

GSA's National 3D-4D-BIM Program

In 2003, the U.S. General Services Administration's (GSA) Public Buildings Service (PBS) Office of Design and Construction established the National 3D-4D-BIM Program. The primary goal of the Program is to promote virtual design and construction through value-adding digital visualization, simulation and optimization technologies to increase quality and efficiency throughout GSA project lifecycles.

As one of the largest public property owners in the world, GSA plans and manages the design, construction, and operation of federal facilities, including agency headquarters, courthouses, office buildings, and land ports of Entry. In the architecture, engineering, and construction (AEC) industry's current practice, building designs and renovations are communicated in fragmented and often inconsistent two dimensional drawings that lack integral information needed for effective design evaluation. The National Institute of Science and Technology (NIST) has identified the lack of information interoperability as the main cause for inefficient rework and waste, which is conservatively estimated to be 4.2% of total construction cost in place.

Specific business drivers related to the construction process and facility service include:

- **As-built documentation:** For the majority of GSA's 8,500 owned or leased buildings across the United States, as-built documentation is fragmented or incomplete, out-dated, or non-existent. Incomplete or inaccurate as-built documentation often leads to delays and/or construction rework during renovations or modernizations, and result in unmet schedules, cost overruns, and unsatisfied customers.
- **Construction Phasing:** Sub-optimized construction phasing has resulted in significant cost and schedule delays, as well as customer dissatisfaction. Communication of complex phasing and sequencing information is often unclear, and difficult for the majority of stakeholders to understand.

Documented Project Successes

Since the establishment of the National 3D-4D-BIM Program, GSA has initiated over 100 capital projects across the country using an array of 3D, 4D, and building information modeling (BIM) technologies in support of GSA business needs. GSA has been able to reduce costs while improving quality and efficiency on capital projects. Specific results have included:

- Fast, complete, and accurate as-built data of existing buildings up to 6mm accuracy is now obtained using laser scanning technology, especially valuable for historic facilities which represents 25% of the GSA portfolio.
- Construction time is consistently reduced using 4D Phasing with improved means of communication between tenants and contractors during pre-bid conferences. One renovation project realized a reduction of 19% in construction duration using 4D Phasing techniques, and became a case study for the Harvard Graduate School of Design.
- Uncovered design errors and omissions (e.g., envelope and coordination omissions) in a complex federal office building employing a dual building envelope for achieving High Performance Green Building.

National Impacts

Based on the high degree of initial success, GSA has mandated BIM requirements for all capital projects that receive design funding since 2007. In addition, GSA's National 3D-4D-BIM Program is actively promoting the implementation of additional BIM technologies above the minimum requirements throughout a project's lifecycle. GSA has also developed a public website (www.gsa.gov/bim), GSA internal web-based knowledge portal, BIM Guide Series to document best practices and lessons learned, a community of regional BIM Champions, and maintains an active collaboration with leading industry consultants, software developers, standards committees, academic and research institutions, as well as other U.S. and international government agencies. In 2009, GSA awarded 16 Nationwide Indefinite Delivery, Indefinite Quantity (IDIQ) contracts for 3D Laser Scanning and BIM Services to further support the growing demand of these technologies within GSA.

Industry Impacts

GSA's National 3D-4D-BIM program has provided influence and incentive for industry participation and has encouraged industry-peer owners to implement BIM requirements. The GSA BIM Guide Series on Spatial Program Validation was chosen as the foundation for the National BIM Standard, and the BIM Guide Series on 3D Imaging will serve as the foundation of the ASTM Laser Scanning Standard. GSA has propelled this technology forward with positive influence and acclaim both nationally and internationally in the AEC industry. Several public and private owners, such as the Army Corps and the Department of State, have followed the GSA's lead and collaborated with the GSA to adopt similar BIM initiatives, as have countries such as Norway, Finland, Netherlands, and Australia. GSA has also influenced many industry organizations, such as AIA, AGC, CURT, and CMAA to adopt and advocate BIM and open standards. GSA is committed to the continued strategic adoption of technologies that advance innovations in the construction process and on facility management through a project's lifecycle.

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3D Laser Scanning provides accurate as-built information to reduce rework on renovation projects.



Accurate as-built documentation was not available before the renovation of a historic courthouse. (New Bern, NC)



3D Laser Scanning of exterior and interior of building provide existing condition information accurately and efficiently.



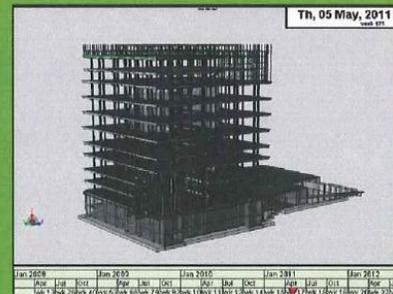
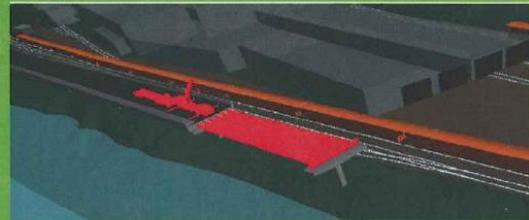
As-built BIM model included all existing architectural, structural, and MEP elements.



4D Phasing improves communication and validation of construction schedule with all project stakeholders.



Visualization of pier (above) and deck (below) construction between embankment and railroad of a new border station. (Madawaska, ME)



Visualization of the construction schedule of a new courthouse during pre-construction team meetings. (Salt Lake City, UT)



GSA's BIM Website
(www.gsa.gov/bim)

GSA's National 3D-4D-BIM Program influences the AEC industry nationally and beyond.



GSA's BIM Guide Series

Washington, DC
January 17, 2008

Public Statement

STATEMENT OF INTENTION TO SUPPORT BUILDING INFORMATION MODELING WITH OPEN STANDARDS

Background

Government clients of the AEC/FM (Architecture, Engineering, Construction, and Facilities Management) sector have an interest in the continuous advancement of productivity, efficiency, and quality in the AEC/FM industry, leading to a better built environment for end users, clients, and stakeholders.

We believe that sharing AEC/FM-related information throughout the life cycle (scoping, planning, design, tendering, procurement, construction, operation, maintenance, refurbishment, and disposal) of capital facilities globally and across all disciplines and technical applications, is key to achieving this goal.

Agreement to implement BIM signed by five international governments: Finland, Norway, Denmark, the Netherlands, and U.S. GSA