

# **Society of American Military Engineers**

## **NOVA Post**

### **1Feb 2018**

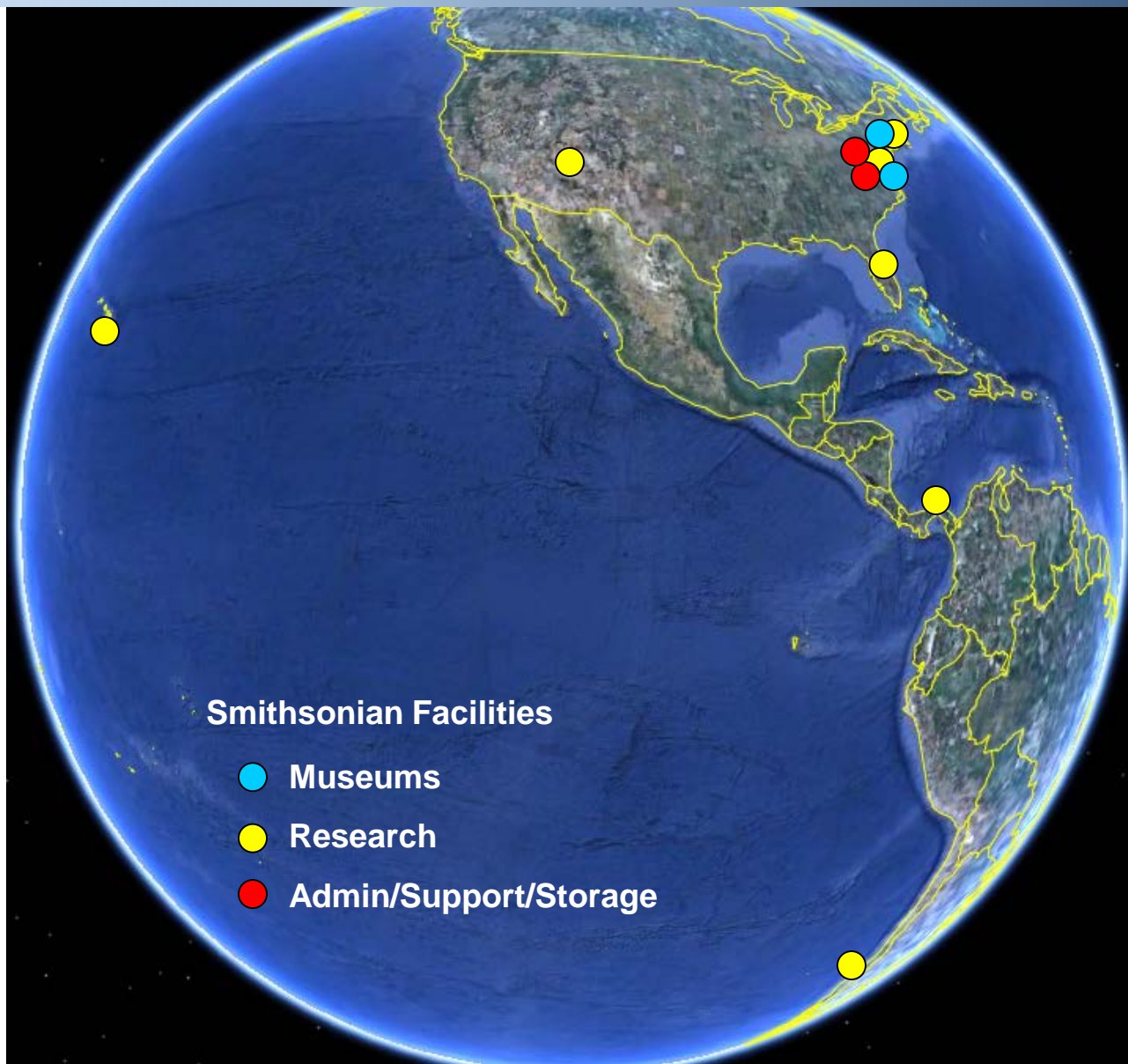
**Mike Carrancho, PE**  
**Chief of Engineering & Design**  
**Smithsonian Institution, Washington, DC**

# Smithsonian around the Globe



Smithsonian  
Institution

**19 Museums, 9 Research Centers, 3 Cultural Centers + National Zoo**



# Smithsonian Facilities By the Numbers



Smithsonian  
Institution

- 19 Museums + 1 Zoo
- 9 Research Centers
- 3 Cultural Centers
- 154 million artifacts
- 2 million library volumes
- 29 million in-person visitors
- 13 million square feet
- 43,000 acres of land
- 28,000 equipment assets
- 13,000 volunteers
- 6,675 employees
- 600 Buildings
- 300 Structures



# Smithsonian Facilities Capital Program

## SCHEDULE

- Exhibit Opening driven
- Open 364 Days/year

## SCOPE

- Stringent Museum, Lab Conditions
- National Historic Landmarks
- Collections – Precious, Fragile, Living
- Special Events – 1700/year
- Security – 29M visitors/year
- “Industrial Strength” Components

## BUDGET

- ~\$150M/year Projected over the next 10 years
- \$5M/year Minor Maintenance Projects
- Multiple fund sources – Federal, Trust, grant, other agencies
- Extraordinary cost for extraordinary solutions



Our largest project

# **NATIONAL AIR AND SPACE MUSEUM RENOVATION**

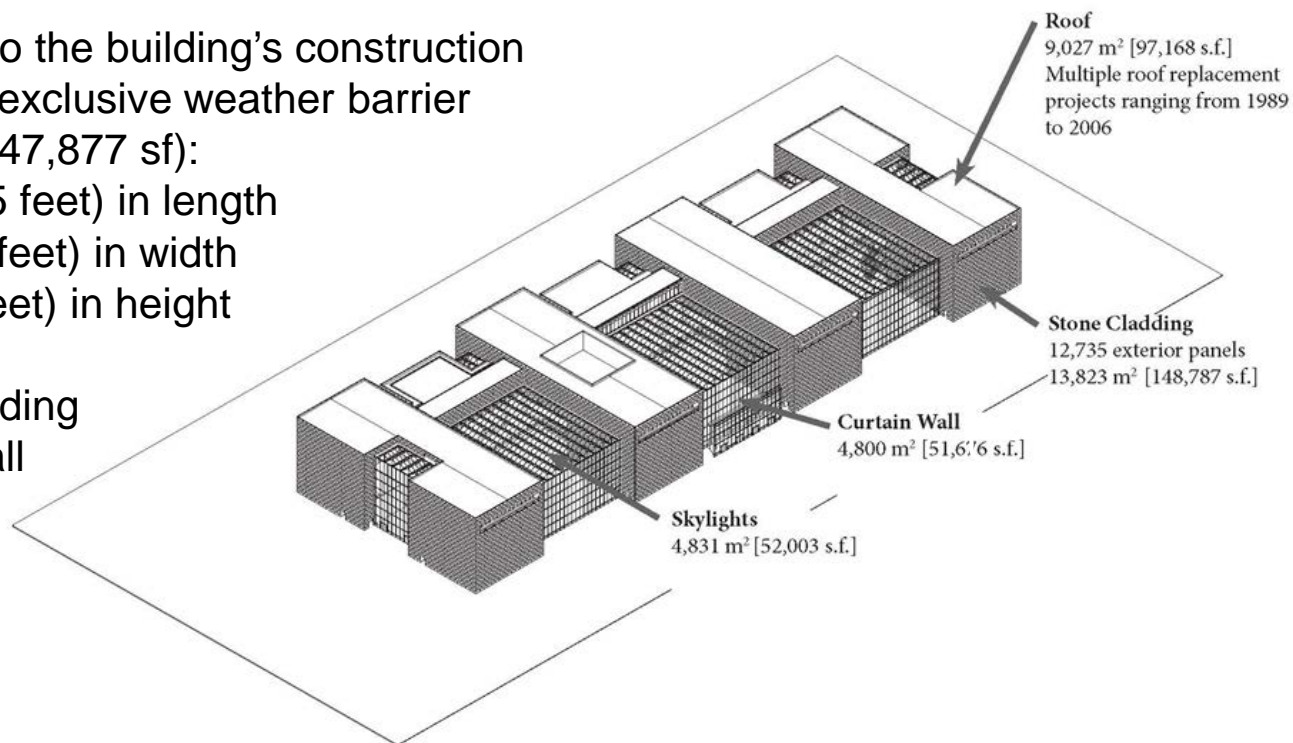
# National Air and Space Museum – Bldg. Facts



Smithsonian  
Institution

- 1958** – planned location authorized by President Eisenhower
- 1971** – Congress appropriated \$41 million for construction
- 1972-1973** – design by Hellmuth, Obata & Kassabaum (HOK)
- 1976** – opened to the public on July 1 as part of the Nation's Bicentennial
- 1995-1997** – last previous major work on stone façade
- 1997-2001** – skylight & window wall replacement

