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How much time do we spend in the built environment?



- Built Environment
- Transportation
- Open

STANFORD UNIVERSITY

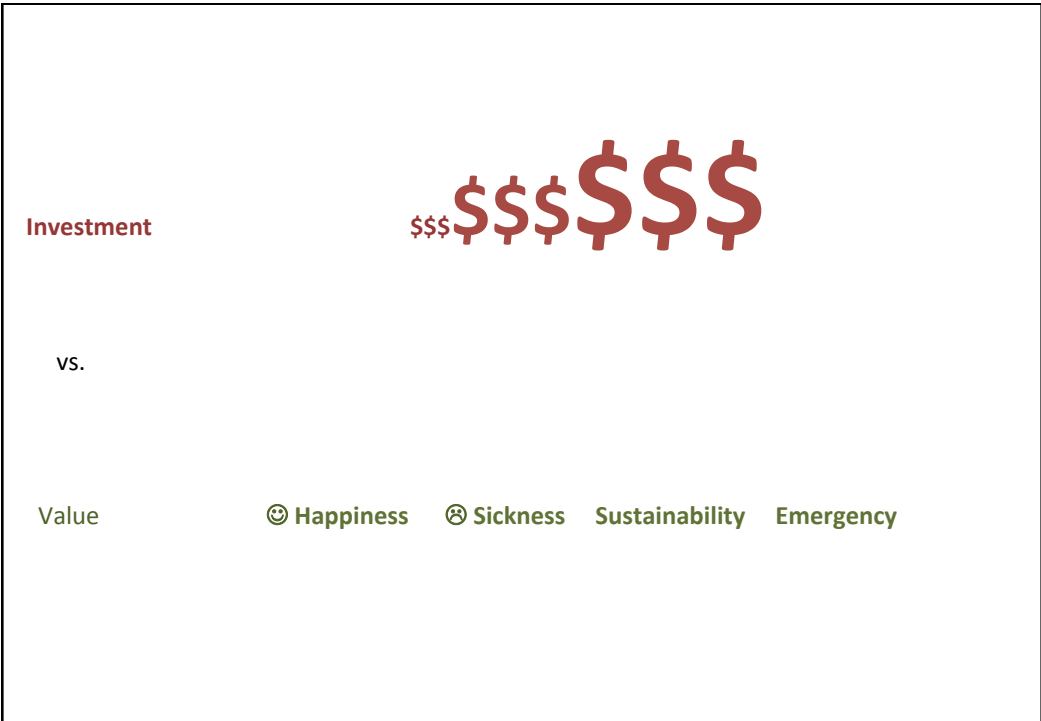


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Director of Industry Programs
Consulting Assistant Professor

GSA National 3D-4D-BIM Program
Co-Founder & Senior Program Expert

American Institute of Architects - National
2010 & 2011 National Chair, Technology in Architectural Practice
2011 National Co-Chair, Center for Integrated Practice



FM Experts



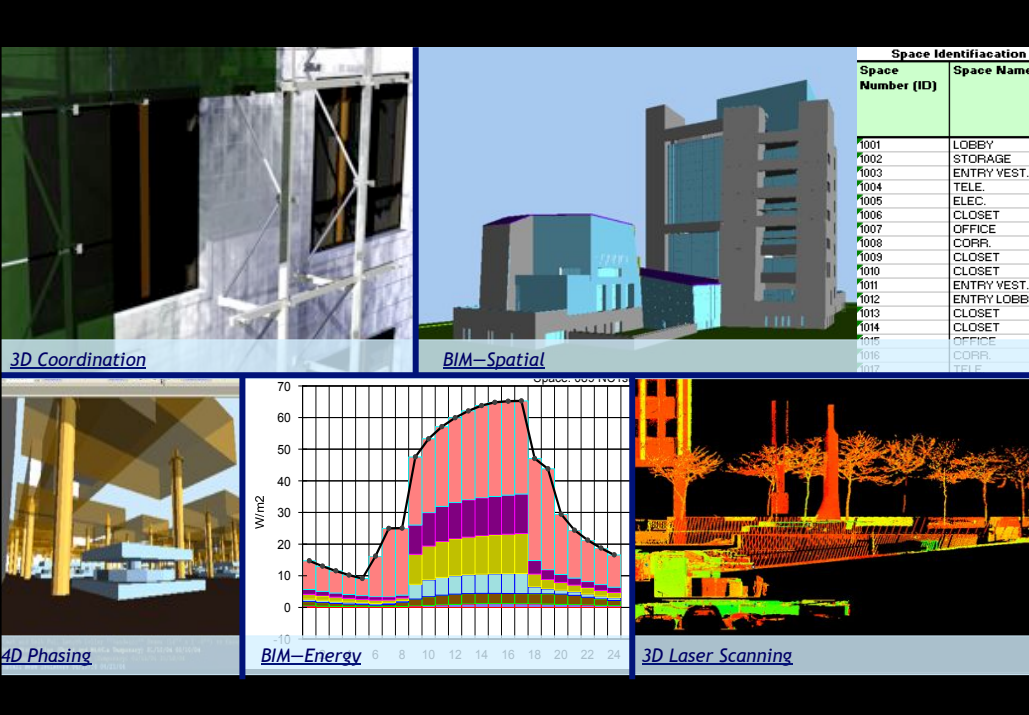
empowered by

BIM



www.wilshirewestacupuncture.com

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Space Identification	
Space Number (ID)	Space Name
1001	LOBBY
1002	STORAGE
1003	ENTRY VEST.
1004	TELE.
1005	ELEC.
1006	CLOSET
1007	OFFICE
1008	CORR.
1009	CLOSET
1010	CLOSET
1011	ENTRY VEST.
1012	ENTRY LOBBY
1013	CLOSET
1014	CLOSET
1015	OFFICE
1016	CORR.
1017	TELE.


