Award-Winning BIM:

Lessons Learned from GSA's 3D/4D BIM Program

+

A Case Study of 2011 AIA BIM Award Winner:

Chicago Federal Center

Featuring:

Stephen Hagan, AIA-TAP, GSA   Peggy Yee, GSA
Charles Matta, GSA   Bob Mauck, Ghafari Associates
Calvin Kam, AIA-TAP, GSA   Paul Blanchard, Ghafari Associates

2011 AIA-TAP Webinar Series
September 09, 2011

Technology in
Architectural Practice
http://www.aia.org/TAP

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AIA/CES Course Summary

Since 2005, the AIA Technology in Architectural Practice (TAP) Knowledge Community has spearheaded an effort to highlight award winning "best of breed" case studies from the profession in the harnessing of Building Information Model (BIM) technology and processes to further design, construction and project excellence.

This 90 minute webinar will highlight that 7 years of exploration of BIM excellence. An overview of the BIM Awards program, a mention of the upcoming 2012 awards program, a more in depth discussion of the U.S. General Services Administration's 3D/4D BIM program, and a detailed case study of BIM enabled Process Innovation from the 2011 Awards.

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AIA/CES Learning Objectives

1. Learn the history and evolution of BIM as demonstrated by the past 7 years of the AIA/TAP BIM Awards Program.

2. Learn what public owners are demanding in terms of BIM as demonstrated by process innovation and sustainability enhanced and enabled by BIM.

3. Learn what BIM can and cannot do in the Practice of Architecture illustrated by a case study of a specific public sector complex in Chicago.

4. Learn the current state of practice and reality in both interoperable standards and reliable outcomes using of BIM authoring and analysis tools for the project team members (architect, construction manager, BIM model manager, and constructor).

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Webinar Schedule

1:00 - 1:15 pm   Welcome

Introduction of the Webinar
Overview of 7 Years of Award Winning BIM

Call for 2012 BIM Awards Submissions

Speakers: Calvin Kam, 2011 TAP Chair
Stephen Hagan, FAIA, GSA, and past TAP Chair

1:15 - 1:35 pm   GSA's Award Winning 3D/4D BIM Program
Update on New Initiatives and
Industry-wide Influence

Speakers: Peggy Yee, GSA
Calvin Kam, GSA + Charles Matta FAIA, GSA

1:35 - 1:45 pm   Q&A

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Webbinar Schedule

1:45 - 2:15 pm 2011 BIM Award Winner
Chicago Federal Center

Speakers: Richard Gee, GSA
Bob Mauck, Ghafari Associates

2:15 - 2:30 pm Q&A + Final Comments

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2011 TAP Leadership Team

Calvin Kam
2011 chair

David Scheer
2012 chair

Kimon Onuma
2013 chair

Stephen Hagan

Kristine Fallon

Tony Rinella

Active Past Chairs

Brian Skripac

Crystal Wilson

Jeff Ouellette

Karen Kensek

Luciana Burdi

Marty Doscher

Mike Kenig

Pete Evans

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TAP Upcoming Events

- **September 16, 2011 – Local TAP Discussion Group 1pm EDT**
- **October 07, 2011 – October Webinar**
  - Residential BIM
  - Co-Sponsored with Custom Residential Architects Network (CRAN)

- **November 17, 2011 – 2011 TAP Conference**
  - Faster Forward @ Build Boston
  - Hybrid, multi-venue event, multi-cast to local venues

- **December 05, 2011 – 2011 Building Connections**
- **December 06, 2011 – 2011 EcoBuild**
  - Washington D.C.

