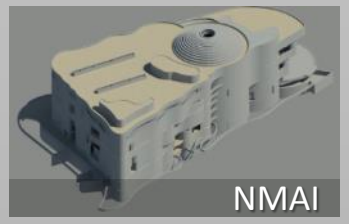
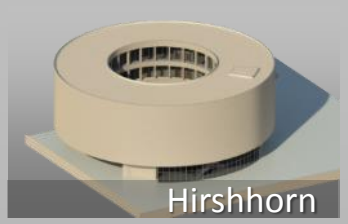
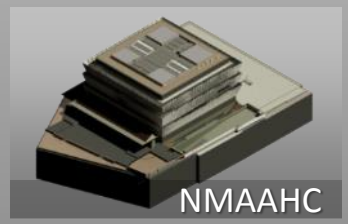
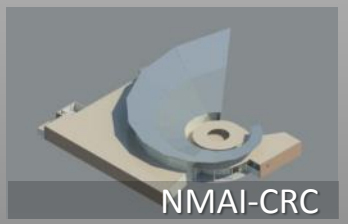








Mike Carrancho, P.E.

Smithsonian Institution

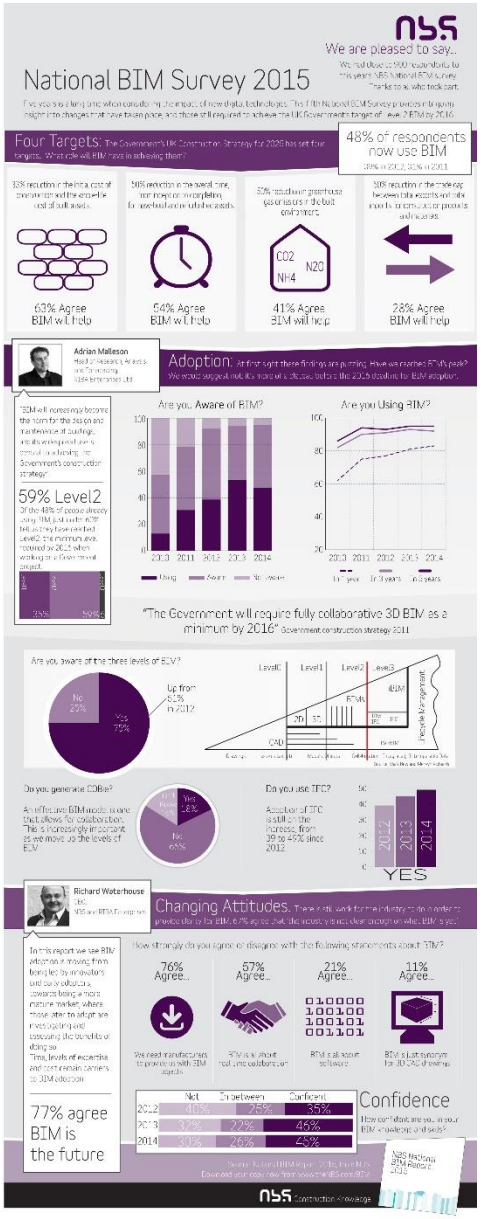
NSF Large Project Workshop 24 May 2016

Smithsonian

BIM for the ASSET Lifespan

Consider This:

- 92% believe it will be ‘de facto’ design standard in 3 years
- Only 25% of US owners have ‘very high involvement’ in BIM
- 75% of these stated that the AEC team used BIM when it wasn’t required by the owner
- UK is a leader in BIM with over 98% of owners having some involvement in BIM compared to 59% in the US



(Sources: NBS National BIM survey, 2015; McGraw Hill Constructon, 2014)

SF BIM Program Timeline

- 2013: Planning for BIM
  - Market and industry survey
  - Use Case Analysis, SI staff and AEs
  - In-house BIM Technician
- 2014: BIM Pilots, Standards and Wiki Sites
  - Identified major upcoming design project
  - Developed draft language for SOW
  - Create BIM templates & Guidance
  - BIM Viewer and Model Checker recommendations
  - Develop internal BIM Wiki sites using MS Sharepoint
- 2014 – 2015:
  - Updated AE Center, public facing website
  - Refine BIM guidelines and design deliverable requirements through pilot project feedback
  - Implement BIM Viewer
  - Focus on Asset replacement workflows
- 2015 – 2016:
  - Developing AE Scope of work language
  - Developing Div 1000 construction specification language
  - Implement Model Checker

Smithsonian

Establishing a BIM Foundation

SF BIM: Begin with the End in Mind

Required Outcomes of using BIM

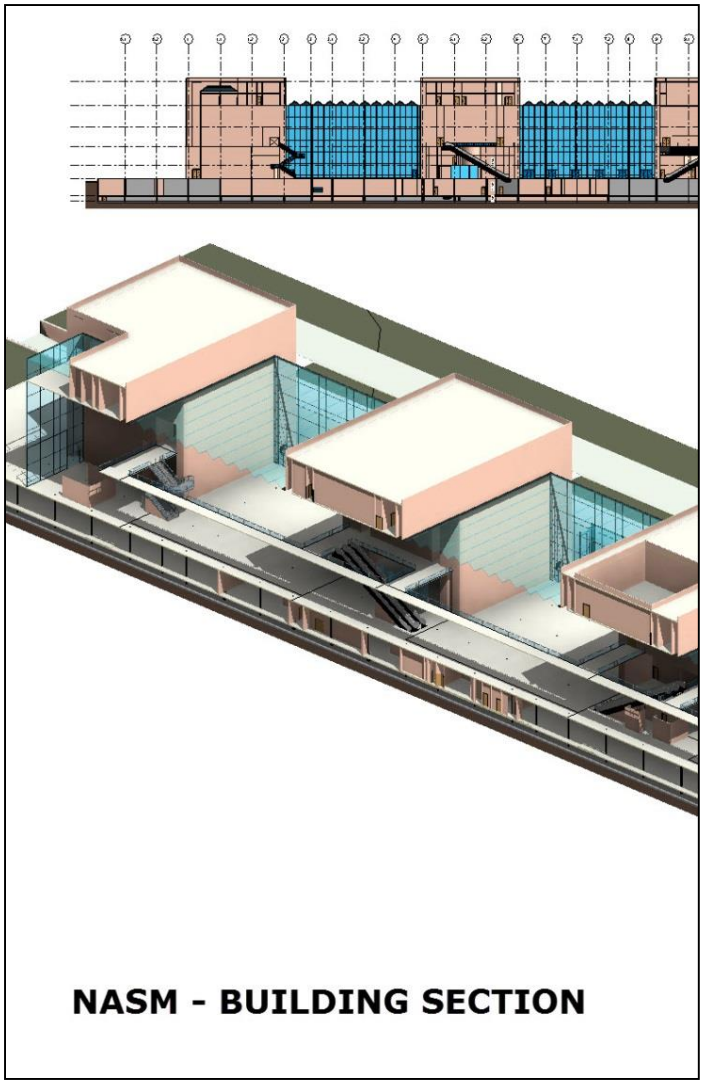
- BIM usefulness required long after design and construction
- Asset management
- Portable for maintenance and operations personnel
- Accessible at multiple user levels across the institution

During Design

- Incorporate specific BIM design review capabilities
- Address multiple user capabilities: equipment & skills
- Develop standards for AE to follow

During Construction

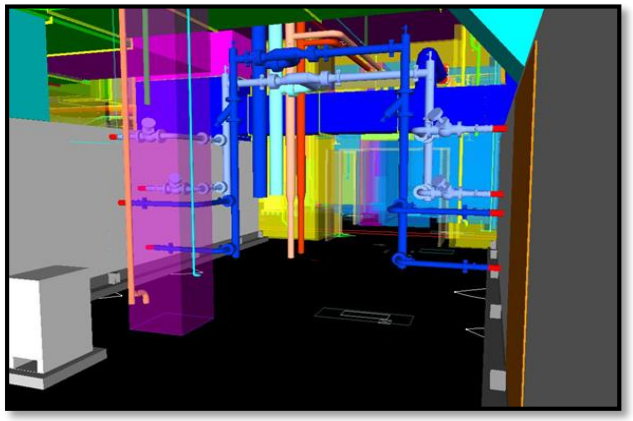
- Define 'As-Built BIM'
- Asset management
- Integration with Computerized Facility Maintenance System (Tririga Facility center)



Use Cases

Capital Program

- Introduce use of 2D and 3D (low detail) to visualize location and extent of capital project areas



Design

- More efficient access to accurate as-builts, shop drawings

Facilities Management

- Support ***preventative maintenance*** through visualization of work tasks and asset location