3D Coordination

BIM-Spatial

4D Phasing

BIM-Energy




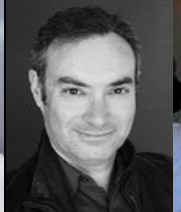


3D Laser Scanning


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2009 AIA BIM AWARDS JURY MEMBERS

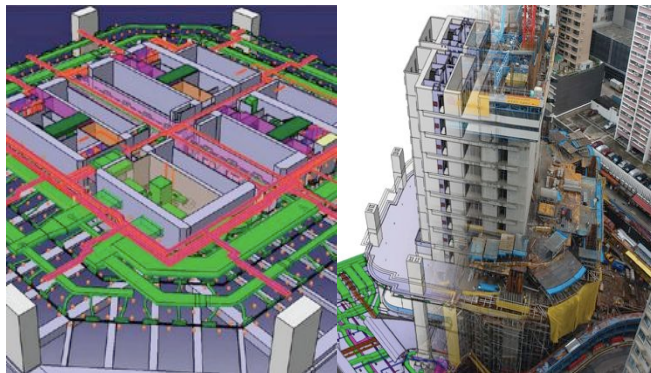
					
CALVIN KAM PhD AIA PE LEED AP	GREGG PASQUARELLI	BEVERLY WILLIS FAIA	DAVID SCHEER AIA	KATHLEEN LISTON	MICHAEL LE FEVRE AIA LEED AP
Stanford University	Principal SHoP Architects SHoP Construction	Trustee National Building Museum Washington DC	Principal Scheer & Scheer Inc Salt Lake City, UT	Consultant San Francisco, CA	Director Holder Construction