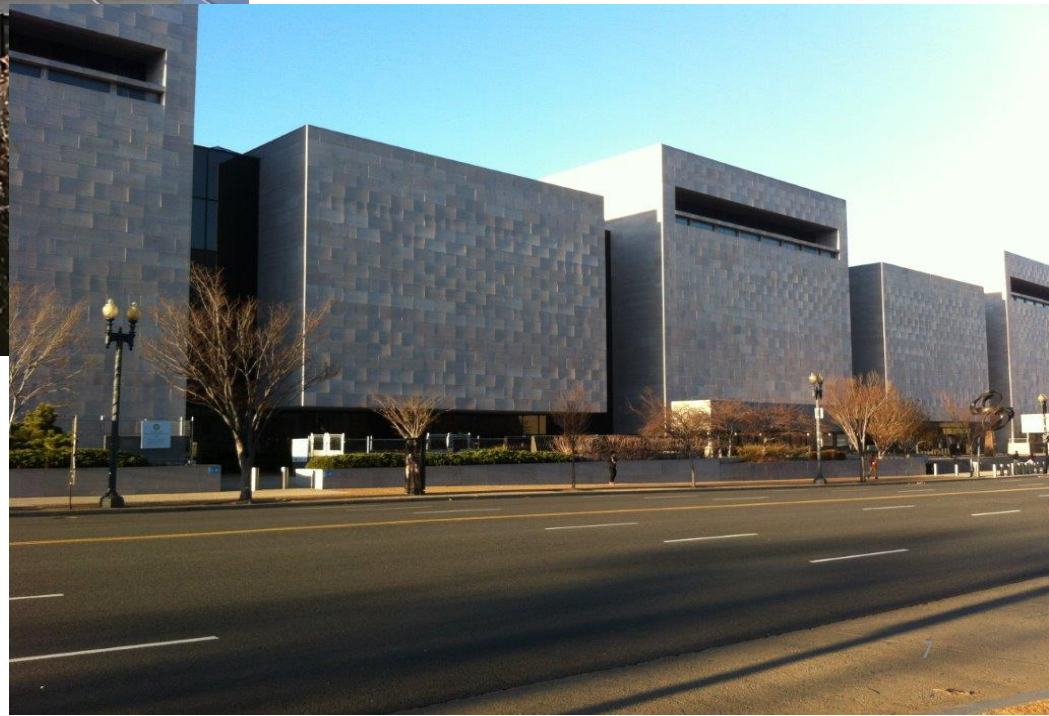
- Mechanical systems date to the building's construction
- Stone façade is primary & exclusive weather barrier
- Building dimensions are (747,877 sf):
  - 209 meters (685 feet) in length
  - 69 meters (225 feet) in width
  - 25 meters (83 feet) in height
- In parallel alignment with National Gallery of Art building on opposite side of the Mall



# The need to address the façade...



Smithsonian  
Institution



# The need to address the façade...



Smithsonian  
Institution

## Envelope Retrofit Planning— Exterior Wall Assembly

- Retrofitting from the exterior required to provide proper detailing
- Reuse and reinstallation of existing stone cladding not recommended
  - Percentage can't be reused due to low flexural and anchorage strength
  - Considerable amount of stone has limited remaining service life (due to warping, cracking, and stacking)
- Six cladding options explored
- Options address required blast reinforcement
- Options require varying levels of structural reinforcement



The typical exterior wall construction consists of the following from exterior to interior:

- 1) Stone panels with spray foam insulation on backside
- 2) Steel framing
- 3) Air Cavity
- 4) Interior metal stud wall with gypsum sheathing





# The need to address major systems...

FCI History  
08/18/2017 02:04 PM

Date	Recorded By	Fiscal Year	Deferred Maintenance	DMFCI	Current Replacement Value
11/02/2012	Daniel P Boyle	2011	\$100,598,681	85%	\$685,744,245
09/12/2013	Forest J Brent	2012	\$100,598,681	85%	\$685,744,245
02/12/2014	Forest J Brent	2013	\$91,069,418	87%	\$699,457,894
09/23/2014	Forest J Brent	2014	\$120,433,783	85%	\$776,992,151
06/22/2015	Forest J Brent	2015	\$181,563,680	77%	\$779,243,261
09/28/2016	Forest J Brent	2016	\$248,170,753	69%	\$801,844,113

Building System Items  
08/18/2017 02:04 PM

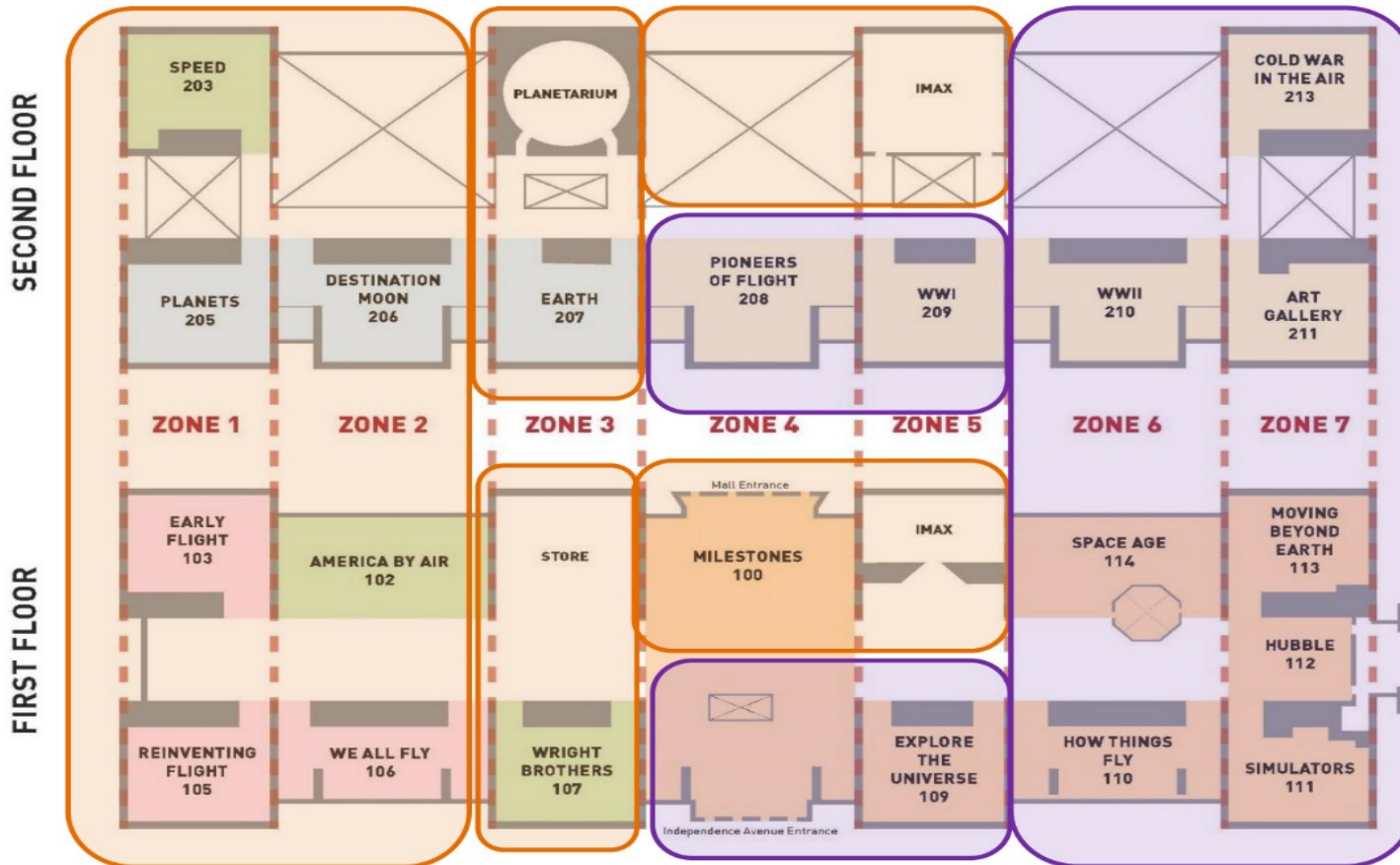
Name	Percent Building Cost	Replacement Cost	Condition Rating	Deferred Maintenance	System Condition Index	Status	Building System Class
Convey	2%	\$16,036,882	4 - Good	\$320,738	98%	Active	Convey
Electrical	15%	\$120,276,617	4 - Good	\$2,405,532	98%	Active	Electrical
Exterior	15%	\$120,276,617	1 - Bad	\$121,479,383	-100%	Active	Exterior
HVAC	10%	\$80,184,411	2 - Poor	\$50,516,179	37%	Active	HVAC
Interior	15%	\$120,276,617	3 - Fair	\$12,027,662	90%	Active	Interior
Plumbing	11%	\$88,202,852	3 - Fair	\$8,820,285	90%	Active	Plumbing
Roof/Cage	12%	\$96,221,294	3 - Fair	\$36,564,092	62%	Active	Roof/Cage
Structure	20%	\$160,368,823	3 - Fair	\$16,036,882	90%	Active	Structure
	100%	\$801,844,113		\$248,170,753			