Energy Management

- Introduce geospatial component to existing power and water usage analysis

Smithsonian Gardens

- Support geospatial analysis of exterior spaces

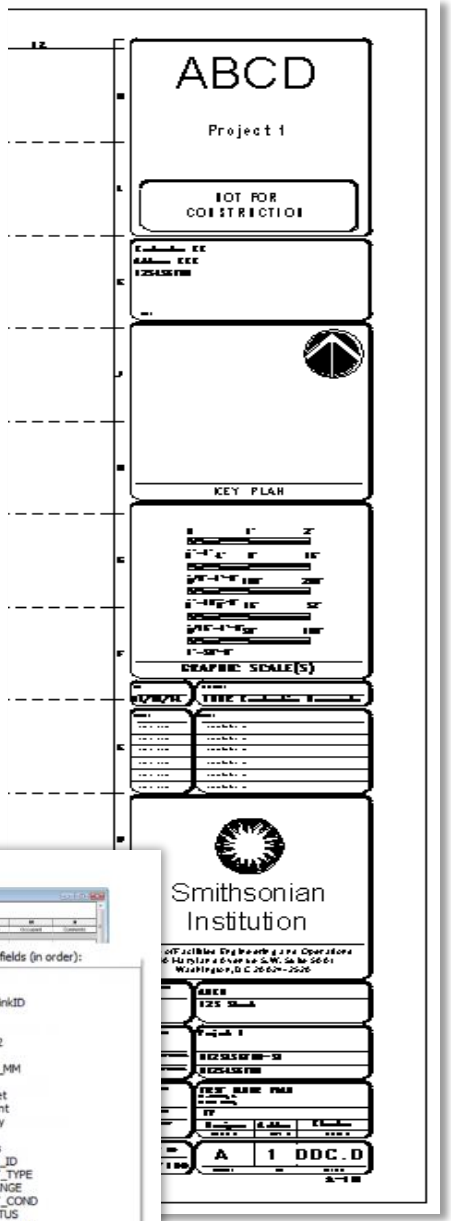
Historic Preservation

- Identify rooms and spaces of historic importance

Data Framework

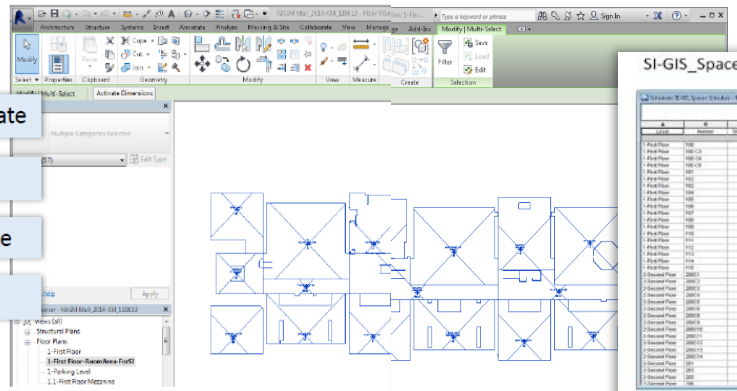
SI BIM Templates

- Provides a standardized Revit work environment to foster consistency in BIM development– for both AEC project teams and internal SI initiatives
- Support SI spatial data management by providing SI data fields and geometry for rooms and floors, and standard attributes
- Standardize model development, BIM guidelines and CAD exports with National CAD Standard and SI document conventions, standardize views and naming conventions
- Provide SI-specific asset data parameters and schedule views for O&M

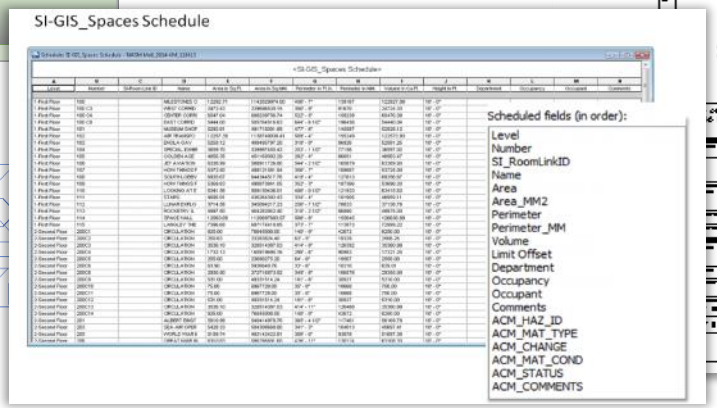


SI Revit Templates

- Architectural Template
- Electrical Template
- Mechanical Template
- Structural Template



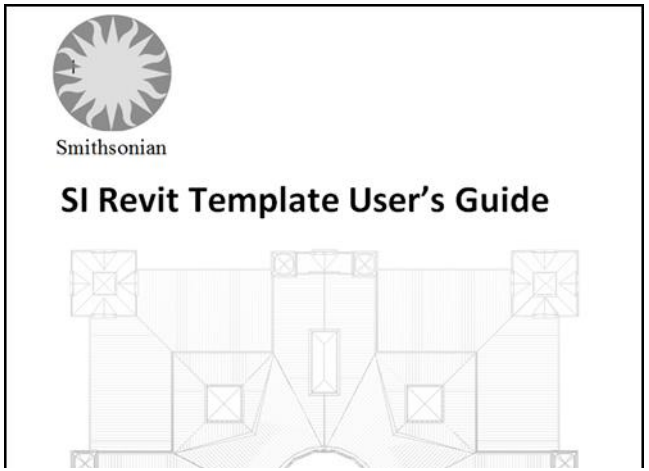
Revit ".rte" Template File – Space Plan



Guidance & Standards

Revit Template User's Guide

- Guidance for AEC project teams (primarily)
- Develop consistent model development across projects (and in-house)
- Not a tutorial – expect reader to know Revit
- Walks the user through Smithsonian minimum standards
- Based on National CAD Standard (v5) 5
- Customized title blocks, syntax for SI
- Identifies "Best Practices" (items not required)



Note that all SI-GIS plan views must contain SI insertion point symbol family located in the appropriate location (0,0,0) before they are exported to AutoCAD for all SI deliverables.

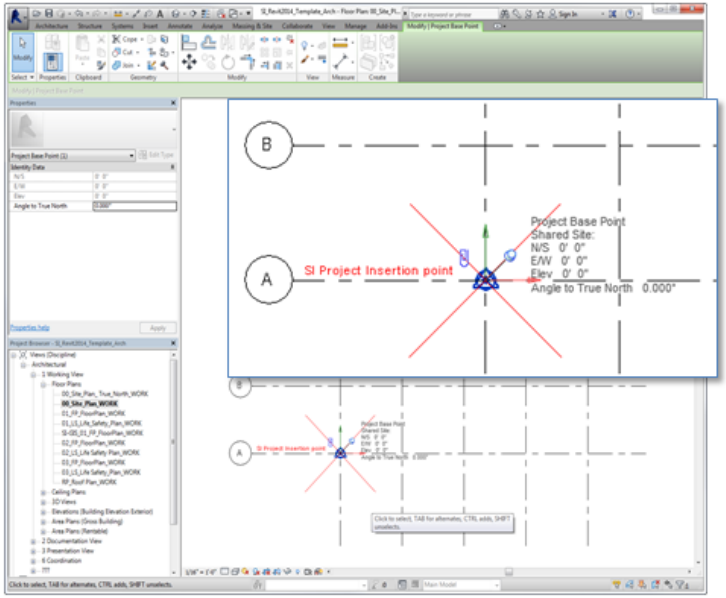


Figure 2– SI's Project Base Point family located at 0,0,0 coordinates

Data Framework

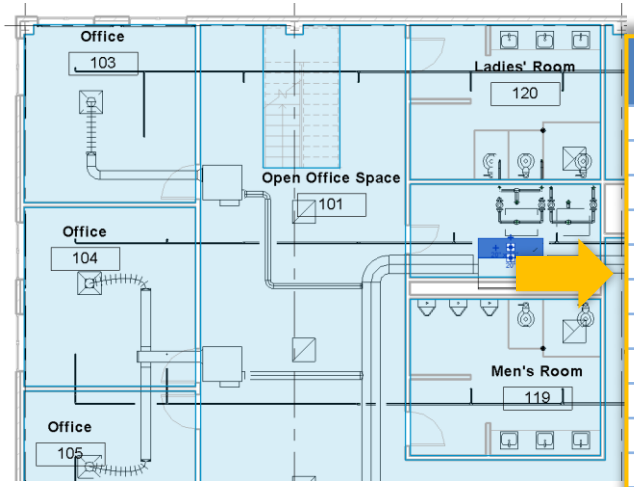
FM BIM: Data Development

IWMS/CAFM

- Provide critical asset data, *"ready"* for Tririga Facility Center Upload
- Focus: less data and higher quality

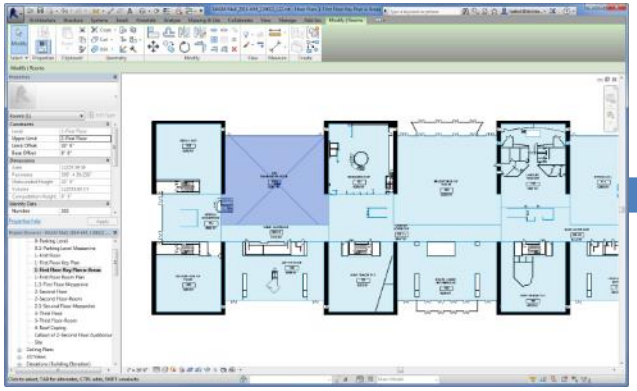
GIS

- BIM exchanges CAD geometry + data attributes for rooms and spaces



BIM to IWMS

SI Asset Parameters
Asset ID
Asset Name
Specification ID
Specification Name
Serial Number
Brand
Model Number
Description
Amps
Voltage
KVA
GPM
Belt Size
RPM
MaxP
Filter Size
Ton
HP
Gal
CFM
BtuH
Floor
Room Number



