GSA's Office of the Chief Architect

The United States General Services Administration (GSA), often referred to as "The Government's Landlord," influences the management of federal assets valued at nearly $500 billion. GSA provides and maintains quality workplaces for over a million Federal agency associates in approximately 8,500 owned or leased buildings across the United States.

GSA's Office of the Chief Architect (OCA) provides national leadership, policy direction, and standards in the areas of architecture, engineering, urban development, design, fine arts, historic preservation, construction services, and project management. As one of the largest property owners and managers in the world, OCA is involved in the planning, design, construction and operation of new and recently modernized courthouses, office buildings, border stations, and other facilities.

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

GSA Office of the Chief Architect established the National 3D-4D-BIM Program in 2003. The primary mission of the National 3D-4D-BIM Program is to promote value added digital visualization, simulation and optimization technologies to increase quality and efficiency in developing and managing GSA's capital assets throughout the entire project lifecylce.

The following are highlights of the GSA National 3D-4D-BIM Program:

- Establishing policy to phase in 3D, 4D, and BIM adoption for all major projects
- Providing expert support and assessment for ongoing capital projects to incorporate 3D, 4D, and BIM technologies•
- Assessing industry readiness and technology maturity
- Developing solicitation and contractual language for 3D-4D-BIM service (for GSA Internal Use only)
- Partnering with BIM vendors, professional associations, open standard organizations, and academic/research institutions
- Building a community of GSA BIM Champions and an internal knowledge portal
- Publishing GSA BIM Guide Series
  - Series 01: 3D-4D-BIM Overview
  - Series 02: Spatial Program Validation
  - Series 03: 3D Laser Scanning
  - Series 04: 4D Phasing
  - Series 05: Energy Performance and Operations
  - Series 06: Circulation and Security Validation
  - Series 07: Building Elements

For all prospectus-level projects receiving design funding in Fiscal Year 2007 and beyond, GSA requires spatial program BIMs be the minimum requirements for submission to OCA for Final Concept approvals by the PBS Commissioner and the Chief Architect. At the same time, all GSA projects are encouraged to deploy mature 3D, 4D, and BIM technologies—spatial program validation and beyond—at strategic project phases in support of specific project challenges.

Building Information Modeling

What is 3D-4D-BIM?

3D models are a geometric representation of building components and serve as an aid for visualization and design/construction coordination.

4D models combine 3D models with time, and include information that can inform and analyze project phasing, tenant sequencing, and construction scheduling.

Building Information Models (BIMs) include not only 3D geometric models (and can generate 2D and 3D drawings), but also more specific information on a wide range of building elements and systems associated with a building. These elements can include wall types, spaces, air handling units, geospatial information, and circulation zones.

The following are key areas of the 3D-4D-BIM Program, and are defined in the current or upcoming Guide Series*:

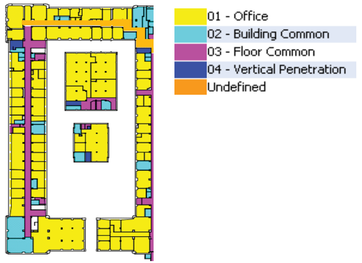
- Spatial Program Validation – Consistently and efficiently using BIM technologies for spatial program BIM minimum requirements
- 3D Laser Scanning – Accurately defining existing space measurements, saving time and cost
- 4D Phasing – Combining 3D models with time, to allow for better understanding of projected construction schedules
- Energy Performance and Operations – Using space-based BIM techniques to better predict and reduce annual energy use
- Circulation and Security Validation – Automating the checking of top priority circulation requirements, such as security
- Building Elements – Collecting and integrating requirements for building elements in BIM

*GSA's BIM Guide Series documents the best practices and lessons learned. It also serves as a guide for future BIM implementation.

Floor Area Calculations (in sf)

Floor	Gross Building Area	Gross Measured Area	Major Vertical Penetration	Floor Rentable Area
Basement	118,823	111,039	3,020	108,020
Ground Floor	107,954	101,020	3,437	97,583
First Floor	153,767	94,678	2,936	91,742
Second Floor	77,037	71,445	7,091	64,354
Third Floor	74,512	70,497	2,328	68,169
Fourth Floor	74,512	68,186	2,108	66,078
Fifth Floor	74,512	65,419	2,221	63,199
Sixth Floor	74,512	69,727	2,251	67,476
Seventh Floor	59,239	51,591	1,676	49,915
BUILDING	814,870	703,602	27,067	676,534

	Usable Areas
Floor	Floor Office Area
Basement	61,778
Ground Floor	71,380
First Floor	74,144
Second Floor	50,622
Third Floor	52,960
Fourth Floor	52,075
Fifth Floor	47,409
Sixth Floor	52,224
Seventh Floor	38,616
BUILDING	501,207



Benefits of 3D-4D-BIM

The 3D-4D-BIM Program has seen the following benefits as compared to traditional project management processes:

Greater Accuracy
Fast, complete, and accurate as-built data of existing buildings is now obtained with up to 6 mm accuracy using laser scanning technology within 3-5 days, vs. 5 feet discrepancy in 3 weeks. On the 26 Federal Plaza project in New York City, 3D laser scanning uncovered a 5-foot error in a key foundation wall placement in the original drawing, saving time and money early on.