# The Phasing Challenge



Smithsonian  
Institution

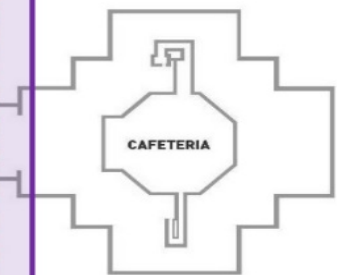
## Phase One



**Each Sequence includes all floors**



## CONSTRUCTION SEQUENCE



## Phase Two



# The Logistics Challenge

## Revitalization / Transformation Artifact Summary

Total number of objects to be moved: 4099

- NASM NMB
  - Total number in NMB: 3086
  - Number moving out: 3074
  - Number returning to NMB: 1645
  - Number to Protect in Place (PIP): 12
  - Number of “NASM Only”: 20
- Garber
  - Number coming to NMB for Transformation: 368
- UHC / DCC
  - Number coming to NMB for Transformation: 698
  - Number in MBERH for treatment: 22
  - Number in Buehler Lab for treatment: 0
  - Number of object ready for Transformation: 5  
(treatment completed)
  - Number to be exhibited permanently at UHC: TBD
  - Number going into long-term storage at UHC: TBD

- Loans for Transformation
  - Number of loans not renewed by NMB: 498
  - Number of loans renewed from NMB: 299
  - Number of new loans: 166
  - Number of recalled loans (NASM artifacts): 30
- Accessions / Deaccessions
  - New accessions: TBD
  - Number of deaccessions: TBD
- VCOs
  - Total number in NMB: 337
  - Number moving out: 220
  - Number returning to NMB: 117

Data Source: 04 July 2017 Artifact List  
Current status as of: 21 July 2017

# Studying the needs

- 2013 Preliminary studies undertaken
  - Envelope Study
  - Feasibility Study
  - Sustainability Study
- Integrated Cost/Schedule Risk Analysis
  - August 2015 Risk Assessment (Concept Design)
  - Nov 2016 Risk Assessment (35% Design)
  - March 2018 Risk Assessment (100% Design)

Best Practice

# **INTEGRATED COST/SCHEDULE RISK ANALYSIS**

# Assessing the needs

- Pre-requisites for Integrated Risk Analysis
  - Detailed Cost and Schedule information is required
  - Cost-loaded Critical Path Schedule is Developed
  - Knowledgeable and dedicated subject matter experts
  - Consultant expertise in conducting workshops and analysis
  - Time

# The Costs

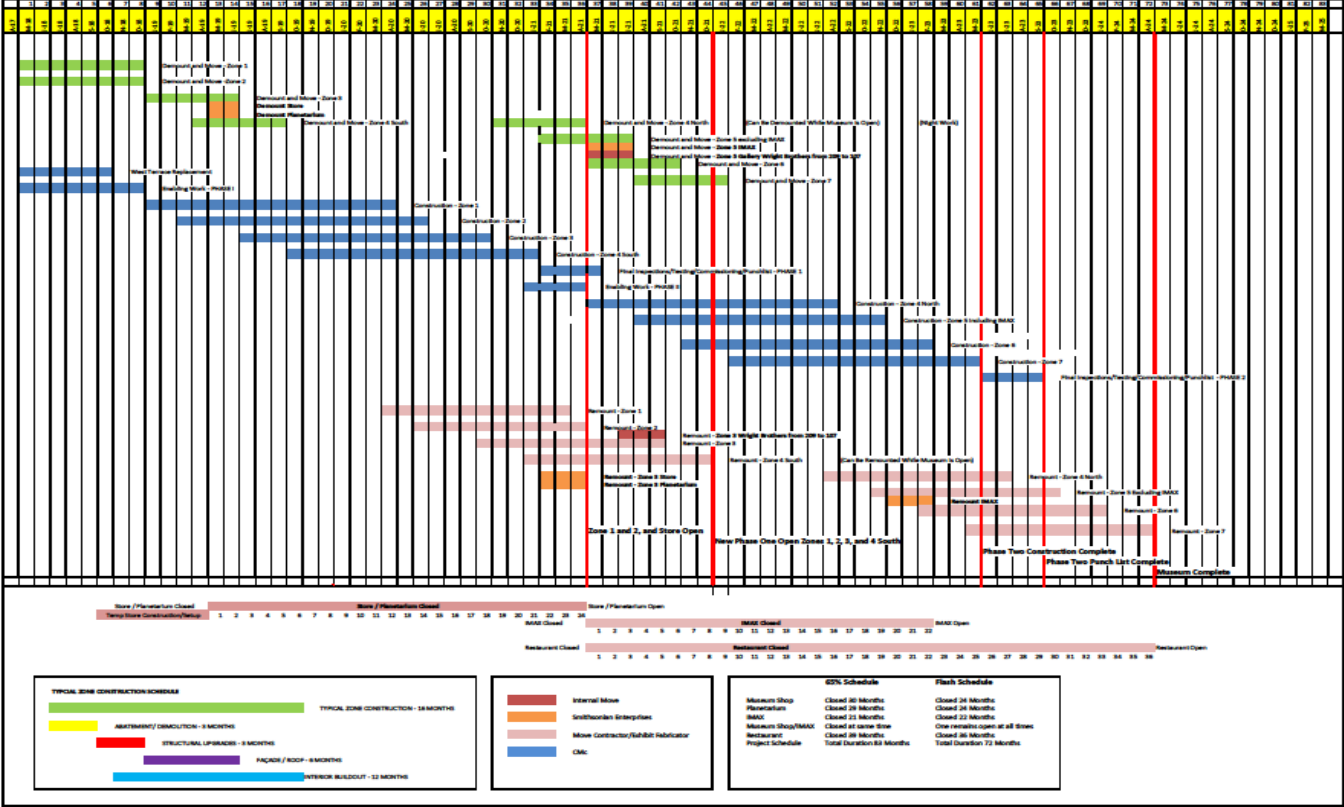


Total SI NASM Program Budget including DCC Storage Module		
No.	Description	Amount
<b>A. NASM Program Budget without Contingency</b>		<b>\$561,492,562</b>
1	Construction without Contingency	\$424,854,507
2	Construction Supervision and Administration (S&A)	\$23,452,041
3	Engineering and Design Services	\$37,190,859
4	Commissioning & Start-up	\$2,345,204
5	Engineering During Construction	\$14,300,002
6	Engineering and Design - Other	\$5,852,000
7	V/E Study	\$400,000
8	Moving Collection	\$33,837,995
9	Swing Space Lease/Construction	\$11,890,000
10	Contractor Audit	\$900,000
11	Other Capital Costs	\$6,469,954
<b>B. NASM Contingency</b>		<b>\$114,542,438</b>
1	Construction Contingency	\$70,356,123
2	Design Contingency	\$28,141,014
3	Construction Contingency (part of Const. Estimate)	\$16,045,301
<b>C. Total NASM Program Budget with Contingency</b>		<b>\$676,035,000</b>
<b>D. Dulles Collection Center (DCC) Storage Module</b>		<b>\$58,004,048</b>
1	DCC Storage Module without Contingency	\$53,804,361
2	DCC Storage Module Construction Contingency	\$4,199,687
<b>E. Total SI NASM Program Budget including DCC Storage Module</b>		<b>\$734,039,048</b>