BIM to GIS

SI Revit templates organize data to be developed in the project BIM, and delivered to SI at project turnover, exported to GIS and IWMS

Guidance & Standards

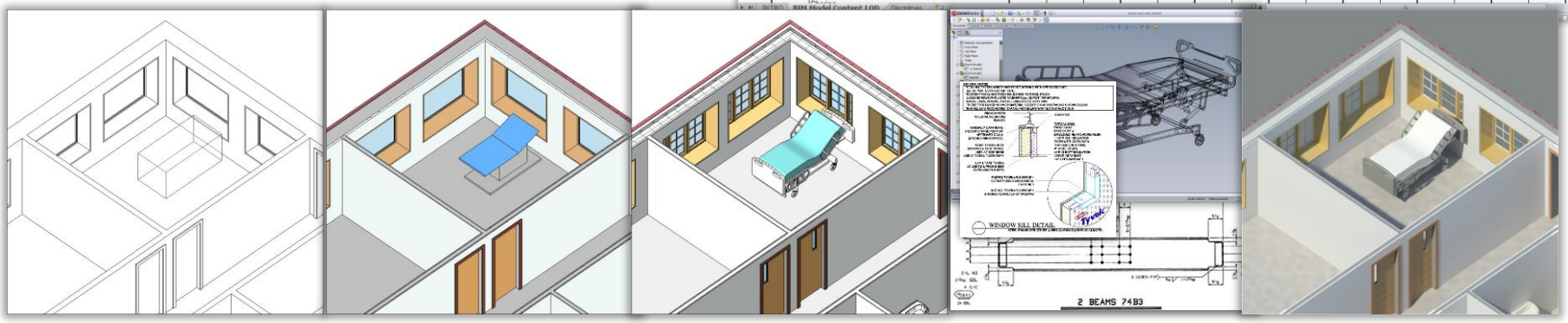
Guidance for BIM Deliverables

Level of Development Guide *(DRAFT)*

- SI has developed a guidance framework for the level development required for BIM deliverables
- BIM LOD will be identified early in the project (passed on to the team to detail in the project BIM PxP)
- The **Scope of Work** of the project ultimately defines the BIM requirements

Project Stage			Design Model			Design Intent Model							Means and Methods Model				
Time of Exchange (SD, DD, CD, Construction)																	
Responsible Party (Information Receiver)																	
Receiver File Format																	
Application & Version																	
BIM Use Title			Model Element (3D)	Model Element (2D)	Data Only (Specs)	Existing Conditions		Schematic Design		Design Development		Construction Documents		Shop Drawings		Construction Adminstration		As-Bu
			Yes (Y) / No (N)			Level of Development (LOD) and Model Element Author (MEA)												
Model Element (ASTM Uniformat II) Classification			Y/N	Y/N	Y/N	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD	MEA	LOD
	SUBSTRUCTURE																	
	A1010	Standard Foundations																
		Wall & Column Foundations																
		Foundation Walls																
		Grade Beams																
		Pile Caps																
		Excavation, Backfill & Compaction																
		Footings & Bases																
		Perimeter Insulation																
		Perimeter Drainage																
		Anchor Plates/Bolt Patterns																
		Means & Methods (Erection/Sequencing/ Shop Standards)																
	A1020	Special Foundations																
		Pile Foundations																
		Grade Beams																
		Caissons																
		Underpinning																
		Dewatering																
		Raft Foundations																
		Pressure Injected Grouting																
		Other Special Conditions																
		Means & Methods (Erection/Sequencing/ Shop Standards)																
	A1030	Slab in Grade																
		Standard Slab on Grade																
		Structural Slab on Grade																
		Inclined Slab on Grade																
		Trenches, Pits, and Bases																
		Under-Slab Drainage and Insulation																
		Means & Methods (Erection/Sequencing/ Shop Standards)																
	A2010	Basement Excavation																
		Excavation for Basements																
		Structure Back Fill and Compaction																

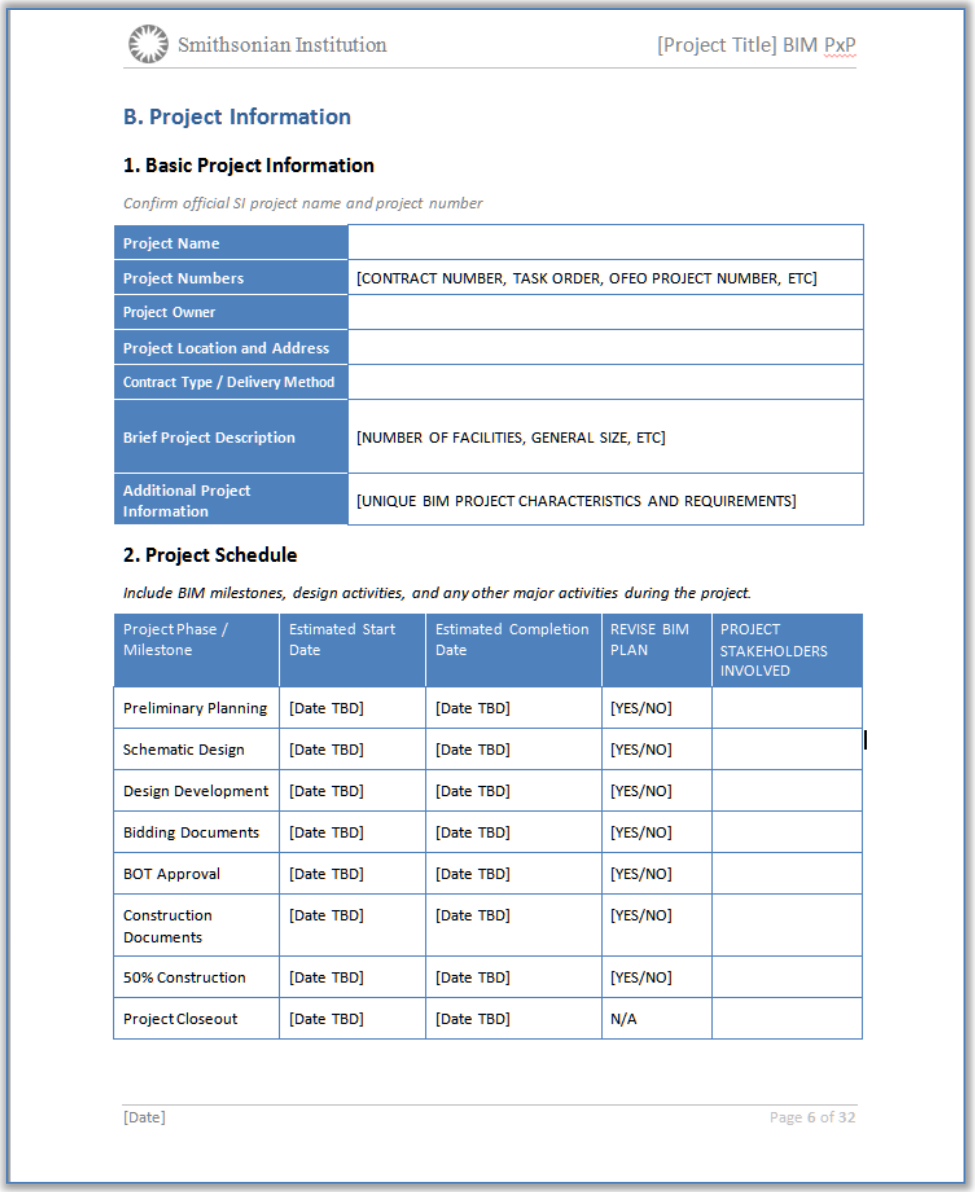
ASTM UniFormat II Classifications



Guidance & Standards

BIM Project Execution Plan (PxP)

- A living document populated and updated by the project team
- Clarifies and maintains the project BIM development process for the owner, and the team
- Provides a vetting process for any changes made in the BIM development process



Smithsonian Institution [Project Title] BIM PxP

B. Project Information

1. Basic Project Information

Confirm official SI project name and project number

Project Name	
Project Numbers	[CONTRACT NUMBER, TASK ORDER, OFEO PROJECT NUMBER, ETC]
Project Owner	
Project Location and Address	
Contract Type / Delivery Method	
Brief Project Description	[NUMBER OF FACILITIES, GENERAL SIZE, ETC]
Additional Project Information	[UNIQUE BIM PROJECT CHARACTERISTICS AND REQUIREMENTS]