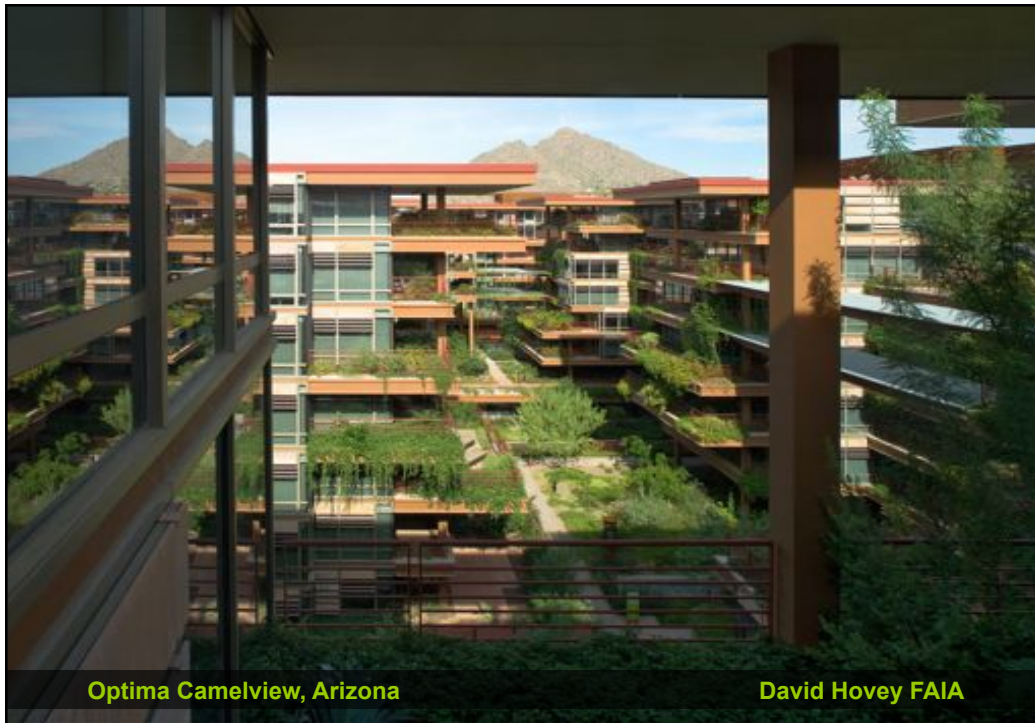
Delivery Process Innovation Using BIM

2008 One Island East – Swire, Gehry Technologies

4D construction model sequencing / anti-clash

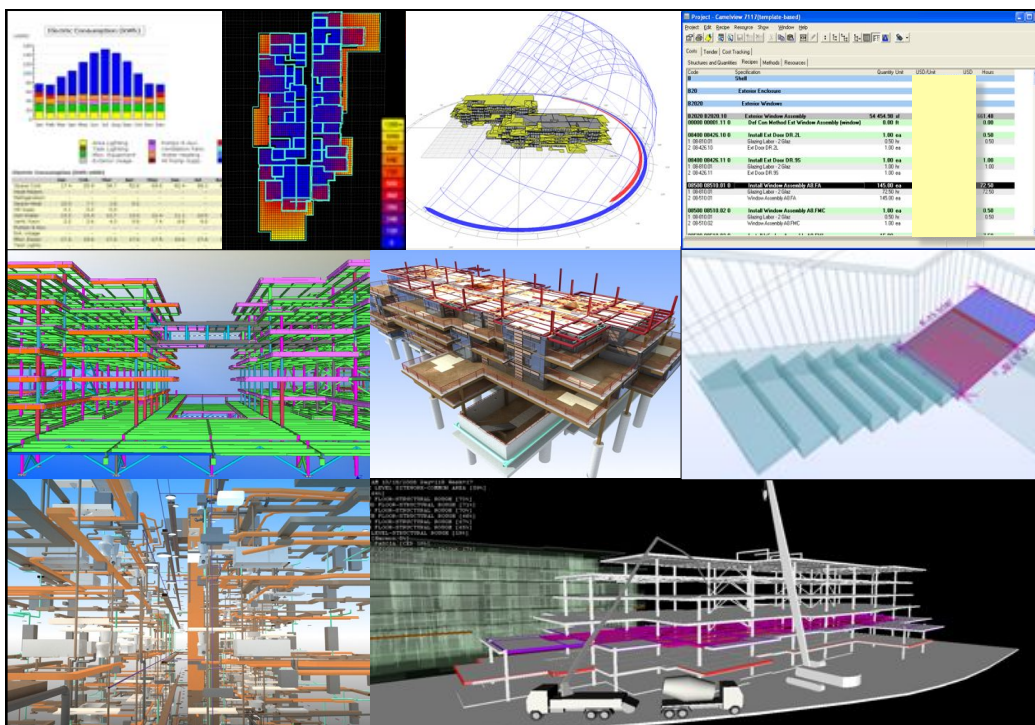
Cost modeling





Optima Camelview, Arizona

David Hovey FAIA





CREATING STELLAR ARCHITECTURE USING BIM