# The Schedule



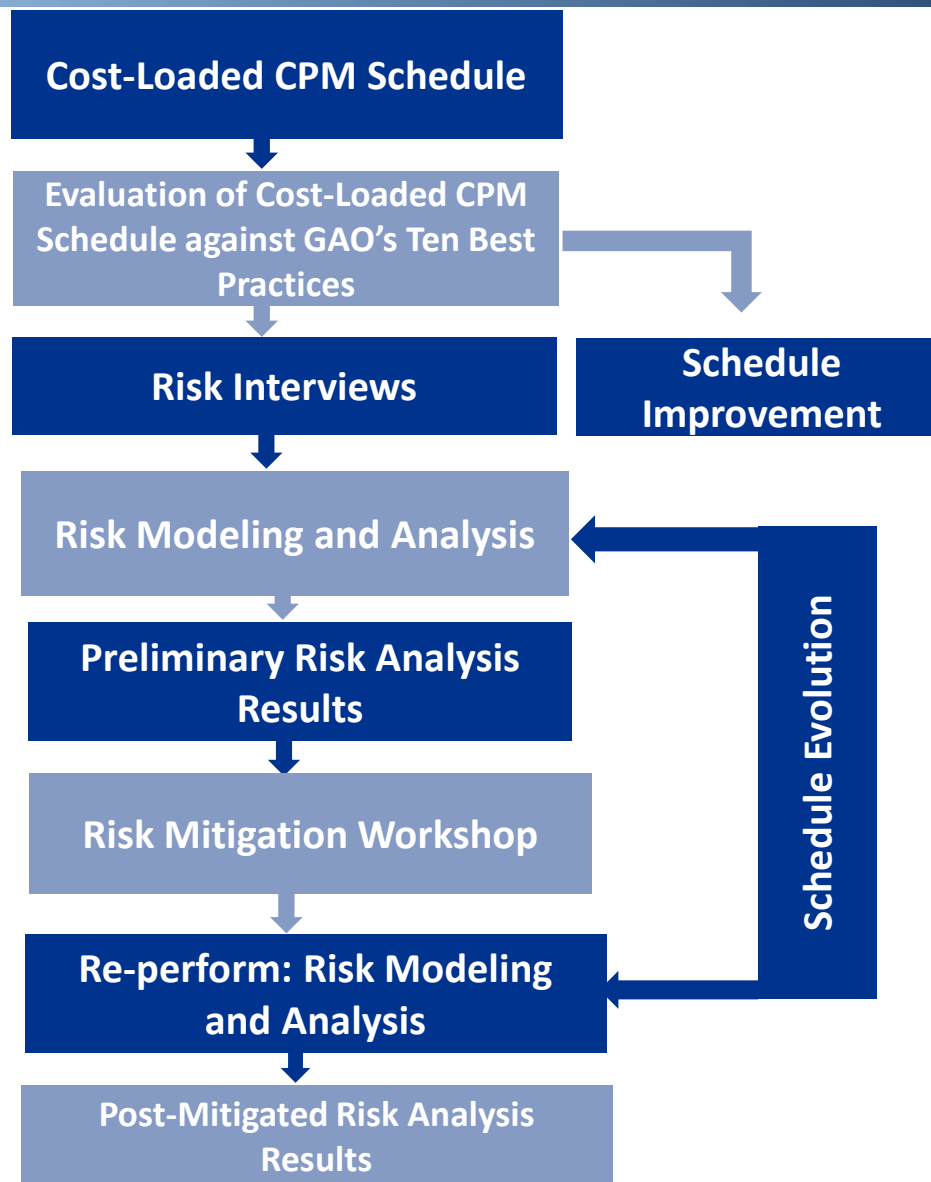
  
 National Air and Space Museum Revitalization  
 20-Jul-17  
 Flash Schedule





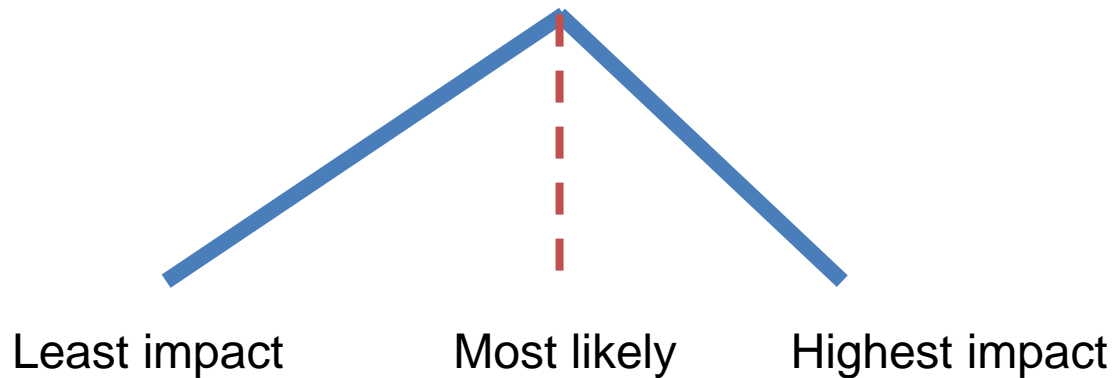


# Overview of the Process



# Projecting the Impacts

For each risk define cost and schedule impact triangle points



# The Risk Worksheets



Smithsonian  
Institution

RISK ID	Risk Statement (cause, risk, impact)	Probability	Impact on Time			Impact on Cost			Activities /Resources Affected	Risk Mitigation Proposed in 2015; Notes; Suggested Mitigations in 2016
			Low	ML	High	Low	ML	High		
1001	Proposed schedule for de-mount/deinstallation of 3-5 months may be insufficient. Move Concerns: * Artifact moves delayed due to construction delays. * Removing all suspended aircraft - risk of damage increases with demount/remount. * Risk of damage to artifacts due to multiple moves	70%	1.00	1.25	2.00				Deinstallation activities	SI is developing staffing needs for Collections and Exhibit Production Departments (I.e., temp employees/contractors or direct reports to include Logistician) during construction. SI is also developing plans for leasing additional artifact handling equipment and programming for Dulles Collections Center Storage Module 1. (3 mos.)
	<b>Mitigation Proposed (2016, at 35% DD) =====&gt;</b>	Conduct condition assessments prior to demount activities commencing in each gallery. Hiring experienced artifact handlers and aviation specialists. Do not rush artifact movement. Flexibility in workhours for move contractor. Caveat is there may be restrictions due to Union rules and/or overtime costs. Any NASM overtime costs should be projected.								
	Post Mitigation Risk Parameters =====>	40%	1.00	1.15	1.30					
1002	Proposed schedule for re-mount/reinstallation of 10-12 months may be insufficient. Move Concerns: * Garber artifacts not being ready to move from Garber to Hazy for conservation * Garber artifact conservation at Hazy takes longer than expected due to lack of conserve space at Hazy and lack of personnel to make the conservation.	70%	1.00	1.25	2.00				Reinstallation activities	SI is developing staffing needs for Collections and Exhibit Production Departments (I.e., temp employees/contractors or direct reports to include Logistician) during construction. SI is also developing plans for leasing additional artifact handling equipment. SI NASM is investigating how to shorten the decision making process for the new exhibits. SI is considering the complexity of artifact installation in its planning. (10 mos.)
	<b>Mitigation Proposed (2016, at 35% DD) =====&gt;</b>	Conduct condition assessments prior to demount activities commencing in each gallery. Hiring experienced artifact handlers and aviation specialists. Do not rush artifact movement. Flexibility in workhours for move contractor. Caveat is there may be restrictions due to Union rules and/or overtime costs. Any NASM overtime costs should be projected.								
	Post Mitigation Risk Parameters =====>	40%	1.00	1.15	1.30					
1003	Congressional approval of funding amount may be less than requested	85%	1.10	1.25	1.75	1.10	1.25	1.75	Construction	Establish funding as an Institutional priority. SI is considering early contractor involvement through either CM at risk and/or Design Assist to develop discrete bid packages, e.g. separate packages into zones, disciplines, etc. SI has started enhanced communications with funding appropriators.
	<b>Mitigation Proposed (2016, at 35% DD) =====&gt;</b>	Establish funding as an Institutional priority. Make a compelling case for the project through profound due diligence. Clearly communicating the impact of inadequate funding. To this effect SI has begun early contractor involvement through either CM at risk and/or Design Assist to develop discrete bid packages, e.g. separate packages into zones, disciplines, etc. SI has started enhanced communications with funding appropriators.								
	Post Mitigation Risk Parameters =====>	80%	1.10	1.25	1.75	1.10	1.25	1.75		
1004	Impact of delayed funding for any particular sequence (construction)	55%	1.00	1.25	1.70				Sequence involving construction activities	SI is considering early contractor involvement through either CM at risk and/or Design Assist to develop discrete bid packages, e.g. separate packages into zones, disciplines, etc. SI has started enhanced communications with funding appropriators.
	<b>Mitigation Proposed (2016, at 35% DD) =====&gt;</b>	Make a compelling case for the project through profound due diligence. Clearly communicating the impact of inadequate funding. To this effect SI has begun early contractor involvement through a CM at risk and Design Assist to develop discrete bid packages, e.g. separate packages into zones, disciplines, etc. SI has started enhanced communications with funding appropriators.								
	Post Mitigation Risk Parameters =====>	50%	1.00	1.25	1.70	1.00	1.15	1.35		
1005	Lack of adequate SF staff within SI to manage NASM Project (impacts ability to keep up with the volume of changes, contract modifications as project progresses).	70%	1.10	1.15	1.30				Construction	SI is developing a staffing plan for additional staff at OFEO and NASM with corresponding budget. SI is considering contracting out for additional staff needs.
	<b>Mitigation Proposed (2016, at 35% DD) =====&gt;</b>									
	Post Mitigation Risk Parameters =====>	35%	1.00	1.05	1.10					
	Current program budget for "Supervision and Administration" may not be enough for additional staff needed to be hired by SI	70%				1.00	1.15	1.30	S&A Cost	