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Welcome!
Our Agenda Today

Award Winning BIM: 7 Years of AIA TAP BIM
Awards and 2012 Call for Submission

Lessons Learned from GSA's 3D/4D BIM Program

+

A Case Study of 2011 AIA BIM Award Winner:
Chicago Federal Center

Award Winning BIM
speaking: Stephen Hagan FAIA
              Calvin Kam, PhD AIA

BIM Awards Committee
Mission & Goals

- **Support the Annual the BIM Awards Program**
- **Develop the BIM Awards Program with evolving metrics**
- **Assist BIM Awards Reception**
- **Case studies | publications | tools for BIM information distribution**

BIM Awards Committee

Timeline

- **7 years of AIA BIM Awards**

  Archives at AIA Technology in Practice:

  http://www.aia.org/about/initiatives/AIAS078440

BIM Awards 2005-2011

AIA TECHNOLOGY IN ARCHITECTURAL PRACTICE — 7TH ANNUAL BUILDING INFORMATION MODELING (BIM) AWARDS — 2011

2011 BIM Awards
7th Annual

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The 2011 Awards reveal how BIM is advancing from a pure tool

2005, 2006, 2007, ...

What's in a name?

A lot, actually.

If we didn't have BIM, we wouldn't have a National BIM Standards Committee - an important component in the

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TECHNOLOGY IN ARCHITECTURAL PRACTICE

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Education Thrives, Process Arrives, Design Survives

BIM Comes Alive

The 4th Annual AIA TAP BIM Awards reveal the liveliness BIM demonstrated in 2007 - a year called a tipping point for this advanced technology tool set.

The fear that institutions of higher education were not hitting their groove with BIM is allayed with four awards in the academic category. One award went to a graduate studio that convincingly tells the story of how affordable modular housing ca... BIM.

TECHNOLOGY IN ARCHITECTURAL PRACTICE

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TECHNOLOGY IN ARCHITECTURAL PRACTICE

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Creating Stellar Architecture **Using BIM**

Technology in
Architectural Practice
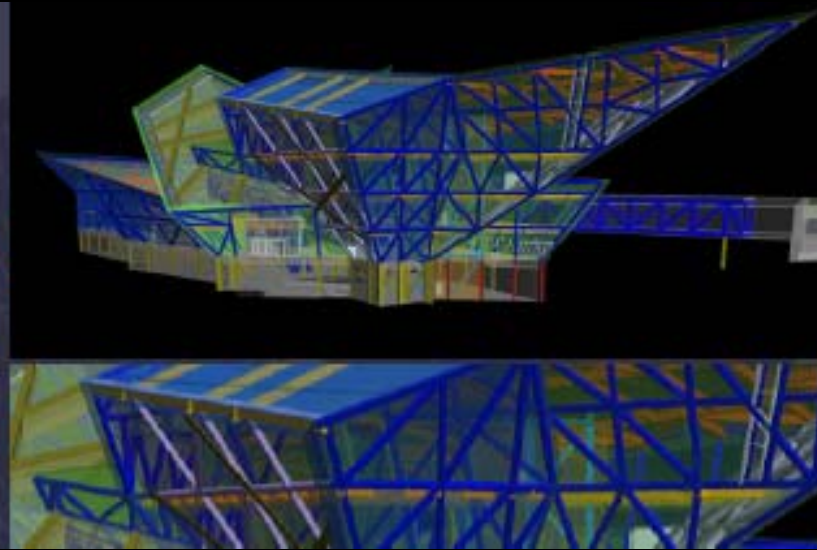http://www.aia.org/TAP

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Creating Stellar Architecture **Using BIM**