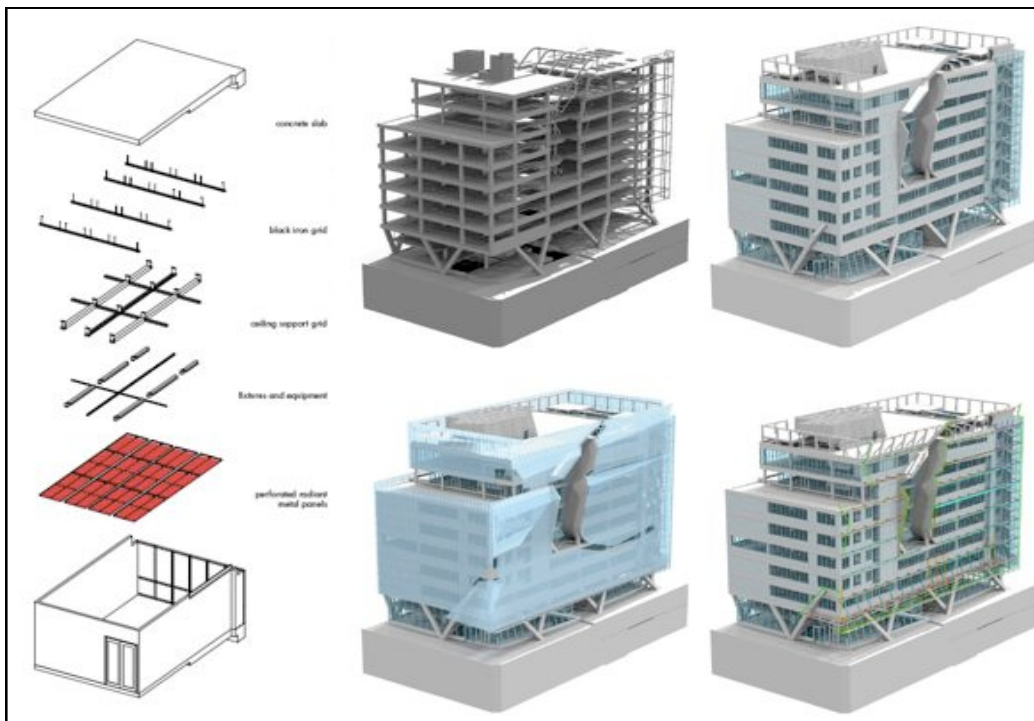
BIM AWARD CITATION

Cooper Union for the Advancement of Science and Art


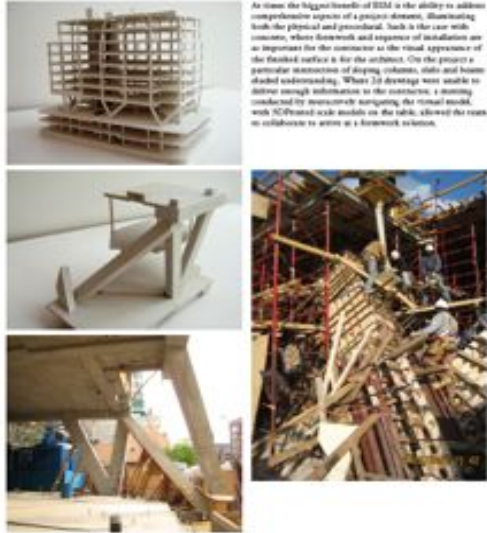
New Academic Building

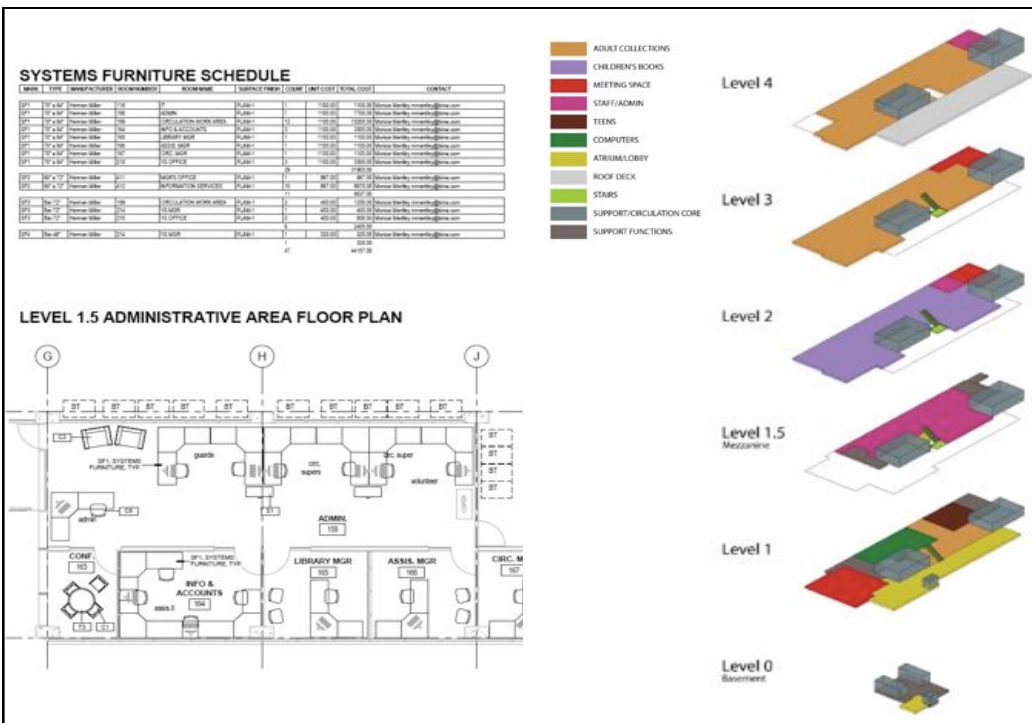
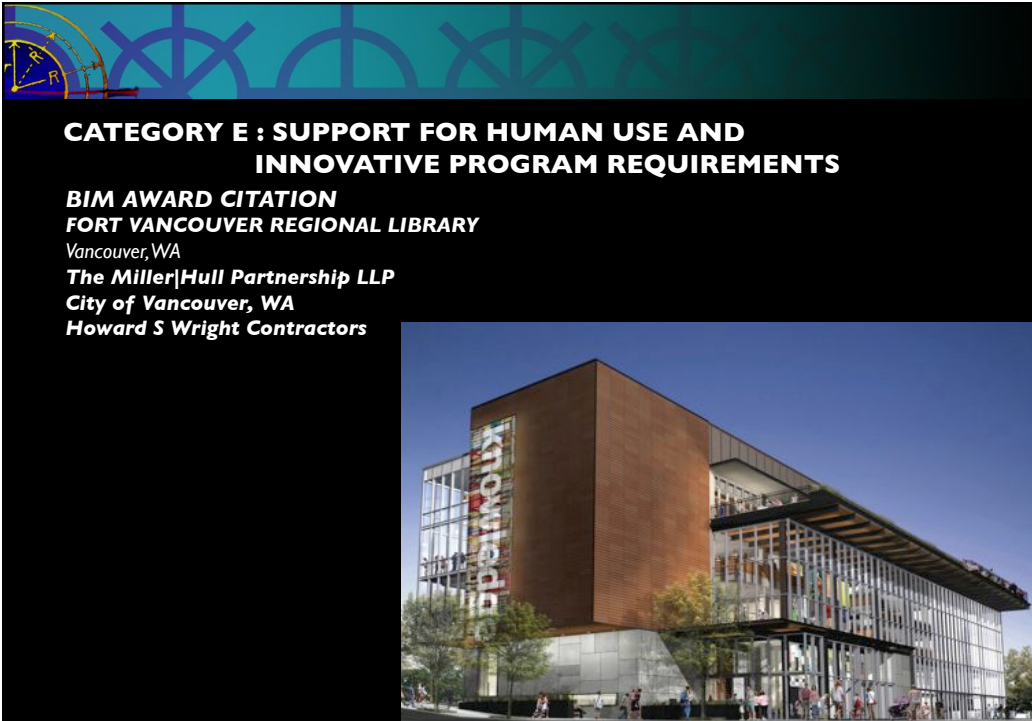
New York, New York

Morphosis Cooper Union F.J. Sciamè Construction Co. Inc.