Increased Savings
A National Institute of Standards and Technology (NIST) study estimated that in 2002, $15.8 billion were lost "due to significant inefficiency and lost opportunity costs associated with interoperability" in the capital facilities industry. NIST's findings equate to $520 million of waste or rework on GSA projects, when applied to the $12.5 billion of construction programs currently in the works. 3D, 4D, and BIM technologies can aid GSA in reducing waste and rework, by affecting process improvements early and throughout project delivery.

Greater Reliability
In current (non-BIM based) practice, building designs are communicated in terms of hundreds of separate and often inconsistent 2D documents. These documents often exclude information needed for effective design evaluation. Or include information that is outdated or is not transferable to other applications. A BIM-based model enables a better, more detailed understanding of building construction and performance (for example, potential "constructability issues" and exposed, and more information is included regarding thermal properties of wall etc.). Across GSA regions and projects, 3D, 4D, and BIM technologies offer a suite of applications that can economically improve the efficiency and reliability of operating and delivering these facilities. On a Federal Office Building project in Houston, use of 3D models uncovered design errors and omission early in the process.

Better Energy Performance
Better accuracy and reliability in estimations of energy performance and major savings through mechanical system optimization have been realized using BIM. In one case, a 40% energy consumption discrepancy was found, compared to a traditional energy model. A national initiative is in place to reduce the average annual energy performance by 30% by fiscal year 2015.

Increased Project Efficiency
3D-4D-BIM has proactively and successfully improved the delivery of a number of ongoing capital projects – from uncovering and mitigating errors and omissions, to predicting potential obstacles and their impacts, to introducing better design solutions, to enhancing tenant and contractor communications, to optimizing budget and schedule options. On the 300 North Los Angeles project, a 19% schedule duration reduction was realized using 4D modeling.

Emulating GSA's commitment to collaborate with other government agencies and industry organizations, several public and private owners, such as the Army Corps and the Department of State, have followed GSA's lead and collaborated with GSA and others to adopt similar BIM initiatives. Countries such as Norway, Finland, Netherlands, and Australia have followed suit as well.

Building Information Modeling

GSA
Building Information Modeling

Since 2003 GSA has initiated over 70 capital projects across the country using an array of 3D, 4D, and building information modeling (BIM) technologies in support of GSA business needs. Some of these applications include:

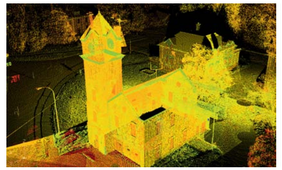
- Spatial program BIM models for spatial program validation
- 4D phasing for schedule optimization
- 3D-laser scanning for accurate as-built documentation
- BIM-based energy analysis for predicting energy performance

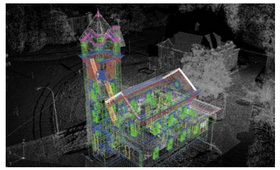
In addition, GSA has been able to reduce costs while improving efficiency on its capital GSA projects. Results have included:

- Validating area measurements in architectural designs with higher accuracy and efficiency
- Capturing accurate as-built data of existing buildings up to 6mm accuracy using 3D laser scanning technology
- Predicting energy performance more reliably and transparently, and achieving major savings through mechanical system optimiztion
- Enhancing means of communication between tenant agencies and contractors during pre-bid conferences
- Achieving cost savings--change order avoidance and design optimization from one of the initial 10 pilot projects was significant enough to pay for the cost of the entire pilot program
- Enabling more informed and efficient building operation practices

GSA's National 3D-4D-BIM Program has been honored with the following awards:

- CoreNet Global Innovators Award 2007
- GSA Achievement Award for Real Property Innovation in Asset Management 2007
- American Institute of Architects TAP Building Information Modeling Awards, Jury's Choice 2007
- FIATECH's CETI Awards — Celebration of Engineering & Technology Innovation, Large Scale Implementation Category Winner, 2007
- International Alliance for Interoperability (IAI) buildingSMART Innovation Award, 2006
- GSA Public Building Service Venture Capital Funding for Innovative Solutions, 2005





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