# The Cost Risk Drivers



Smithsonian  
Institution

## Top 20 Cost Risk Drivers

No.	Risk Description	Cost Impact
1	Resource Uncertainty	\$29,467,000
2	Client initiated/requested changes	\$26,972,900
3	Stone Risk - production/fabrication	\$11,368,700
4	West End is the choke point for everything coming in and out of the building (hazmat, stone, exhibits, artifacts)	\$7,188,340
5	At the current staffing level in Collections, challenging to properly focus on major projects that include Revitalization, NASM Master Plan, Suitland Master Plan for DCC, UHC-buildout, and building upgrades at Garber	\$5,727,580
6	Lack of adequate SI "Supervision and Administration" budget	\$2,477,810
7	Swing Space - Design and Construction of Swing Space Overall Duration (planned duration 11 month may not be adequate)	\$2,135,390
8	Proposed schedule for re-mount/reinstallation of 10-12 months may be insufficient.	\$2,074,530
9	Duration Uncertainty	\$1,856,730
10	Cladding - delayed selection of cladding material (e.g., due to lack of consensus within or outside SI) and its impact on agency review and approval process, issuance of 65% DD, material testing and construction documentation	\$1,765,660
11	Unforeseen conditions	\$1,682,980
12	Unintended consequences of perceived good ideas (best intentions) from newer parties brought onboard for various studies might slow the design and construction process; cumulative effect on design completion	\$1,655,170
13	Changes in senior leadership might impact the project due to the change in priorities	\$1,559,170
14	DCC - Client requested changes	\$1,546,150
15	DCC - Unforeseen Conditions	\$1,478,650
16	Agency reviews may result in additional design changes and time	\$1,251,390
17	Risk of a large batch of stone falling during construction (due to vibration, etc. - during de-installation) impacting construction - in the construction zone	\$1,173,890
18	Lack of adequate staff within SI to manage NASM Project	\$927,505
19	DCC - Delayed or insufficient funding	\$617,515
20	Current re-mounting schedule has not accounted for additional artifacts, yet to be selected from collection currently outside of Mall Building.	\$541,653

# The Schedule Risk Drivers



Top 20 Schedule Risk Drivers		
No.	Risk Description	Time Impact (days)
1	Stone Risk - production/fabrication	107
2	Client initiated/requested changes	45
3	West End is the choke point for everything coming in and out of the building (hazmat, stone, exhibits, artifacts)	36
4	Proposed schedule for re-mount/reinstallation of 10-12 months may be insufficient.	27
5	Duration Uncertainty	25
6	Cladding - delayed selection of cladding material (e.g., due to lack of consensus within or outside SI) and its impact on agency review and approval process, issuance of 65% DD, material testing and construction documentation	13
7	Current re-mounting schedule has not accounted for additional artifacts, yet to be selected from collection currently outside of Mall Building.	8
8	Lack of adequate staff within SI to manage NASM Project	6
9	Swing Space - Design and Construction of Swing Space Overall Duration (planned duration 11 month may not be adequate)	5
10	Unforeseen conditions	5
11	Risk of a large batch of stone falling during construction (due to vibration, etc. - during de-installation) impacting construction - in the construction zone	5
12	Agency reviews may result in additional design changes and time	4
13	At the current staffing level in Collections, challenging to properly focus on major projects that include Revitalization, NASM Master Plan, Suitland Master Plan for DCC, UHC-buildout, and building upgrades at Garber	3
14	Unintended consequences of perceived good ideas (best intentions) from newer parties brought onboard for various studies might slow the design and construction process; cumulative effect on design completion	3
15	Lack of defined schedule for exhibit re-installation will have impact to the construction (also Risk ID 1020)	1
16	Price above Engineer's Estimate	1
17	Resource Uncertainty	0
18	Lack of adequate SI "Supervision and Administration" budget	0
19	Changes in senior leadership might impact the project due to the change in priorities	0
20	DCC - Client requested changes	0

# The Mitigation Workshops





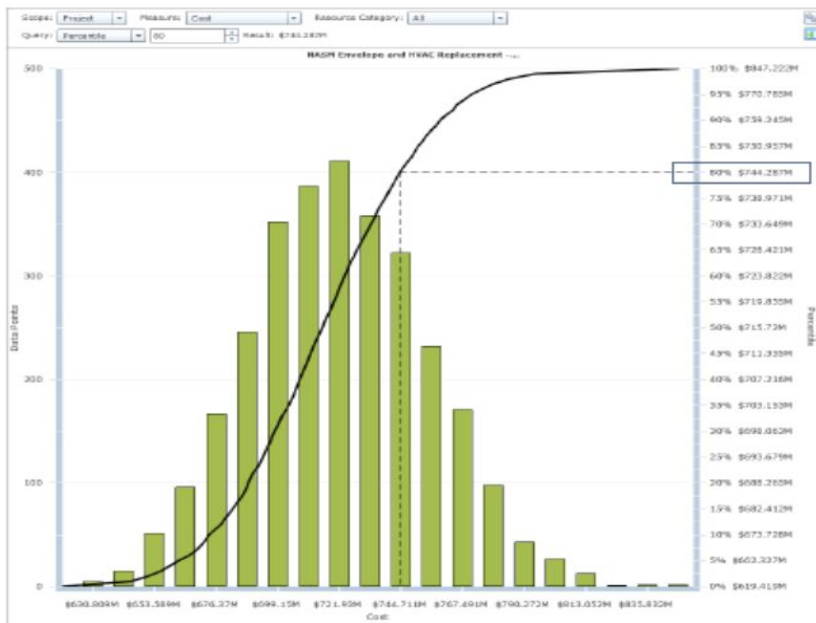
# P-80 Cost Confidence

## 2.5.2 Cost Confidence Levels

As shown in the table on the following page, at the P-80 confidence level, the project cost from the Integrated Cost-Schedule Risk Analysis is \$744.287 million, which is \$14.447 million above the Program Budget of \$734.039 million.

Summary of Risk Analysis Results: Cost Objectives						
No.	Program Description	SI CWE Budget Amount	CPM Schedule Amount	Polaris Risk Model Amount	Risk Analysis P-80 Value	Risk Analysis P-90 Value
1	Total NASM Program Budget without Contingency	\$561,492,562	\$561,492,562	\$561,492,562		
2	NASM Construction Contingency	\$114,542,438	\$114,542,438			
3	<b>Total NASM Program Budget with Contingency</b>	<b>\$676,035,000</b>	<b>\$676,035,000</b>	<b>\$561,492,562</b>		
4	DCC Storage Module without Contingency	\$53,804,361	\$53,804,361	\$53,804,361		
5	DCC Storage Module Contingency	\$4,199,687	\$4,199,687			
6	<b>DCC Storage Module with Contingency</b>	<b>\$58,004,048</b>	<b>\$58,004,048</b>			
5	<b>Total SI Program Budget with Contingency including DCC</b>	<b>\$734,039,048</b>	<b>\$734,039,048</b>	<b>\$615,296,923</b>	<b>\$744,287,000</b>	<b>\$759,245,000</b>
6	Contingency needed from Risk Analysis				\$128,990,077	\$143,948,077
7	Contingency shortfall				(\$14,447,639)	(\$29,405,639)

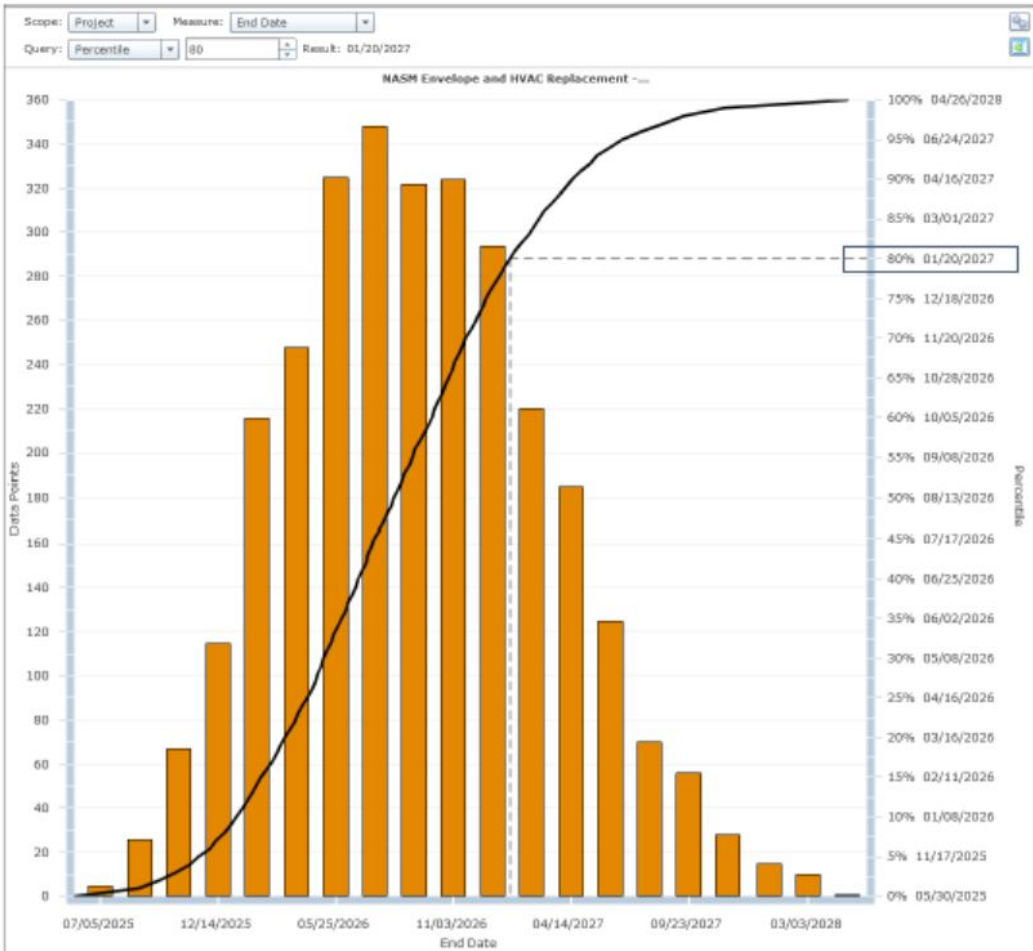
In other words, in order to be at P-80 confidence level, the project needs an additional contingency amount of \$14.4475 million. Accordingly, at the P-90 confidence level, the project needs additional \$29.405 million. The following is a chart for the overall program cost from the Integrated Cost-Schedule Risk Analysis derived using the Polaris software.