 <p>THE AMERICAN INSTITUTE OF ARCHITECTS</p>	<p>PRACTICING ARCHITECTURE</p>	<p>EDUCATION</p>	<p>CONTRACT DOCUMENTS</p>	<p>CONFERENCES & EVENTS</p>
<p>Reinforced Concrete (RC)</p> 		<p>Concrete</p> <p>As time the biggest benefit of BIM is the ability to address comprehensive aspects of a project element. Illustrating both the physical and procedural, such as the case with concrete, where framework and sequence of installation are as important for the contractor as the visual appearance of the finished surface is for the architect. On the project a particular advantage of using software, data and hosted shared collaboration. When all drawings were made to deliver enough information to the contractor, a meeting conducted by meticulously navigating the virtual model, with 3D virtual scale models on the table, allowed the team to collaborate to arrive at a framework solution.</p> 		
<p>Morphosis 2009 AIA BIM Award—Cooper Union, NY</p>				



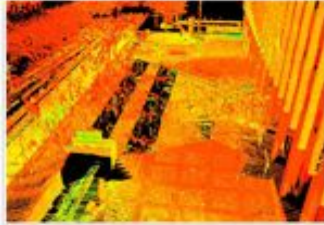
2006 AIA BIM Awards

Jury's Choice

Citation

Project: National BIM Program: Highlights from 2006 Successes and 2006 Pilot Project Successes
Architect: U.S. General Services Administration

The GSA's National BIM Program goal is "to advocate and employ value-adding digital visualization, simulation, and optimization technologies to increase quality and efficiency through project life cycles and beyond." GSA mandated that projects receiving design funding in fiscal year 2007 and after would be required to submit a spatial program BIM as a prerequisite of final concept approval. GSA's successful strategic pilot project initiative adopted an array of BIM technologies on a wide range of projects across the country. Three 2D projects included spatial program BIM models for spatial program validation, 3D-laser scanning for accurate as-built documentation, 4D phasing for schedule optimization, BIM-based energy analysis for predicting energy performance, and circulation validation studies for testing security and adjacencies. To date, through the use of 3D, 4D, and BIM, GSA has significantly reduced costs while improving quality and efficiency.



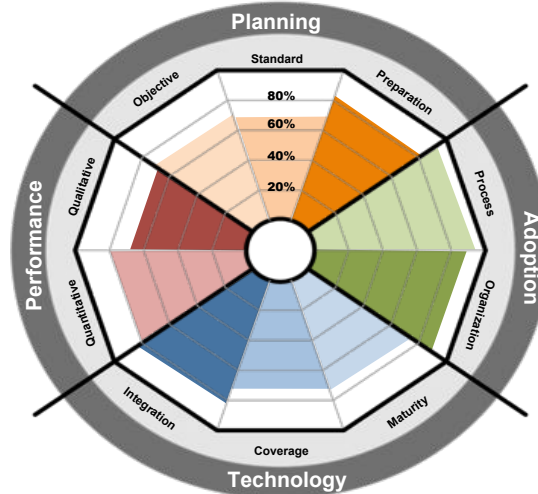
Honorable Mention

Project: Opera Theatre, Sydney Opera House, and Western Colonnade
Architect: Arup
Location: Sydney, Australia

An international partnership of architects and local consultants has been studying the Opera Theatre interior as part of the strategic building plan. Initially, the architect, structural engineer, and MEP engineer used a single platform package to facilitate interoperability among their models. The structural and MEP engineers were both involved in the original building design and construction and therefore held large amounts of information that were invaluable in creating the "existing conditions Opera Theatre BIM." The Opera House Facilities Management Group designed a Web-based intranet and Internet system that will use the continually growing BIM as a backbone for all project stakeholders. The team also introduced a tagging system for drawing information, allowing access to relevant component drawings that removed the need to search through drawing registers. As the days of using 3D models to generate 2D documentation are fast disappearing, and as BIM technology develops, the Opera Theatre will approach true integration.



Stanford University BIM Scorecard



BIM Scores of 22 Projects

	No.	Project Name	Leads	Type	# of Interviewees	VDC Score
AIA BIM Award	1	Sutter Medical Center Castro Valley	DPR	Medical	3	80%
	2	UCSF Mission Bay	DPR	Medical	2	71%
	3	EGWW	GSA	Federal Bldg.	1	70%
AIA BIM Award	4	Camelview	Optima	Residential	1	66%
	5	Alta Bates Summit Medical Center	DPR	Medical	1	57%
	6	Southern Polytechnic University	DPR	Lab	1	54%
AIA BIM Award	6	United Therapeutics	DPR	Office	1	54%
	6	McCoy FB Modernization	GSA	Federal Bldg.	1	54%
	9	Palomar Pomarado	DPR	Medical	1	52%
	9	Glodon Headquarters	Glodon	Office	4	52%
	9	NREL	NREL	Lab	4	52%
	12	Sensitive Project	GSA	Federal Bldg.	1	49%
AIA BIM Award	12	Journey to Madagascar	Scenario	Theme Park	1	49%
	14	Lucille Packard Children's Hospital	DPR	Medical	1	46%
	15	Chicago Federal Center	GSA	Federal Bldg.	1	45%
	16	Ten West Jackson	GSA	Federal Bldg.	1	44%
	17	Byron Rogers Federal Building	GSA	Federal Bldg.		43%
	18	San Diego Courthouse	GSA	Courthouse	3	39%
	19	Richard H Poff	GSA	Courthouse	1	38%
	20	Federal Center South / USACE	GSA	Federal Bldg.	3	37%
	20	San Antonio Courthouse	GSA	Courthouse	1	37%
	22	Building 105	GSA	Federal Bldg.	1	36%