Fredric C Hamilton Building
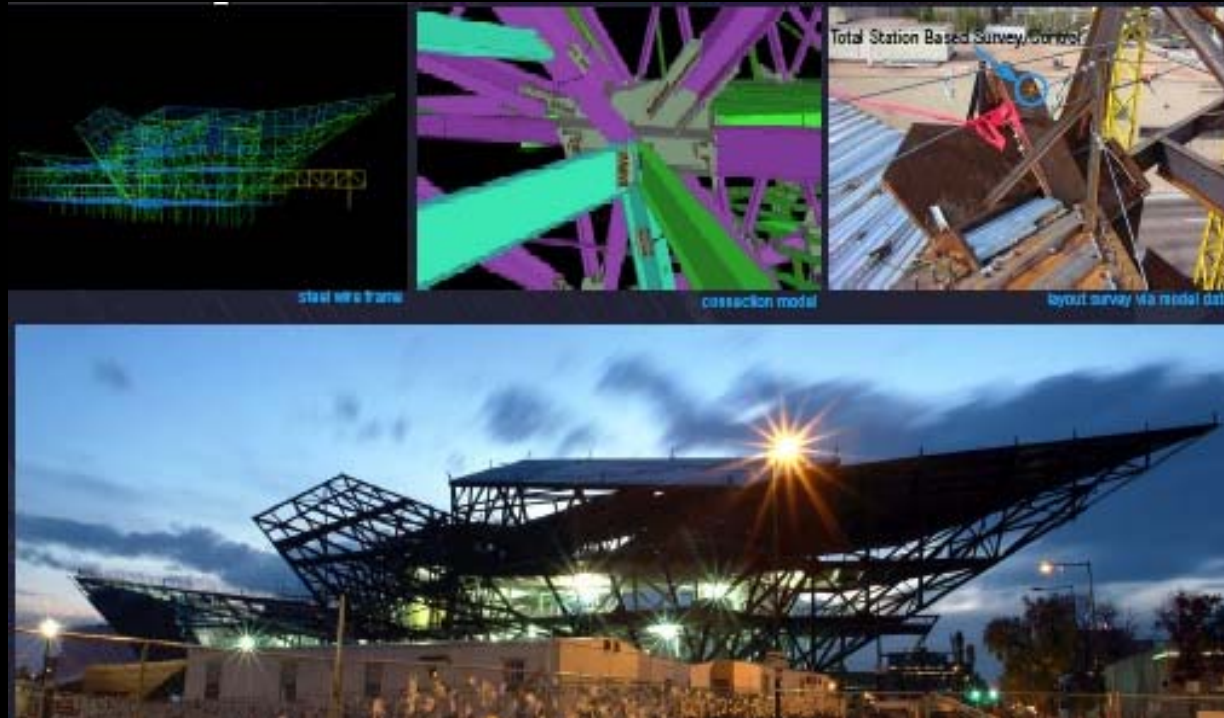*Denver Art Museum*

M.A. Mortenson Company

Creating Stellar Architecture **Using BIM**

Fredric C Hamilton Building *M.A. Mortenson Company*
Denver Art Museum

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Creating Stellar Architecture **Using BIM**