2. Project Schedule

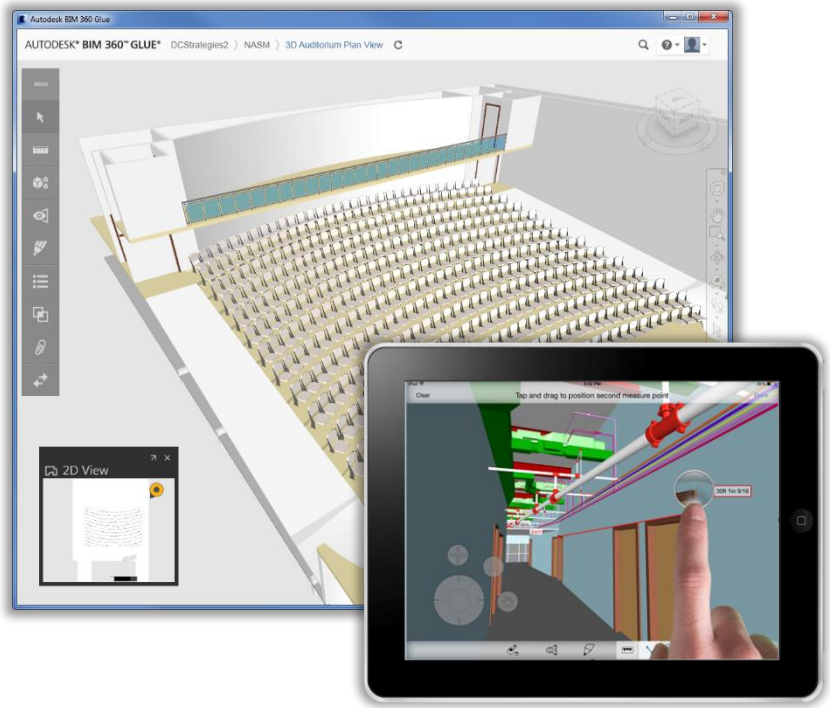
Include BIM milestones, design activities, and any other major activities during the project.

Project Phase / Milestone	Estimated Start Date	Estimated Completion Date	REVISE BIM PLAN	PROJECT STAKEHOLDERS INVOLVED
Preliminary Planning	[Date TBD]	[Date TBD]	[YES/NO]	
Schematic Design	[Date TBD]	[Date TBD]	[YES/NO]	
Design Development	[Date TBD]	[Date TBD]	[YES/NO]	
Bidding Documents	[Date TBD]	[Date TBD]	[YES/NO]	
BOT Approval	[Date TBD]	[Date TBD]	[YES/NO]	
Construction Documents	[Date TBD]	[Date TBD]	[YES/NO]	
50% Construction	[Date TBD]	[Date TBD]	[YES/NO]	
Project Closeout	[Date TBD]	[Date TBD]	N/A	

[Date] Page 6 of 32

Plan

Supporting SI BIM Project Reviews

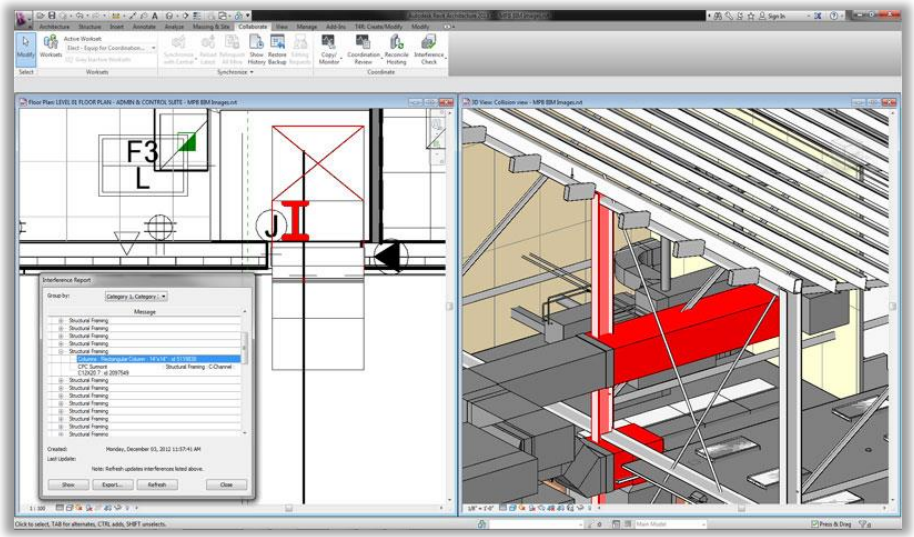


BIM Viewers

- Provides a means to review developing project models by SI users who are not Revit experts
- Offers versatile methods for viewing BIM: PDFs, mobile devices

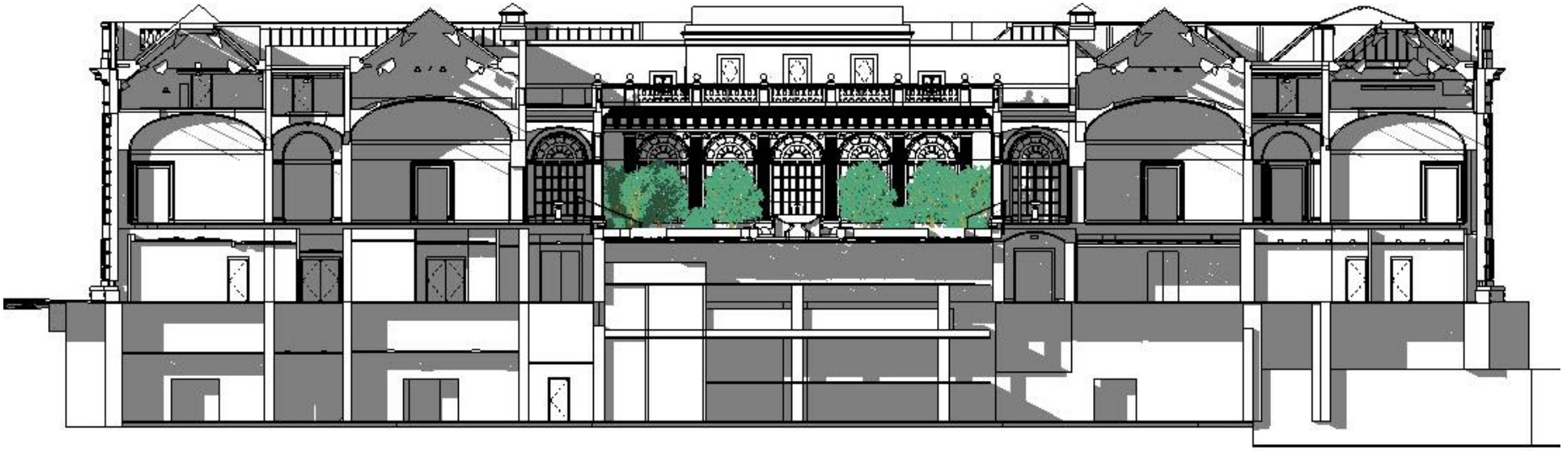
Model Checkers

- Provides an automated means to check a BIM against a customized rule set
- Useful by SI and by their project consultants



How will it all work?

BIM data improvement over time



How will it all work?

BIM data improvement over time

How will it all work?

BIM data improvement over time

How will it all work?

