.
    - » Hard interferences and soft interferences (service access, fireproofing, insulation, etc.) will be reported.

# Highlights

- Construction Operations Building Information Exchange (COBIE).
  - Model(s) and project specific facility data are required to fulfill the COBIE requirements as applicable.
  - Follow requirements of NBIMS, Appendix B: [www.nbims.org](http://www.nbims.org).
    - » Provide information identified in the COBIE Pilot Implementation Standard worksheets.

# Highlights

- Project Reviews
  - For visual review the 3D model will be delivered in NavisWorks, Adobe 3D PDF 7.0 (or later), SketchUp\*, Google Earth KMZ or equivalent format. Other formats may be requested as needed, i.e. IFC, Bentley Navigator.

\*SketchUp for initial design charrette only

# Highlights

- BIM Model Minimum Requirements and Output
  - Design
    - » Systems will be complete and accurate to reflect the design intent.
    - » Final design-intent model(s) will be modeled as they would be built to get complete and accurate quantity takeoffs of relevant construction materials to satisfy COBIE requirements and to reflect as-built conditions.
  - Construction
    - » Systems will be complete and accurate to reflect the as-built conditions.
    - » COBIE requirements will be met.

# Model Minimum Requirements

- Architectural system
  - Spaces
  - Walls and Curtain Walls
  - Doors, Windows and Louvers
  - Roof
  - Floors
  - Ceilings
  - Vertical Circulation
  - Architectural Specialties and Woodwork
  - Fixtures and Equipment
  - Schedules

# Model Minimum Requirements

- Furniture system
  - Office and system furniture layouts
- Structural system
  - Foundations
  - Floor Slabs
  - Structural Steel
  - Cast-in-Place Concrete
  - Stairs
  - Elevators

# Model Minimum Requirements

- Mechanical system
  - HVAC
  - Plumbing
  - Equipment clearances shall be modeled for use in interference management and maintenance access requirements.

# Model Minimum Requirements

- Electrical/Telecommunications system
  - Interior Electrical / Power and Lighting
  - Communications
  - Conduit larger than 1.5” shall be modeled.
  - Exterior Building Lighting
  - Electrical Site
  - Equipment clearances shall be modeled for use in interference management and maintenance access requirements.

# Model Minimum Requirements

- Fire Protection system
  - Fire protection components
  - All fire protection piping shall be modeled
  - Fire alarm/mass notification devices and detection system

# Model Minimum Requirements

- Civil 'system'
  - Terrain (DTM)
  - Drainage
  - Utilities
  - Road and Parking

# Model Implementation

- AE design services
  - Design intent
    - » Multi-discipline
    - » IFC compliant model(s)
  - Schedules
  - Project review (visualization)
  - Validation of estimates
  - Value management
  - Interference management (Clash detection)
  - COBIE requirements
  - Contract documents

# Model Implementation

- AE design services
  - Potential requirements
    - » Acoustical analysis
    - » Lighting analysis
    - » Energy analysis
    - » High definition scanning
    - » LEED supported/documented in model

# Model Implementation

- GC services
  - Project review (visualization)
  - Validation of estimates
  - Interference management (Clash detection)
  - Project scheduling
  - COBIE requirements
  - As-built models
    - » Inclusion of sub-contractors

# Contracting Issues

- Model ownership
  - USACE will own model(s)
  - Models in CoS program will be reused in site adapt applications
- In DBB,
  - what is liability on GC for errors in AE design-intent model?
  - How is model-continuity-process addressed? Design-intent model versus construction model.
- Contract Document precedence – the model or the hardcopy plans?

# Contracting Issues

- Goal is to be application-neutral
  - Unless specified otherwise by customer, focus is on performance and output requirements versus specific means and methods.
  - **CoS program will specify data and file format for continuity of standard designs and internal research initiatives.**
- Design services payment schedule
  - AE's would prefer a larger distribution of funds at earlier stages to cover cost of modeling marathon.

## Contact Info

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# Questions?



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