Creating Stellar Architecture **Using BIM**

CATEGORY A : BIM EXCELLENCE

- JURY ASSESSMENT OF ARCHITECTURAL QUALITY

- CLEAR USE OF MULTIPLE APPLICATIONS INTEROPERATING TO REALIZE OUTSTANDING DESIGN

- ARCHITECTURAL EXPRESSION THAT COULD NOT HAVE BEEN REALIZED IN OTHER WAYS

BIM EXCELLENCE

BIM AWARD CITATION
DC Consolidated Forensic Lab
District of Columbia
HOK

AIA
TAP

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FACADE DESIGN AND INTEGRATION
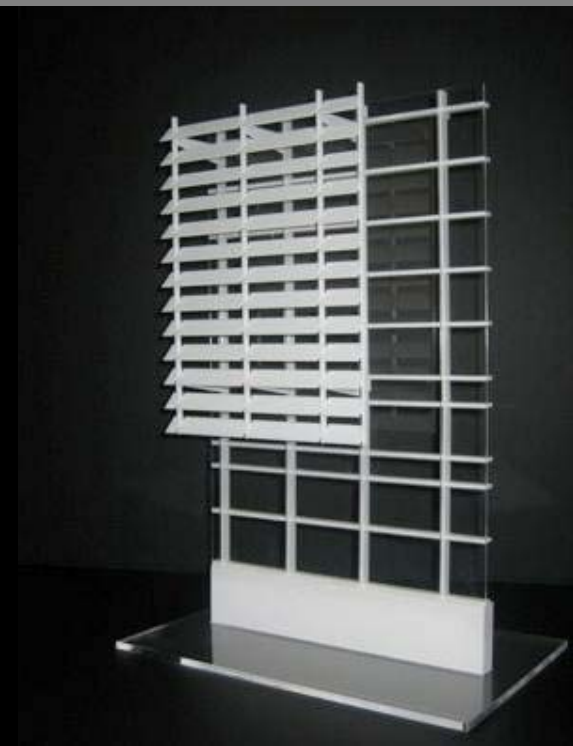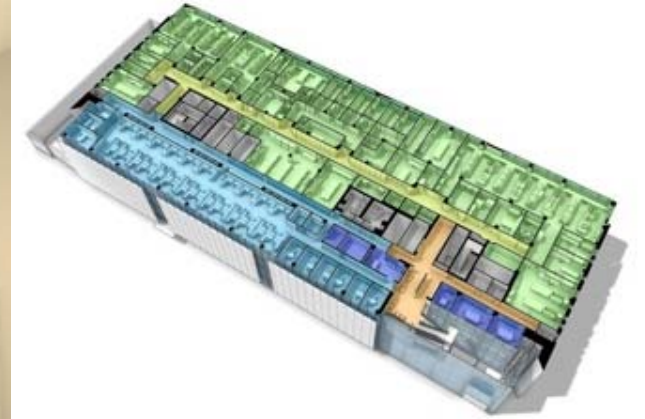
LAB PLANNING AND CONSTRUCTABILITY
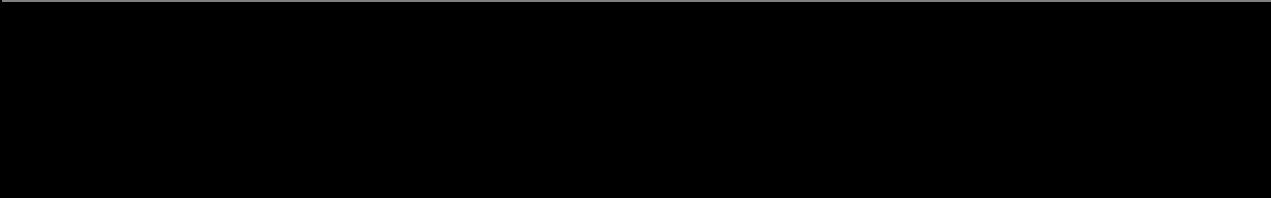
DATA EXCHANGES EMPLOYED