BIM data improvement over time

Building Information Management Portal

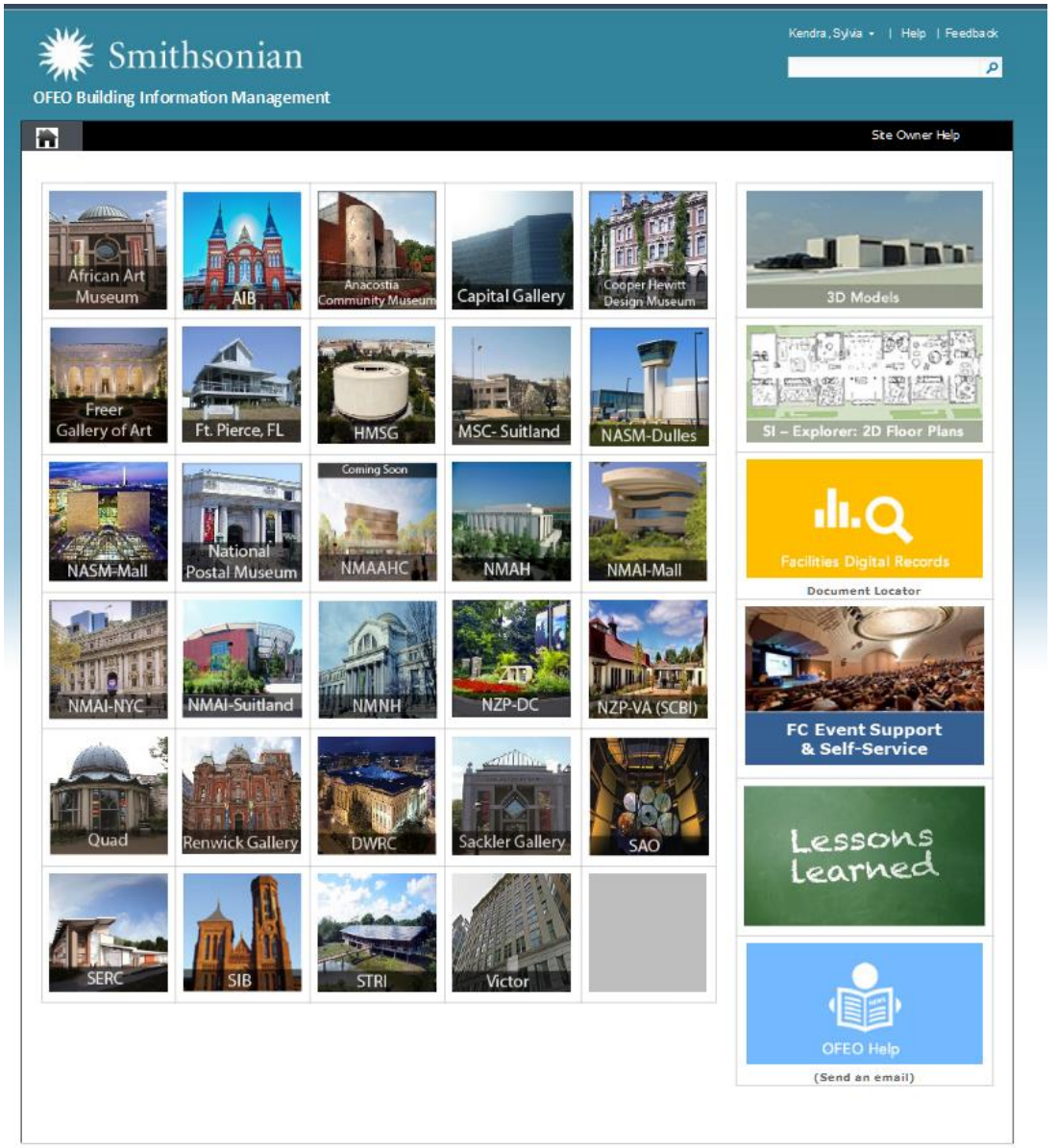
BIM "Wiki"

Develop a go-to source for information about SI facilities

- Highly visual
- Collaborative web-based environment
- Leveraging SI's SharePoint expertise

Provide links and information from *existing* SI systems

- No new data, just a clearinghouse for existing systems
- SI campus specific
- Simplifies access to critical facilities information

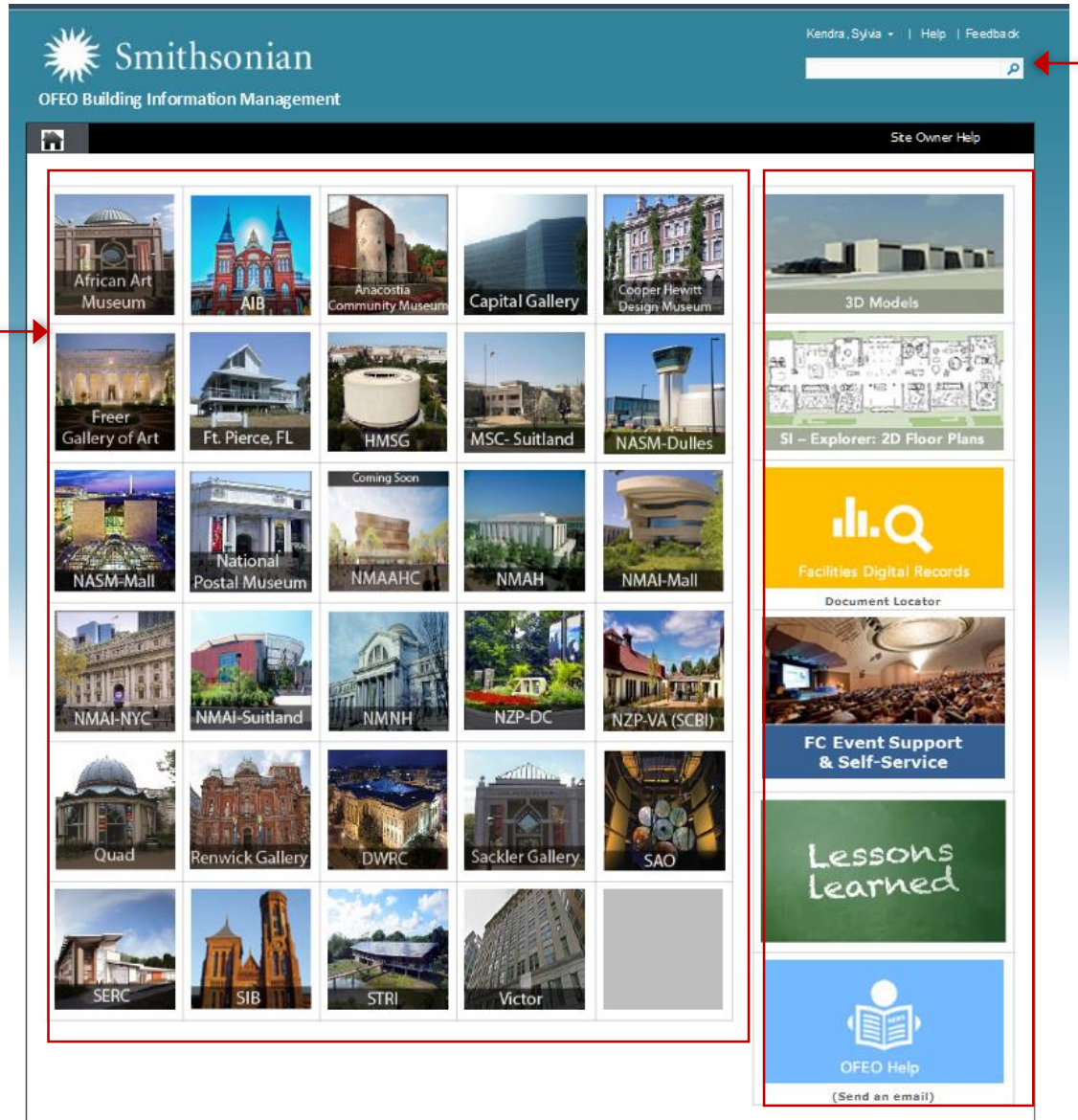


BIM "Wiki" – Home Page

Top level page – access to all building pages and support documentation

Access:

Individual Building Wikis



Search

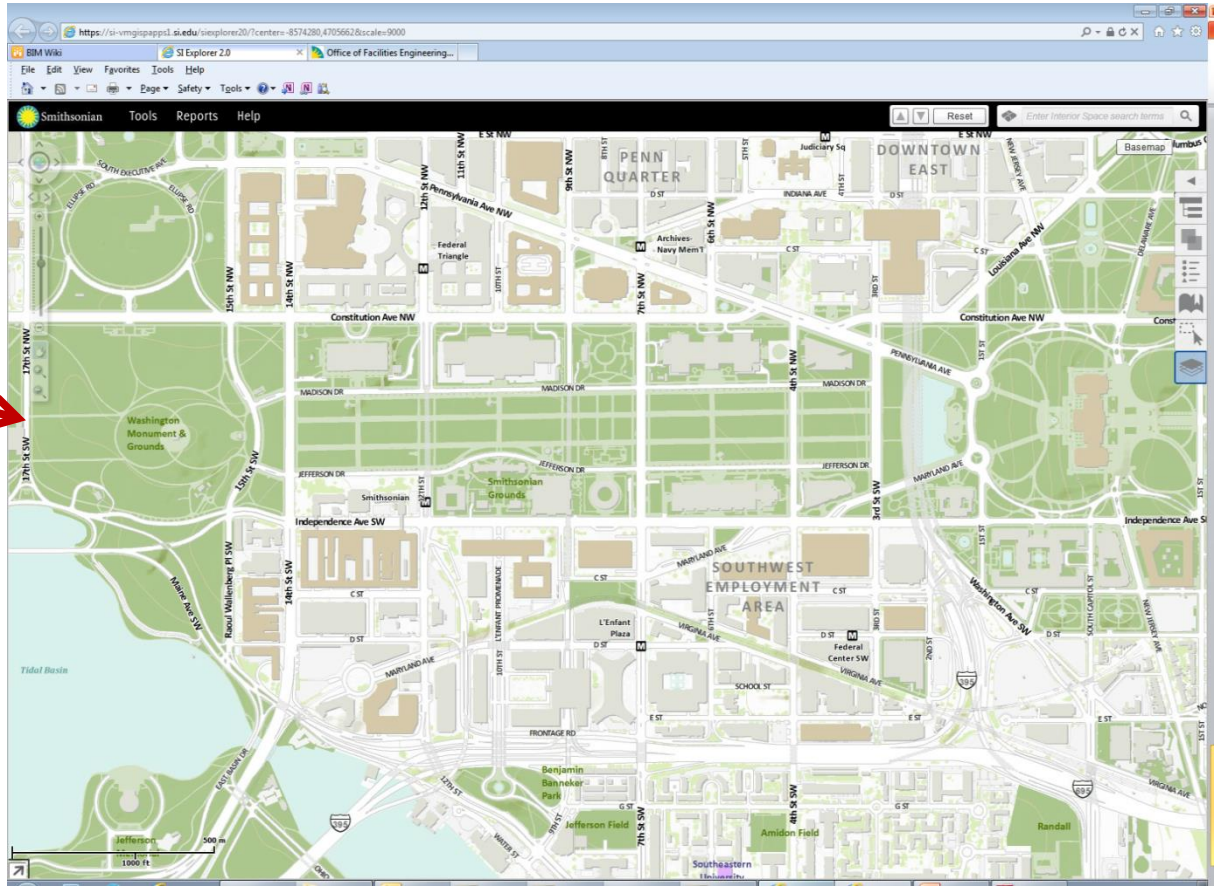
Access:

Top level access to OFEO systems

3D Models

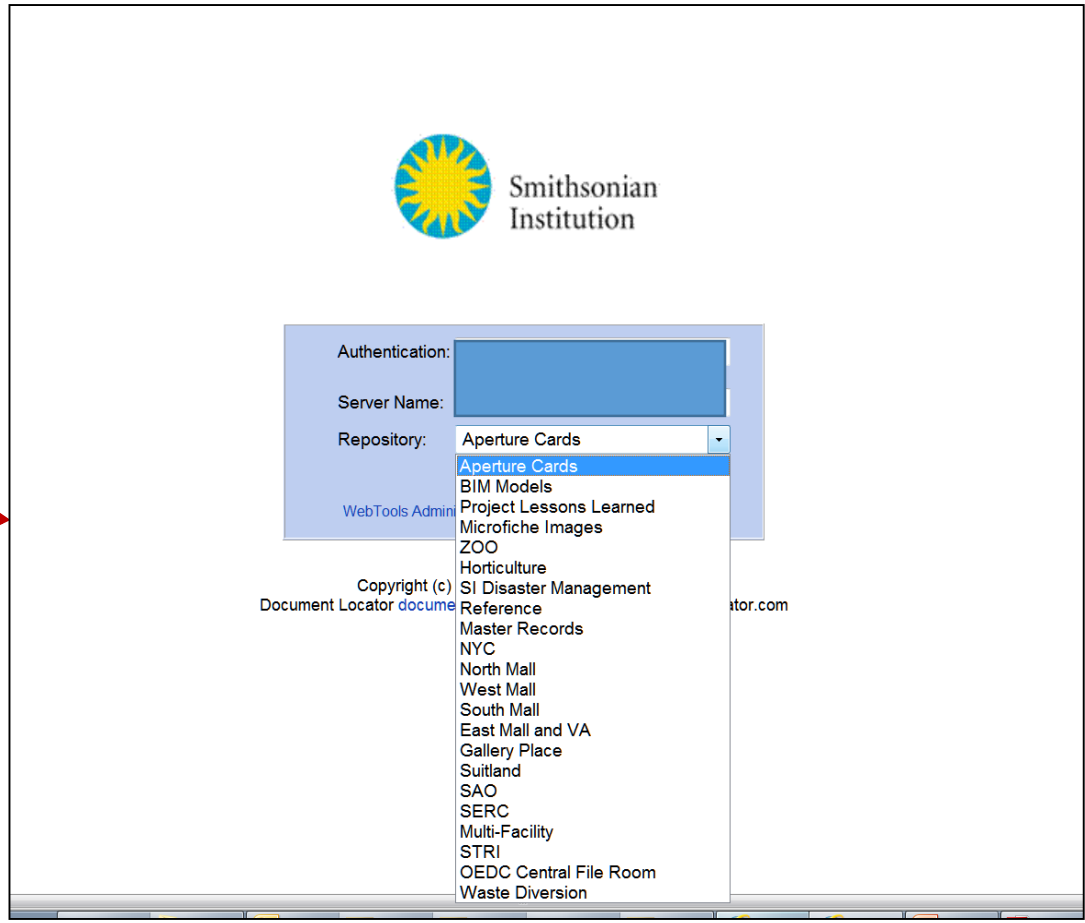
Direct Download of
Autodesk Revit Files

SI Explorer – GIS Mapping & Viewer



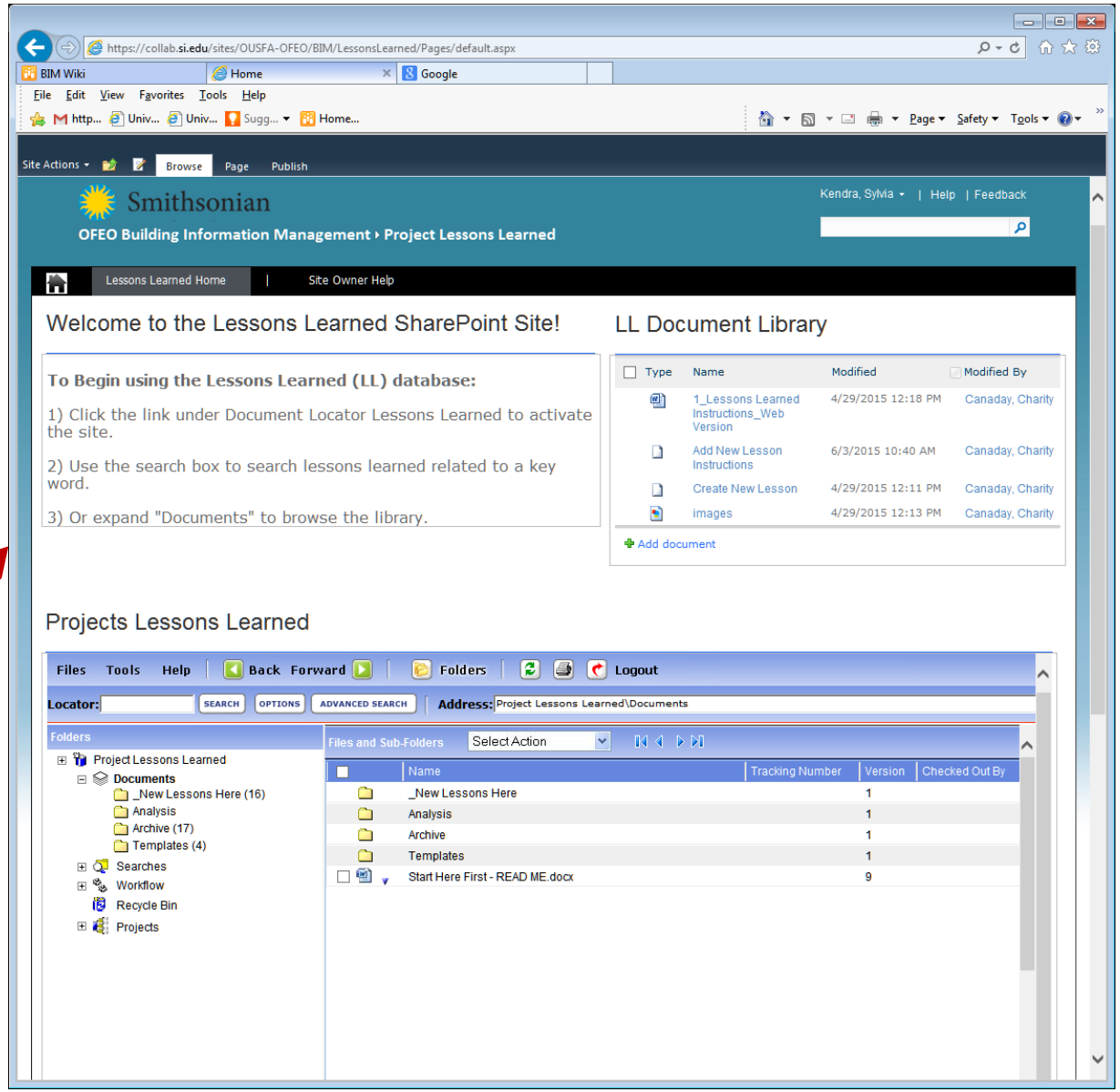
Visualize 2D drawings and sites

Document Locator

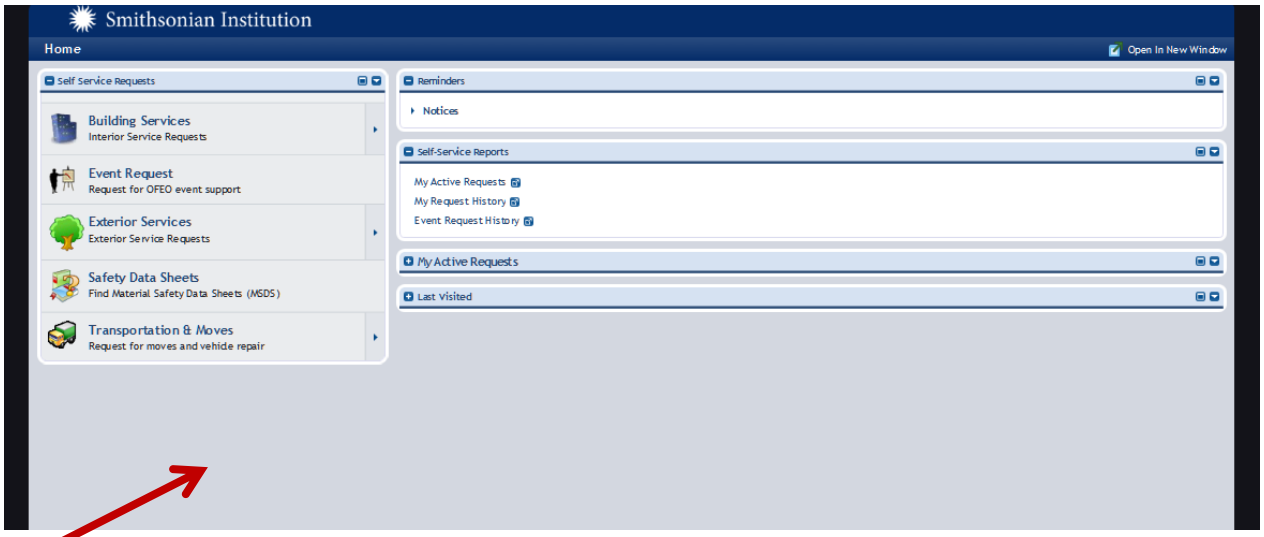


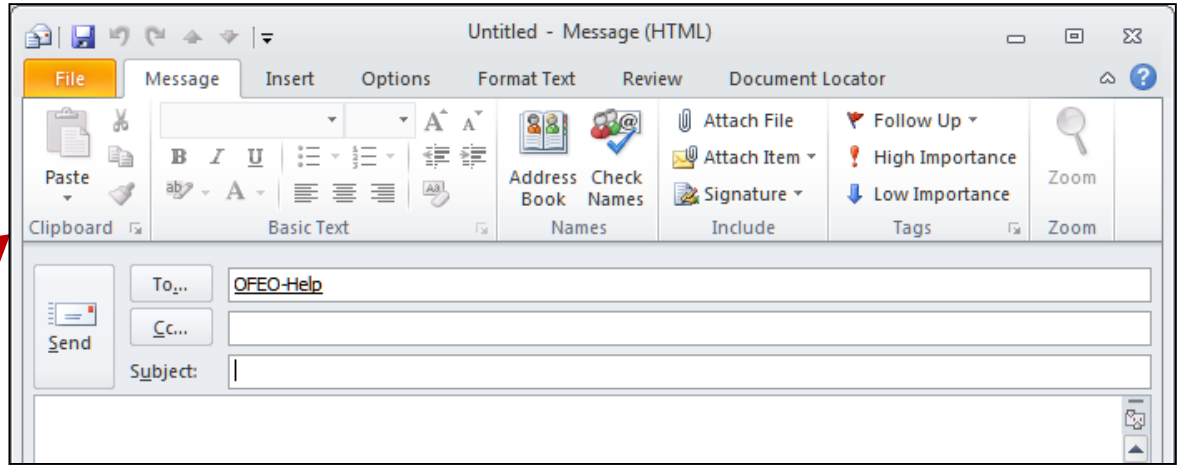
A different way of getting to document locator
- - same data