# P-80 Schedule Confidence

## 2.5.1 Schedule Confidence Levels

As shown in the chart below, at the P-80 confidence level, the final project completion date including the completion of exhibit remount from the Integrated Cost-Schedule Risk Analysis is January 20, 2027, which is 23.5 months later than planned completion date of January 31, 2025 and 26 months later than CPM Schedule deterministic date of November 24, 2024.





Innovation

# **BUILDING INFORMATION MODELING**

## Opportunities

- Design Visualization, Early Clash Detection
- Improved Estimating and Value Engineering
- 4D Modeling in Construction Planning
- Energy Modeling
- Asset Management
- Building Automation

# Matching BIM to Existing Business Processes



Smithsonian Institution



Smithsonian Facilities  
Revit Template User's Guide



November 2010 Edition



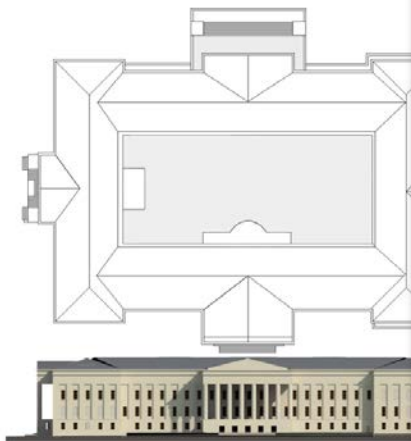
Smithsonian Facilities  
BIM Guidelines



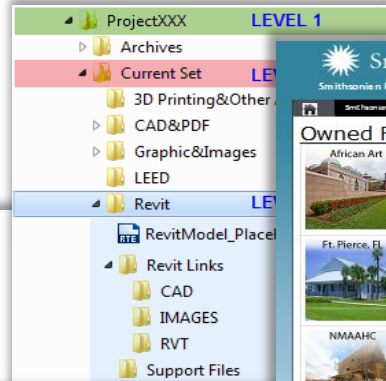
November 2010 Edition



Smithsonian Facilities  
Revit Model Review Instru



November 2010 Edition



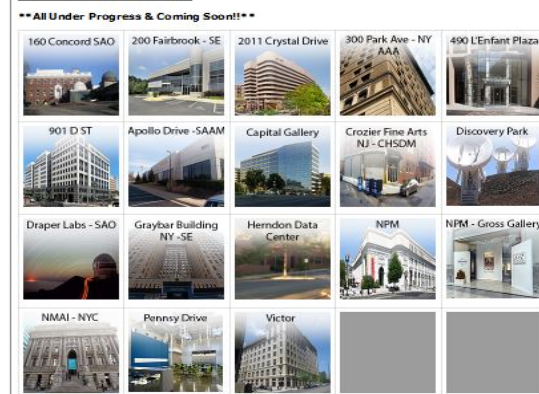
Smithsonian

Smithsonian Facilities Building Information Management

## Owned Facilities



## Leased Facilities



Building Information Model  
Practice Development  
for the  
Smithsonian Institution

Design + Construction Strategies  
30 April 2014



# BIM in Construction



Smithsonian  
Institution

## During Construction

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

July 2016

Smithsonian Facilities Project No. XXXXX

### SECTION 01 3250

#### BUILDING INFORMATION MODELING (BIM) REQUIREMENTS

##### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Section includes requirements for Building Information Modeling including, but not limited to, the following:
1. Transfer of Design Intent Facility Data.
  2. Development of BIM Execution Plan.
  3. Development of Construction Models.
  4. Development of Fabrication/Shop Drawings at Contractor's option.
  5. Development of Coordination Model(s).
  6. Development of Coordination Report.
  7. Collection and Handover of Facility Data.
  8. As-Built Model and Drawings.
- B. Contractor's Responsibility:
1. Develop deliverables required in this Section.
  2. Contractor is solely responsible for the quality and accuracy of all documentation and submittals of this Section.
  3. The intent of BIM deliverables is to avoid interference and conflicts, optimize construction sequencing, achieve greater efficiencies in cost estimating and project coordination, ensure access for maintenance, replacement or repairs, and to provide SI with facility data.
    - a. Coordination: Contractor is solely responsible for the coordination of facility systems and equipment.
    - b. Construction sequencing: Contractor is solely responsible to sequence construction activities to facilitate the fabrication and installation of systems and equipment without interference, conflicts or delays in construction, and providing adequate access to effectively maintain and replace systems and equipment.
    - c. Contractor is responsible for providing accurate and complete facility data based on final as-built conditions, as required by SI.
- C. Existing Documents: Revit template data developed by Architect during the design phase will be available to the Contractor.
- D. SI BIM Practice Requirements:
1. The following documents related to are available on the Smithsonian Facilities A/E Center website, under the Codes and Standards section and are applicable to BIM requirements:
    - a. SI BIM Standards: Describes information, procedures, and responsibilities relevant to BIM work completed by architecture, engineering and construction (AEC) consultants in order to assure accurate and consistent deliverables.
    - b. SI Revit Templates: BIM templates developed by the Smithsonian that the Contractor is required to employ in developing the project BIM and populate with accurate project-specific facility, space and equipment data.
      - 1) Provide asset information for all equipment in SI provided format which

[project name]  
BIM REQUIREMENTS

[Issued for construction]  
01 3250- 1



## Facilities Management

- Support **preventative maintenance** through visualization of work tasks and asset management
- Support **emergency response** through visualization of critical asset and shut off locations
- Use 3D for **vetting new systems** prior to installation - make sure new equipment will fit in tight space
- Integrate geospatial data into facilities mobile applications

## Energy Management

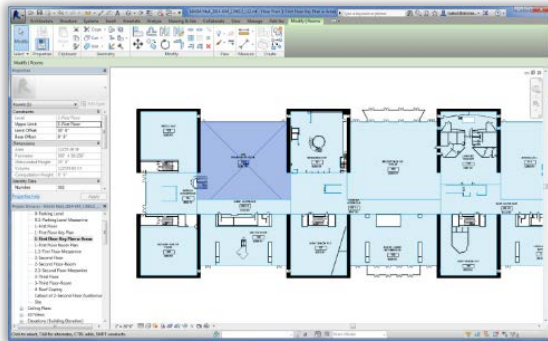
- Introduce geospatial component to existing power and water usage analysis