DESIGN TEAM

STRUCTURAL
BLOCK & STACK
DESIGN
LAB
INTERIORS
SPECIALTY STUDIES
MEP
APPROVALS

OWNER / CONSTRUCTION MANAGEMENT

REVIEWS
ESTIMATES

GENERAL CONTRACTOR

LAB CASEWORK
SCHEDULE
STRUCTURAL
COORDINATION
COST
FABRICATION
MEP
EXTERIOR WALL
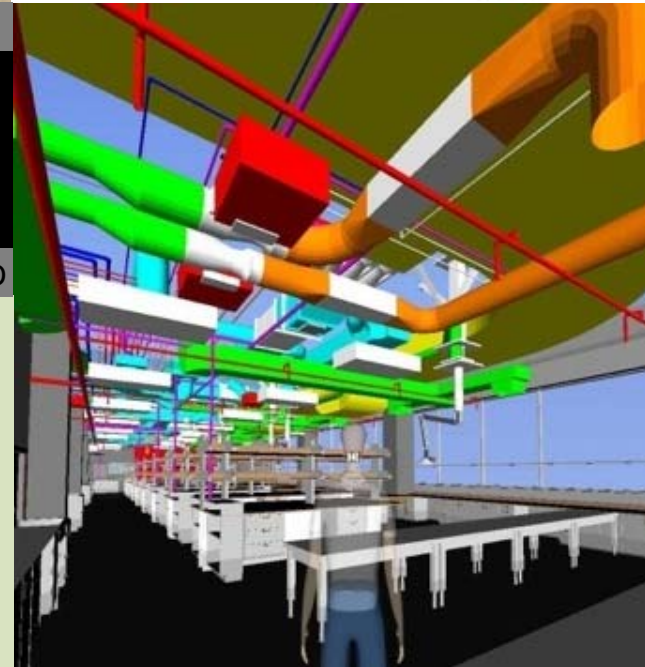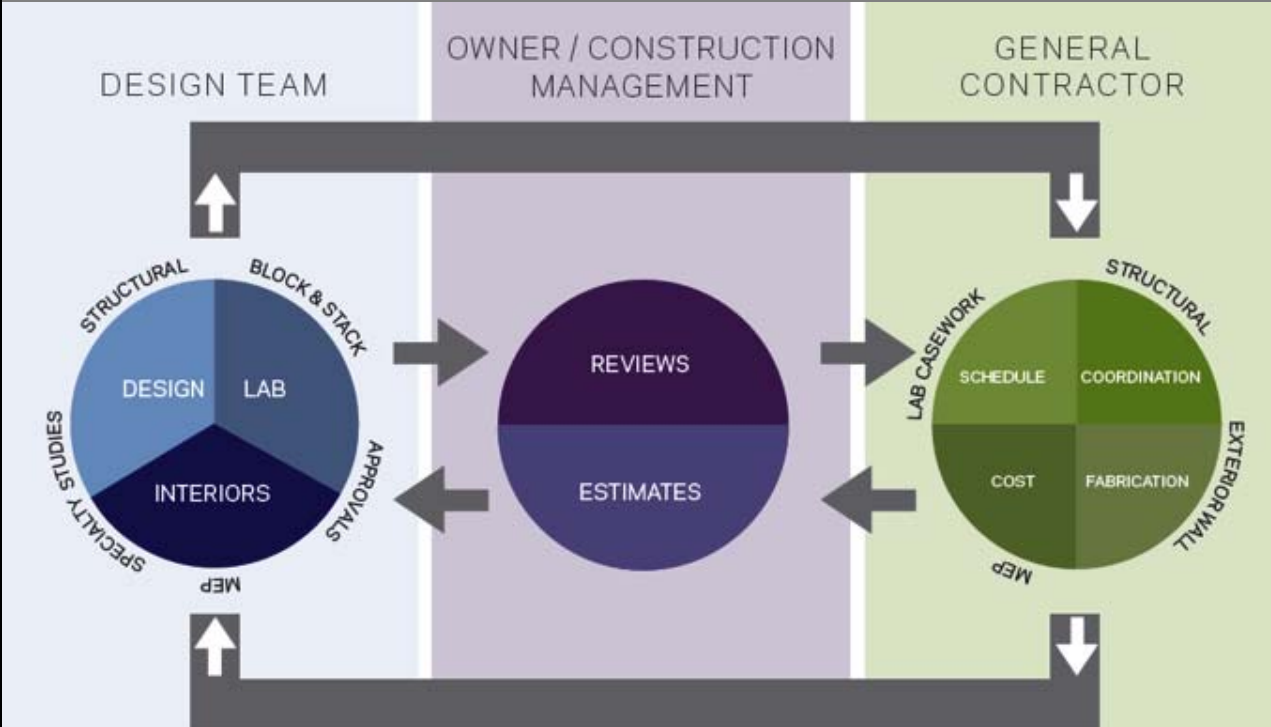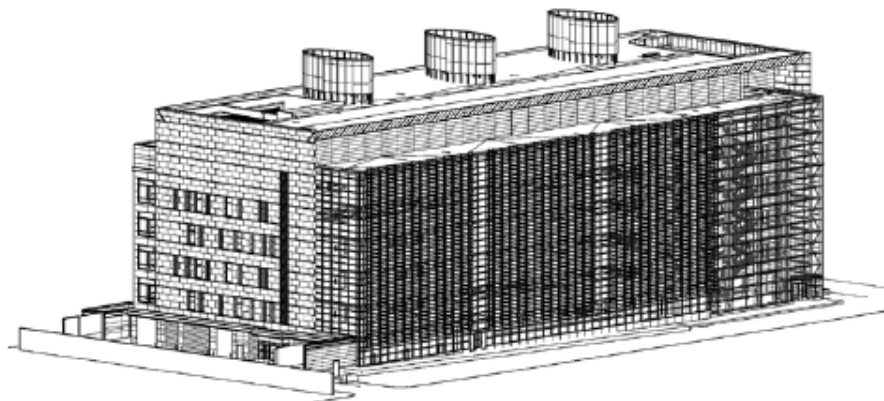
MODEL LOOKING NORTHWEST
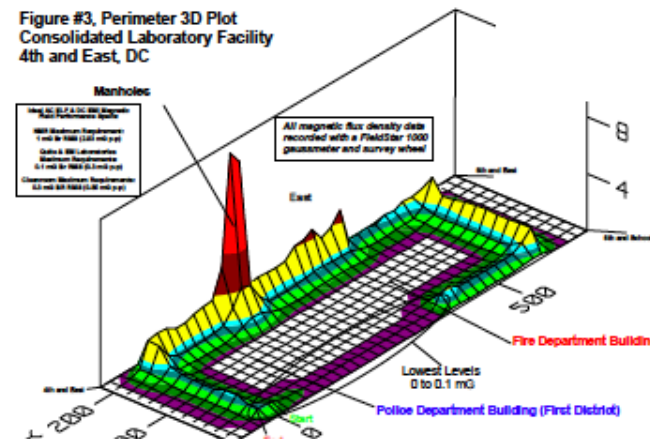
EMI/RFI
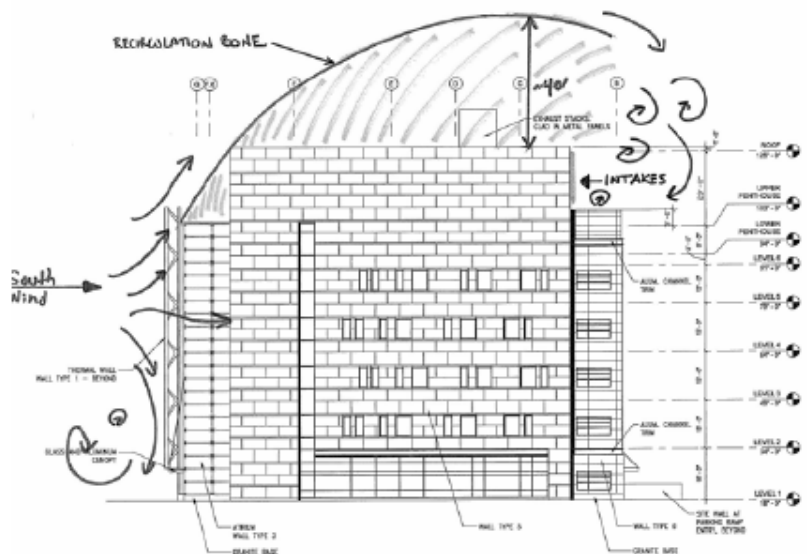
EAST ELEVATION- WIND WAKE
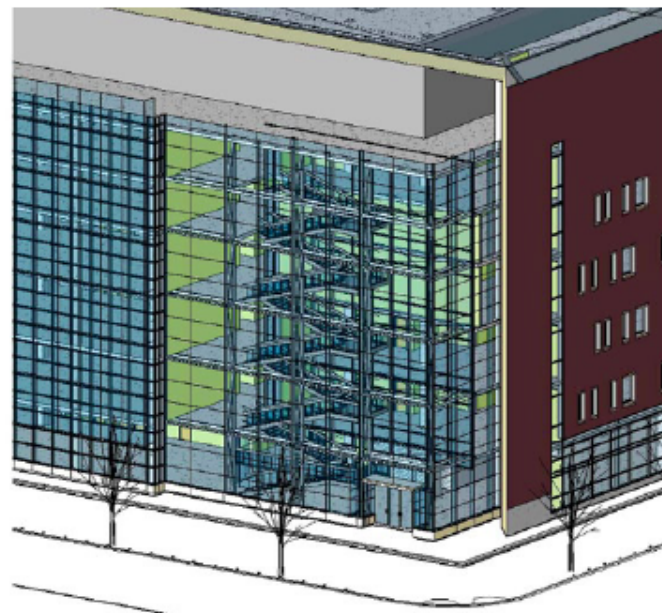
ATRIUM EXHAUST MODEL