Lessons Learned

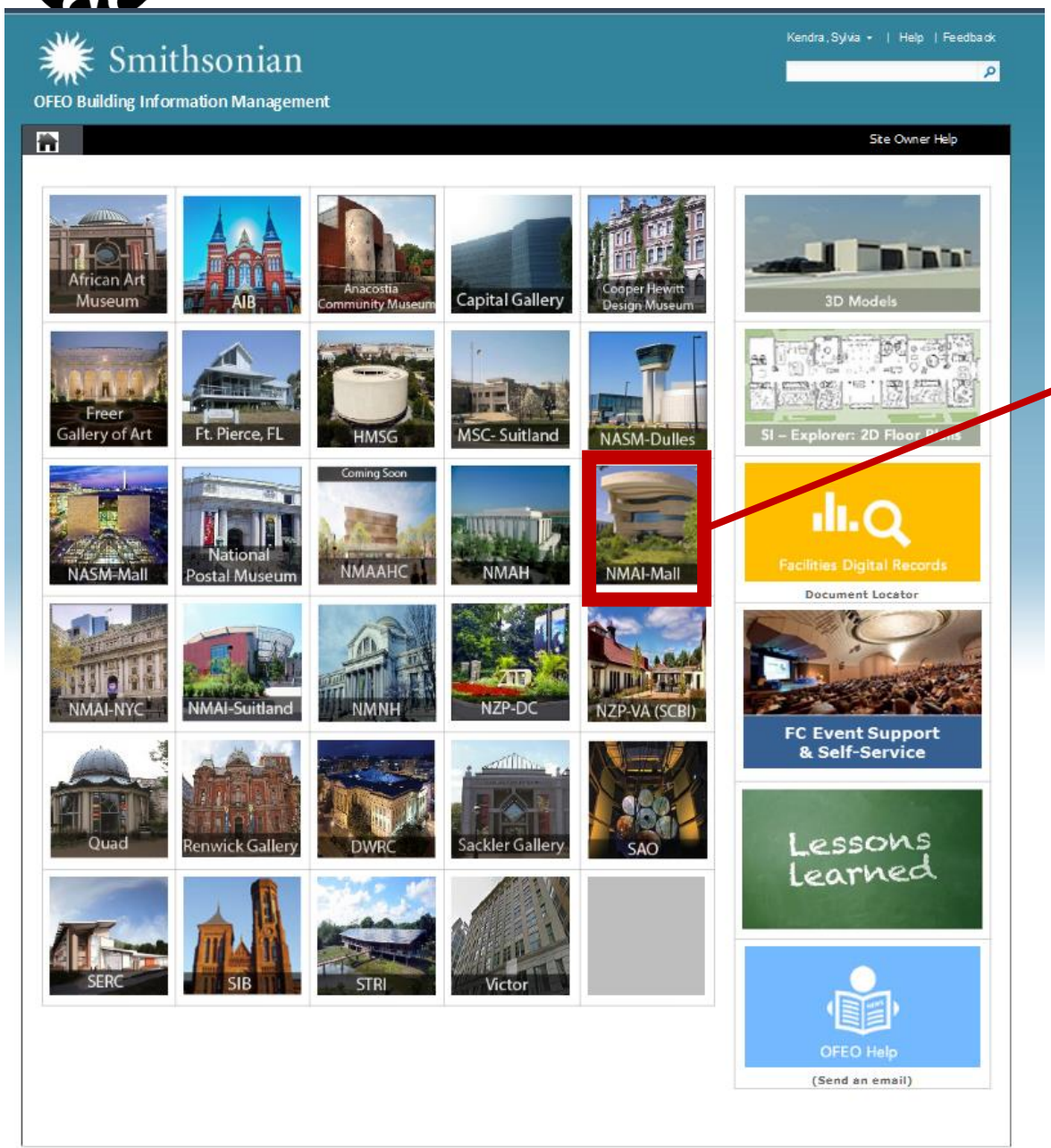


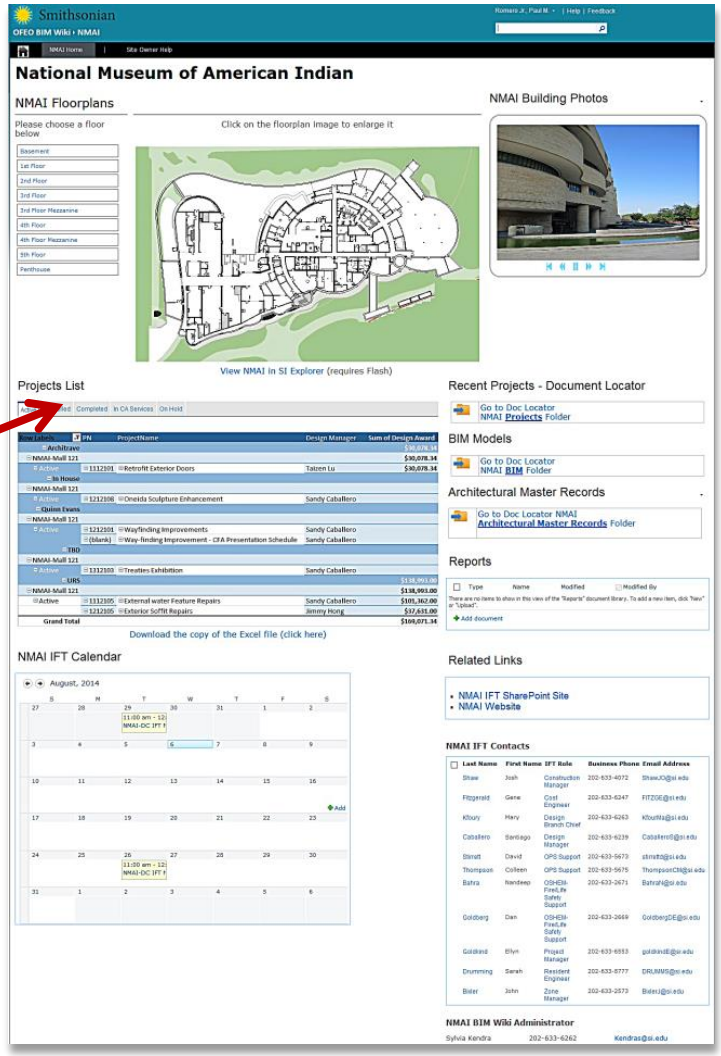
Other OFEO resources



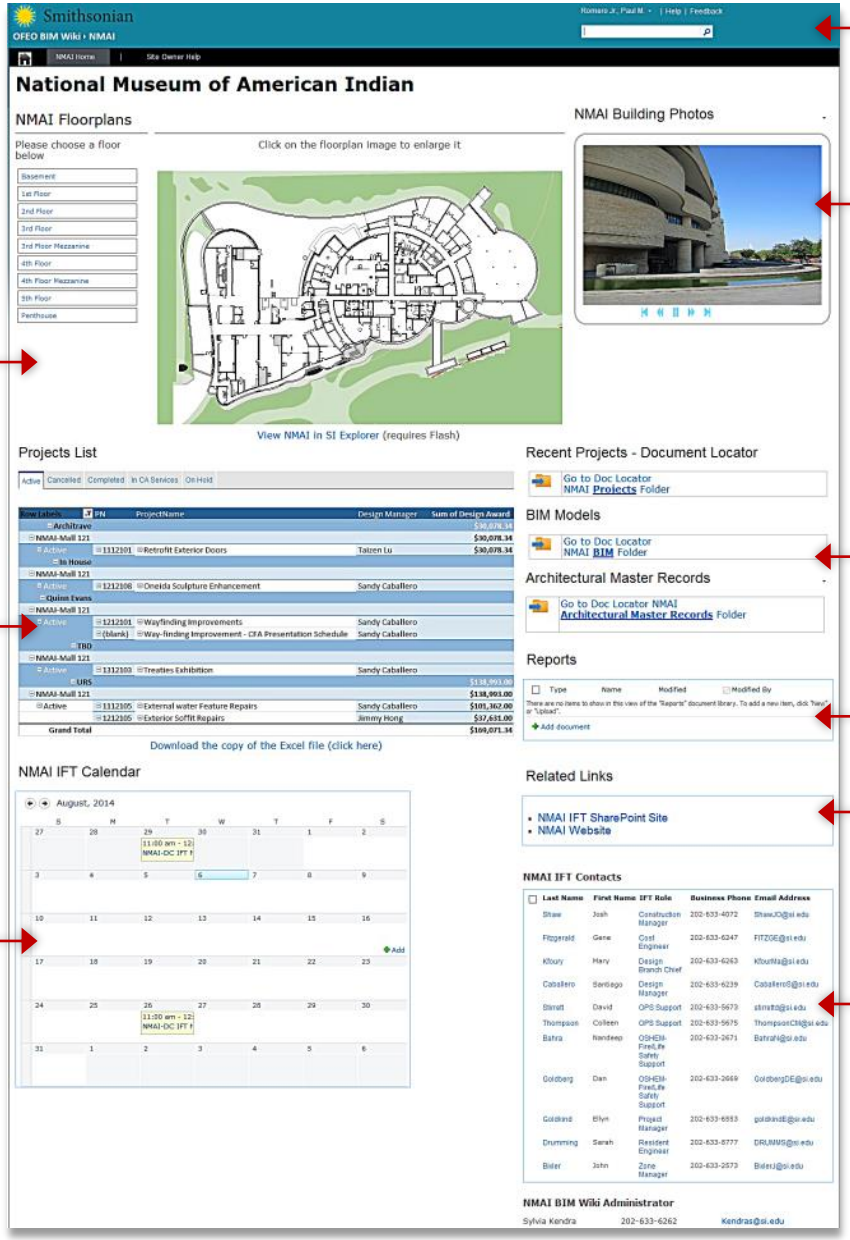


NMAI – BIM Wiki Page





Building - Home Page (NMAI)



SharePoint functions

Building Photos

Views of floor plans

Document Locator: Building specific shortcuts to Projects, BIM, Architectural Master Records

Projects List (Excel download – live link to MOPS)

Reports

Related links

NMAI IFT Calendar

NMAI IFT contacts

Architectural History – second tab

Smithsonian

Kendra, Sylvia | Help | Feedback

OFEO Building Information Management › NASM › Historic Information

NASM Home | Bldg Facts | Site Owner Help

NASM Historic Information

Architectural Description

History:

The National Air and Space Museum, designed by Gyo Obata of Hellmuth Kassabaum and Obata, is a series of alternating masses of Tennessee marble and glass. Four sections are clad in this marble, chosen to complement the National Gallery of Art's west building.
The marble alternates between glass in three recessed exhibit bays; flooded with even, north-facing light, these glass areas feature heavy truss systems to support the planes suspended above. Window walls were placed at the end of each building to bring in large artifacts; the one at the west end is still active.