The slide features a background image of a complex 3D BIM model of a building's internal systems, including pipes, ducts, and structural elements. In the top left corner is the GRANLUND logo, a green stylized 'G'. In the top right corner is the Senate PROPERTIES logo. The main title is 'BIM as a Tool in Asset Management' in blue text. Below the title is the name 'Reijo Hänninen, Senior Executive Consultant, M.Sc.' and the company 'Olof Granlund Oy'. At the bottom, there is a green footer bar containing the text 'Copyright Granlund | www.granlund.fi' and the GRANLUND logo on the right.



International Collaboration among Public Owners

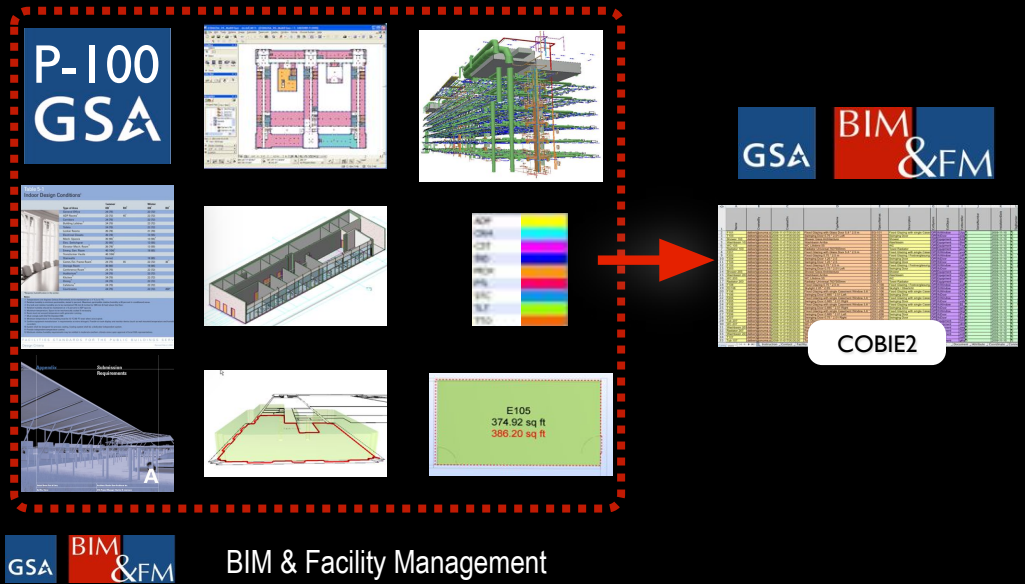
- public owners from United States, Finland, Norway, Denmark (January 2008)
- joint statement in support of BIM, open standards and collaboration
- welcome other public owners around the world to join!





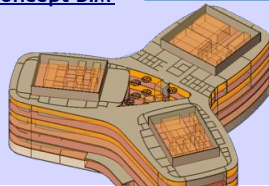
Autodesk NavisWorks
Autodesk Revit
COBIE
Custom API
dRofus
Ecodomus
ESRI
Graphisoft ArchiCAD
IFC
Maximo
Onuma Planning Systems
Solibri Model Checker

Elements Exist in Current Process to Support COBIE & FM





Final Concept BIM



Early Space Program Review for Concept
Project: U.S. Courthouse of Toledo, OH
Date: 10/15/2010

Item Description	Type	Target Value	Current Value
1 Number of Building Floors	EA		11
2 Total building gross area	Area (sqft)	298,000	298,000
3 Total parking area	Area (sqft)	21,079	21,079
4 Total gross minus waste parking area	Area (sqft)	187,076	187,076
5 Total usable area	Area (sqft)	162,217	162,217
6 Usable area	Area (sqft)	4,322	4,322
7 Building Efficiency (USF/Total gross minus parking area)	Ratio (%)	67%	87%
8 Number of Courtrooms	EA		11
9 Number of Special Proceedings/Appeals Courtrooms	EA		Not found
10 Number of Chambers	EA		11
11 Number of Judge Parking Spaces	EA		47
12 Number of Elevator Spreads on the 1st Floor	EA		7
13 Elevator Ratio (Total Gross Area / Number of Elevator Spaces)	Area (sqft)	25,000	29,822
14 Floor to Floor Height for Courtroom	Height (ft)	20	22 @ 8.0, 16.0
15 Maximum Ceiling Height of Courtroom	Height (ft)	16	3.0, 16.0
16 Floor to Floor Height for Sp. Proceedings/Appeals Courtroom	Height (ft)		Not found