**SMITHSONIAN INSTITUTION - OFEO  
ASSET UPDATE/COLLECTION FORM**

What is the modification for? (Check one)			
<input type="checkbox"/> Change/replace old equipment with new equipment (Provide new and replaced Asset ID below)		<input type="checkbox"/> Add new equipment, not replacing old equipment (Provide new Asset ID below)	
<input type="checkbox"/> Retire old equipment w/ no replacement (Provide retired Asset ID below) <sup>1</sup>		<input type="checkbox"/> Modify information on existing equipment (Provide modified Asset ID and mark boxes)	
Fill out applicable Asset ID information			
<input type="text"/> Replaced Asset ID (Barcode)		<input type="text"/> New Asset ID (Barcode)	
<input type="text"/> Retired Asset ID (Barcode) <sup>1</sup>		<input type="text"/> Modified Asset ID (Barcode)	
Fill out the applicable asset data for equipment that is new or replacing old equipment. If only modifying data, mark the appropriate box and write in the change.			
<input type="checkbox"/> <input type="text"/> Specification ID (CSI MasterFormat Number)*			
<input type="checkbox"/> <input type="text"/> Reference ID (Local Name)			
<input type="checkbox"/> <input type="text"/> Serial Number			
<input type="checkbox"/> <input type="text"/> Condition			
<input type="checkbox"/> <input type="text"/> Criticality*			
<b>Spec Information</b>			
<input type="checkbox"/> <input type="text"/> Brand Name		<input type="checkbox"/> <input type="text"/> KVA	
<input type="checkbox"/> <input type="text"/> Model Number		<input type="checkbox"/> <input type="text"/> GPM	
<input type="checkbox"/> <input style="width: 100%; height: 100%;" type="text"/> Description*		<input type="checkbox"/> <input type="text"/> Belt Size	
		<input type="checkbox"/> <input type="text"/> BTUH	
		<input type="checkbox"/> <input type="text"/> RPM	
		<input type="checkbox"/> <input type="text"/> Filter Size	
		<input type="checkbox"/> <input type="text"/> Ton	
<input type="checkbox"/> <input type="text"/> Amps		<input type="checkbox"/> <input type="text"/> HP	
<input type="checkbox"/> <input type="text"/> Voltage		<input type="checkbox"/> <input type="text"/> CFM	
		<input type="checkbox"/> <input type="text"/> Max P	
<b>Notes</b>			
<input type="checkbox"/> <input type="text"/> Building*		<input type="checkbox"/> <input type="checkbox"/> Confined Space	
<input type="checkbox"/> <input type="text"/> Floor*		<input type="checkbox"/> <input type="checkbox"/> Lock Out-Tag Out	
<input type="checkbox"/> <input type="text"/> Room No.*		<input type="checkbox"/> <input type="text"/> Photo URL	
		<input type="checkbox"/> <input style="width: 100%; height: 100%;" type="text"/> Special Maintenance Instructions	
Please provide a brief explanation for equipment that is being retired w/ no replacement <sup>1</sup>			
<input style="width: 100%; height: 100%;" type="text"/>			
<small>* Required field for equipment that is new or replacing old equipment.  <sup>1</sup> If the equipment is being retired the Asset ID (Barcode) and the reason for retiring are the only things needed.</small>			
Please clearly PRINT the appropriate information below. Thank you!			
Name		Date	Contact Info
Equipment Received by:			
Equipment Installed by:			
Form filled out by:			

# BIM to FM Systems: GIS

Exchange of spatial geometry + data attributes to GIS and IWMS (Tririga)



Project Architectural BIM  
using SI Revit Architectural Template

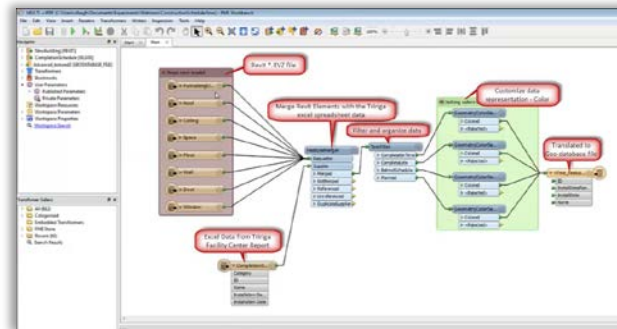
BIM to GIS

- Initially: CAD files exported from Revit
- Future: Tririga BIM Integrator



SI Explorer (ESRI GIS application linked to TRIRIGA - spatial data system of record)

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



# BIM “Wiki”



Smithsonian  
Institution

## Value Proposition

– Leverage additional technologies to improve information support

- Develop a go-to source for information about SI buildings
  - Highly visual, collaborative web-based environment
  - Leveraging SI’s SharePoint expertise
- Provide links and information from existing SI sources
  - Create a format that is easily updatable and flexible
  - Incorporate info from SI Explorer, CAD, BIM, Tririga, Document Locator, and more ...
- Promote interactivity via collaborative technologies
  - Calendaring, FAQs, videos, discussion forums

**Owned Facilities**

**National Air and Space Museum**

Project Title	Current Phase	DM	PM	AE BIM Consultant
1206101 - NAGM Revitalization <a href="#">Bluebeam Studio Project Link</a> Project files can be accessed from Studio Project Link Above <a href="#">Click Here</a> to request access to Bluebeam Studio Project	Design Development <a href="#">65% Bluebeam Studio Review Session Link</a> 65% Submission Files can be accessed from Link Above	Mike Henry	Charles Gbi	Quinn Evans
1454504 - DCI - Storage Module <a href="#">Click Here</a> to request access to Bluebeam Studio Project	Construction	David Ray	Charles Gbi	
1654501 - Delicate NASM Lin A Archives <a href="#">Click Here</a> to request access to Bluebeam Studio Project	Design Development	Earl Lawandowski	N/A	Ayers Saint Gross
Bluebeam Design Review Training <a href="#">Training Session Link</a> Studio Session can be accessed from Studio Session Link Above <a href="#">Click Here</a> to request access to Bluebeam Studio Session	Training	N/A	N/A	

**SI References**

[I-Manage - Click to Access](#)

**General Links:**

- [Smithsonian Facilities At Center Codes and Standards](#)
- [Bluebeam for Design Review](#)
- [Getting Started](#)
- [SI BIM Design Review Guidelines](#)
- [SI Bluebeam Profiles](#)
- [SI Design Review Training](#)

Have a question or comment?  
Send it to: [SP-BIM-WikiAdmin@si.edu](mailto:SP-BIM-WikiAdmin@si.edu)



Quality

# **CLIENT FEEDBACK TOOL & CPARS**

# Contractor Performance Assessment Reporting System (CPARS)



Smithsonian  
Institution

- 2014 Smithsonian begins transition to CPARS
- Identified Agency POC, Focal Points, etc.
- Revised processes, procedures, forms
- Developed documentation, training, website
- Trained staff & informed contractors
- Oct 2015 (FY16) Fully implemented
- CPARS first step to improve quality



The screenshot shows the CPARS website homepage. At the top, there is a banner with the CPARS logo and the text "Contractor Performance Assessment Reporting System". Below the banner is a navigation menu with links for HOME, ACCESS INFO, CONTACTS, FAQs, GUIDANCE, RELEASE HISTORY, RELATED LINKS, SYSTEM REQUIREMENTS, and TRAINING. The main content area is titled "Welcome to CPARS" and contains several paragraphs of text. On the right side, there are several sections: "System Access" with a "System Login" link, "Special Notices" with links for "New Release! CPARS v5.0.8 is here!", "New CPARS Guide available!", and "New Access Authorization Process", "Applications" with links for "CPARS" and "FAPLIS", and "Links" with links for "3 Ways to Improve Past Performance Compliance Metrics" and "PKI Information". At the bottom, there is a "Customer Support Desk" section with contact information, a "Contact the Webmaster" section, and a "Mailing Address" section. The footer contains various links and a disclaimer: "This is an official website of the U.S. Government".

**Welcome to CPARS**

CPARS hosts a suite of web-enabled applications that are used to document contractor and grantee performance information that is required by Federal Regulations.

Federal Acquisition Regulation (FAR) Part 42 identifies requirements for documenting contractor performance evaluations for systems, non-systems, architect-engineer, and construction acquisitions.

The FAR also requires documenting additional contractor performance information in the Federal Awardee Performance & Integrity Information System (FAPLIS), including Terminations for Cause or Default (FAR Part 42), Defective Cost or Pricing Data (FAR Part 42), Information on Trafficking in Persons (FAR Part 22), Determinations of Non-Responsibility (FAR Part 9), Subcontractor Payment Issues (FAR Part 42), Administrative Agreements (FAR Part 9), and DoD Determination of Contractor Fault (Defense Federal Acquisition Regulation Supplement (DFARS) Part 209) and to make the information available in the Past Performance Information Retrieval System (PPIRS).

The Grant Community is also required to utilize FAPLIS to document Terminations for Material Failure to Comply and Recipient Not Qualified Determinations (2 CFR 200).

The CPARS applications are designed for UNCLASSIFIED use only. Classified information is not to be entered into these applications.

**System Access**

System Login

**Special Notices**

New Release! CPARS v5.0.8 is here!

New CPARS Guide available!