In 1988 the original architects designed a restaurant at the east end with panes of glass to echo the original building.The grounds of the museum contain several sculptures:
- *Delta Solar* by Alejandro Otero (1921-90),
- *Continuum* by Charles O. Perry (b.1929)
- *Ad Astra* by Richard Leopold (1915-2002).

The building features exhibition spaces that show airplanes suspended against the natural backdrop of the sky.

For more information, please contact Amy Ballard, BALLAAM@si.edu, Senior Historic Preservation Specialist

Building Facts

Location:

600 Independence Ave SW
Washington, DC 20056
Coordinates: 38°53'17"N 77°01'12"W / 38.888°N 77.020°W

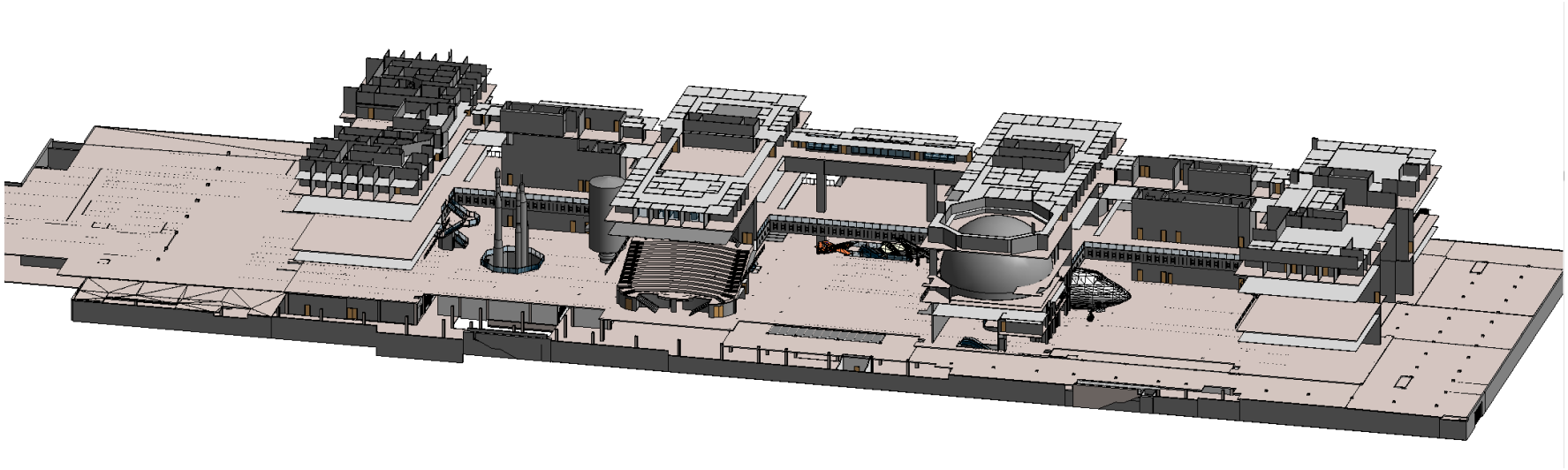
Building Measurements:
Gross Exterior:
747,877 sq ft (69,478 sqm)
Gross Interior:
668,507 sq ft (62,104 sqm)
Rentable:
589,058 sq ft (54,723 sqm)

Construction History:
Completed in 1976
Architect: Gyo Obata
General contractors: Gilbane Building Company

Historic Image Gallery

Future Plans

- More templates – life safety and security templates
- BIM Viewer – easy to use -- to facilitate early project visualization by clients and reviewers
- Model Checker to assist both contractors and SI staff in verifying data accuracy – especially in complex deliverables.



Questions

Mike Carrancho

Smithsonian Institution
Deputy Director, Office of Planning, Design and Construction
CarranchoM@si.edu