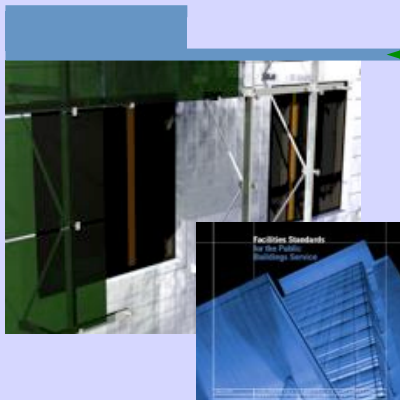
Program Target vs. Spatial Data, Energy Target vs. Predictions

IFC + Native (.dgn / .pln / .rvt)



Final Concept BIM

Design-Intent BIM



Design Specifications, Performance Requirements

IFC + COBIE + Native (.dgn / .pln / .rvt) + Specifications

GSA P-100

Facilities Standards for the Public Buildings Service

Table 5-1
Indoor Design Conditions^a

Type of Area	Summer		Winter	
	DB ^b	RH ^c	DB ^b	RH ^c
General Office	24 (75)		22 (72)	
ADP Rooms ^d	22 (72)	45 ^e	22 (72)	
Corridors	24 (75)		22 (72)	
Building Lobbies ^f	24 (75)		22 (72)	
Toilets	24 (75)		22 (72)	
Locker Rooms	26 (78)		21 (70)	
Electrical Closets	26 (78)		13 (55)	
Mech. Spaces	25 (75)		13 (55) ^g	
Elec. Switchgear	25 (75)		13 (55)	
Elevator Mech. Room ^h	26 (78)		13 (55)	

Table 5-6
Minimum Control and Monitoring Points for Typical HVAC Equipment

Control Air Handling Units	Refrigeration Equipment	Hot Water Boilers
Start/Stop	Start/Stop	Start/Stop
Heating Control	Leave Water Temp Reset	Leaving Water Temp Reset
Cooling Control	Demand Limiting	Leaving Water Temp Reset
Humidification Control	Isolation Valve Position	Isolation Valve Position
Supply Air Reset	Leaving Water Temp	Leaving Water Temp
Static Pressure Reset	Entering Water Temp	Entering Water Temp
Building and Zone	W/ Draw	Flow
Pressurization Control	Flow	BTU Draw
Damper Position (Incremental)	Return Air Flow Rate	
Supply Air Discharge Temp		
Return Air Temp		
Mixed Air Temp		
Supply Air Flow Rate		
Filter Differential Pressure		
Air Flow Measuring Station		

Cooling Towers	Terminal Boxes	Pumps
Start/Stop	Start/Stop	Start/Stop
Leaving Water Temp Reset	Discharge Temp Reset	Discharge Pressure Reset
Flow	Supply Volume Reset	Differential Pressure
Isolation Valve Position	Heating Control	Flow
Entering Water Temp	Zone Temp Reset	
Leaving Water Temp	Minimum Volume Reset	
	Zone Temp	
	Supply Air Reset	
	Zone Pressurization Control	

Utilities
Natural Gas Consumption

GSA

Life-Cycle BIM for Facility Management

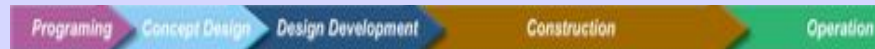


- Final Concept BIM
- Design-Intent BIM
- Construction BIM
- As-Built/Record BIM

Item Number	ASSET TAG	Site	Description	Equipment Data Type
7800407	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800408	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800409	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800410	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800411	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800412	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800413	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800414	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800415	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800416	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800417	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800418	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800419	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800420	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800421	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800422	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800423	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800424	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800425	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800426	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800427	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800428	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800429	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800430	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800431	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800432	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800433	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800434	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800435	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800436	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800437	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800438	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800439	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800440	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800441	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800442	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800443	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800444	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800445	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800446	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800447	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800448	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800449	FR02100	FR02100	FREE AND DRYING DAMPING	ARI
7800450	FR02100	FR02100	FREE AND DRYING DAMPING	ARI

Equipment Information, Type, Warranty; Fabrication Model
IFC + NavisWorks + COBIE + Native (tekla / cadduct / quickpen)

Life-Cycle BIM for Facility Management

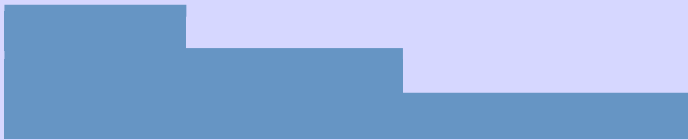


Final Concept BIM

Design-Intent BIM

Construction BIM

As-Built/Record BIM



- Work Order
- Sustainable (and preventive) Maintenance
- Small Project
- Major Modernization