New Access Authorization Process

**Applications**

CPARS

FAPLIS

**Links**

3 Ways to Improve Past Performance Compliance Metrics

PKI Information

**Customer Support Desk:**  
Voice Phone: (207) 438-1600 or DSN: 684-1600

**Contact the Webmaster:**

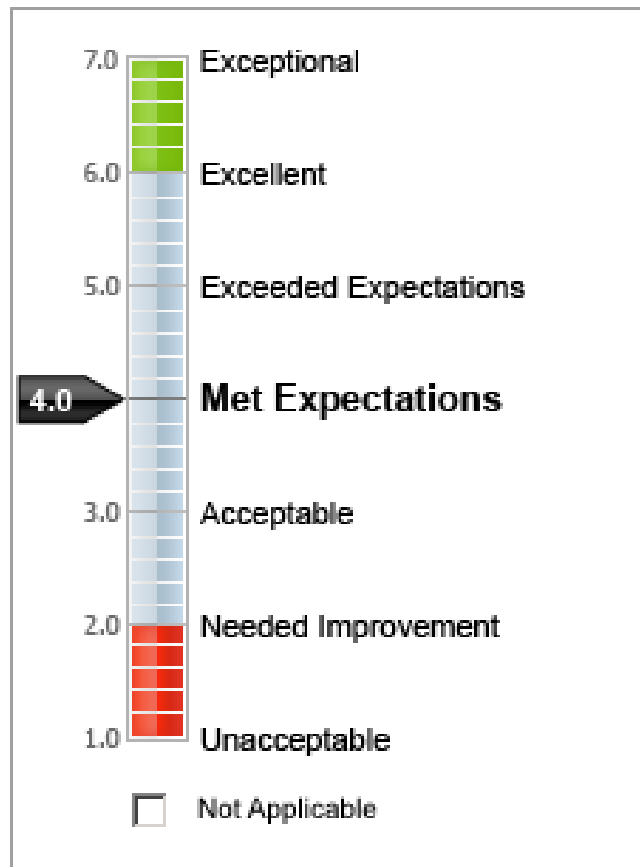
**Mailing Address:**  
Naval Sea Logistics Center Portsmouth  
Bldg 153, 2nd Floor  
Portsmouth Naval Shipyard, Portsmouth, NH 03804-5000

US Navy Web Site | IAE | USA.gov | Accessibility | Section 508 | FOIA | No FEAR Act | Privacy Policy | Site Map

This is an official website of the U.S. Government

## Managing Expectations

### RESPONSE



The **gap** between expectations and perceptions is an opportunity

Feedback **never creates problems** – simply reveals pre-existing conditions

**Expectations change**, which allows for continuous improvement

You can't control satisfaction, but you can **manage expectations**



# Project Stakeholders receive surveys in their inbox

## Clients

- Museum Directors
- Exhibit & Curatorial Staff
- Researchers & Administrators

## Facilities

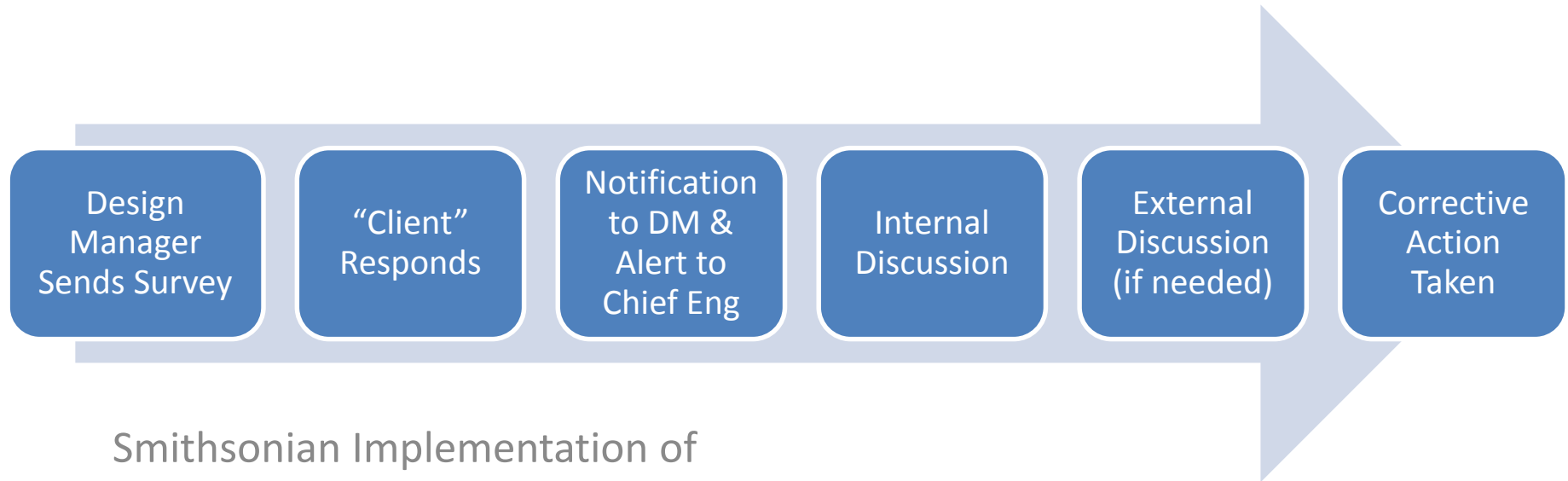
- Safety & Health
- Security, Accessibility, Preservation
- Master Planning, M/E/P, Structural

## Contractors

- Architects and Engineers
- Constructors
- Facilities Specialists



# THE PROCESS



Smithsonian Implementation of

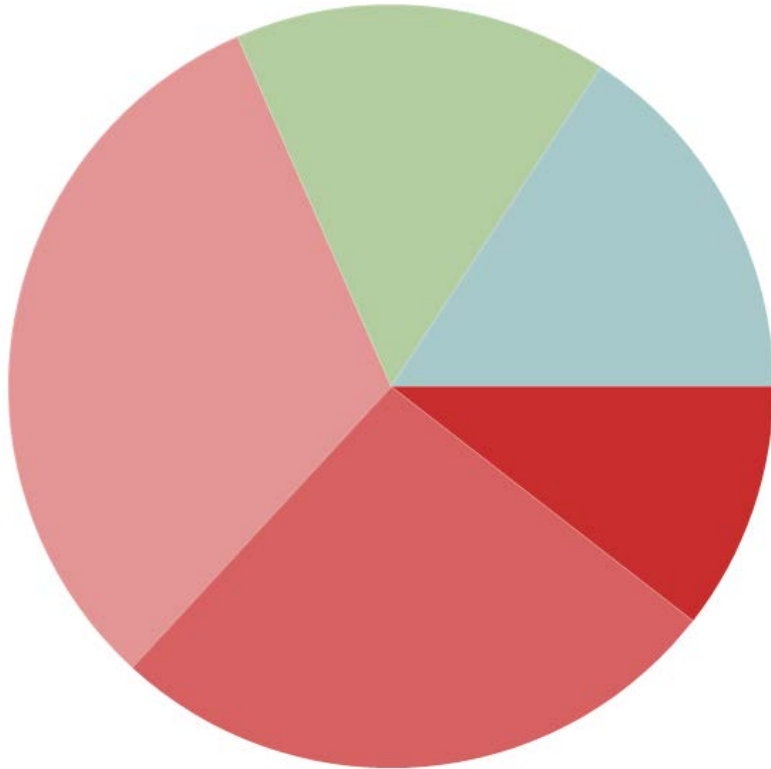
## **CLIENT FEEDBACK TOOL**



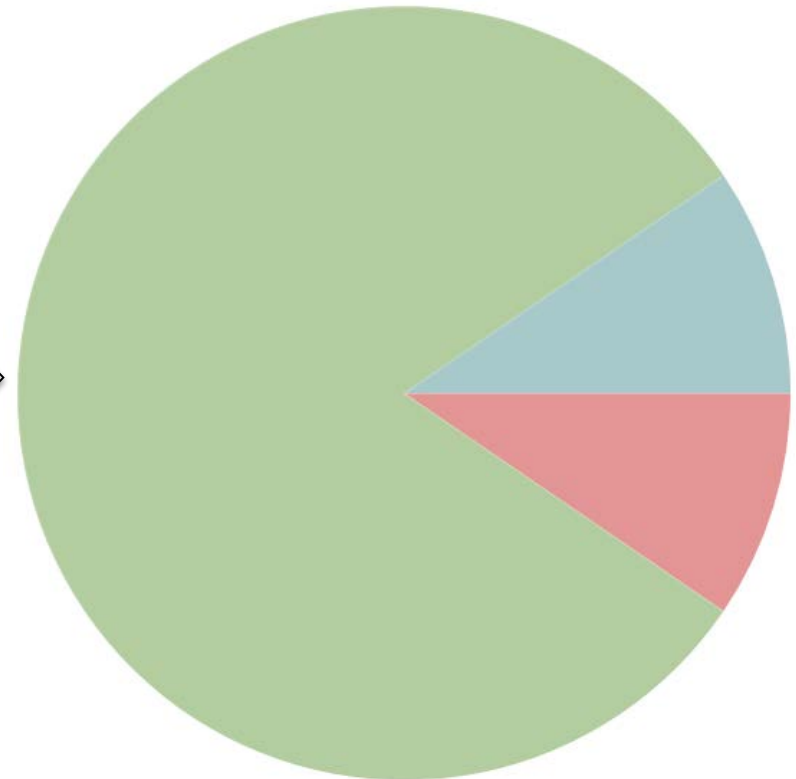
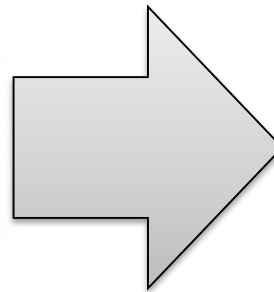
# The Results



**2015 – 30% Satisfied**



**2016 – 95% Satisfied**



# Questions?



Smithsonian  
Institution

Mike Carrancho, PE  
[carrancho@si.edu](mailto:carrancho@si.edu)