Life-Cycle BIM for Facility Management

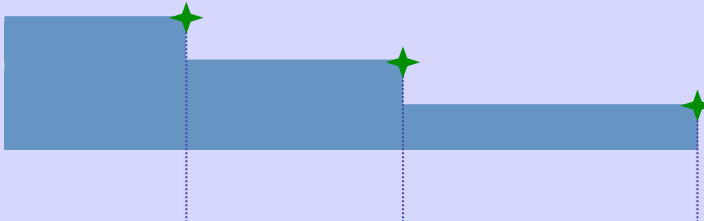


Final Concept BIM

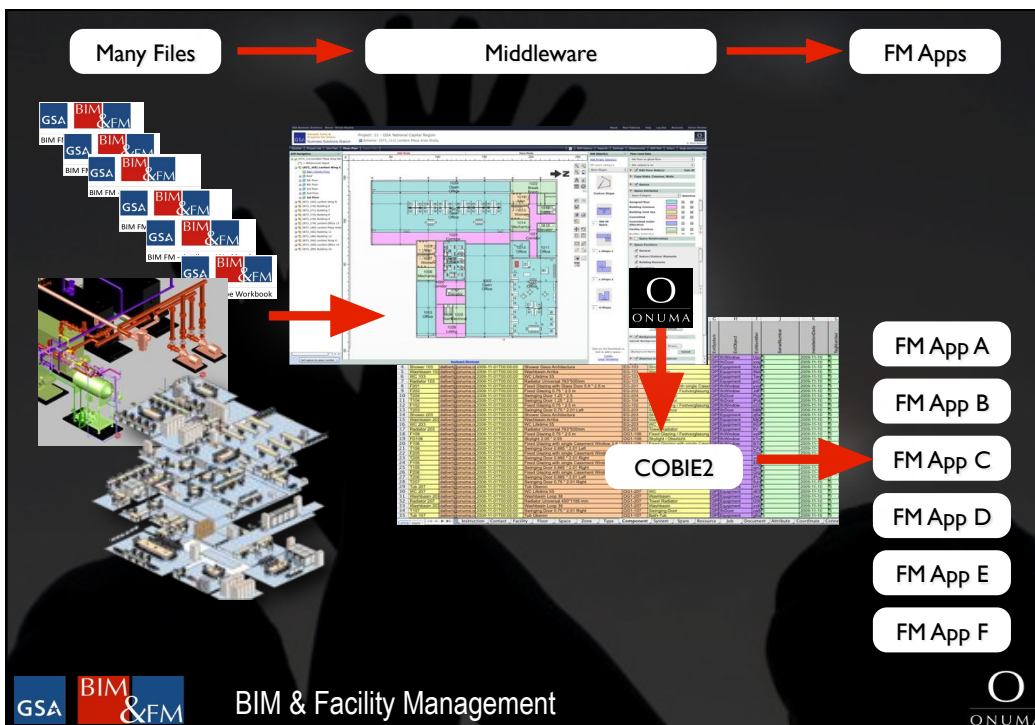
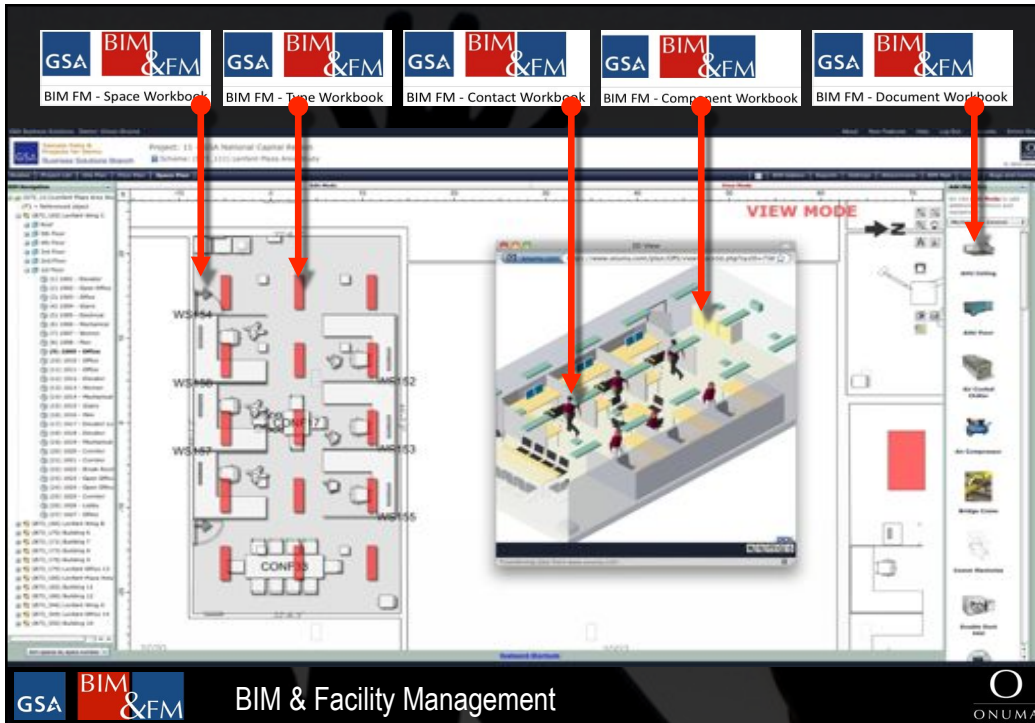
Design-Intent BIM

Construction BIM

As-Built/Record BIM



BIM + (cobie)Dataset + CMMS
and more...






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Facilities Management
William (Kenny) Floyd, National Institute of Health, discusses how GIS tools are

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2011 National Co-Chair, Center for Integrated Practice