BIM Awards Committee
Participants

- **Stephen Hagan, Co-Chair**
- **Marty Doscher, Co-Chair**

BIM Awards Committee
Activities - Status

- **In 2011 Expand BIM Awards: AGC BIMForum**

- For the 2011 Building Information Modeling (BIM) Awards competition, the AIA TAP Knowledge Community seeks projects that have used integrated and interoperable BIM.

- Category A: BIM Excellence
  Category B: Delivery Process Innovation (in association with BIMForum, Professional's Choice Award—Owners Choice and COAA added for 2012
  Category C: Outstanding Sustainable Design
  Category D: Academic Program / Curriculum Development
  Category E: Exemplary use of BIM in a Small Firm

BIM Awards Committee

2011 Jury

Joseph G. Burns, FAIA - Thornton-Tomasetti Group – Chicago, IL

Luciana Burdi, Ph.D. - State of Massachusetts Office of Planning, Design and Construction Division of Capital Asset Management – Boston, MA

Rodd Merchant, P.E. - JE Dunn Construction – Denver, CO

Kimon Onuma, FAIA - Onuma, Inc. – Pasadena, CA

Marty Doscher, AIA Co-Chair of TAP BIM Awards Committee

BIM Awards 2005-2011

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GSA's 3D 4D BIM Program Lessons Learned

Charles Matta, FAIA

Director, Strategic Programs & Resources

GSA PBS Office of Design and Construction

Calvin Kam, PhD, AIA

Senior Program Expert, National 3D-4D-BIM Program

GSA PBS Office of Design and Construction

Peggy Yee, PhD

Program Expert, National 3D-4D-BIM Program

GSA PBS Office of Design and Construction

Building Information Modeling at GSA

Policy & Guidance, Interoperability, and why it matters

The Business Case:

Why do it?

Industry Leadership

within agency first

Incremental steps

Innovation

- BIM
  - Interoperability
- SmartBuilding Technology
  - Operational adaptability
- Industry Agreements
  - Public Owners

BIM Program

→ Pilot Program

    → GSA National Policy

       → National Standards

          → International Agreements

BIM **at GSA**

IDIQ nationwide contracts:

- BIM Services

- Laser Scanning Services

BIM **+ Next**

Organization wide BIM server

- On-demand access

- Open Standards data files

Project LifeCycle Tool for design & construction AND Asset Management

Integrated Project Delivery & FAR

Stanford VDC / BIM Scorecard

Innovation

Best Proven P. — 100% / 90%

VDC Score: 80%

Good Practice — 75%

Common Practice — 50%

Low-Hanging Fruit — 25%

Conventional Status-Quo — 0%
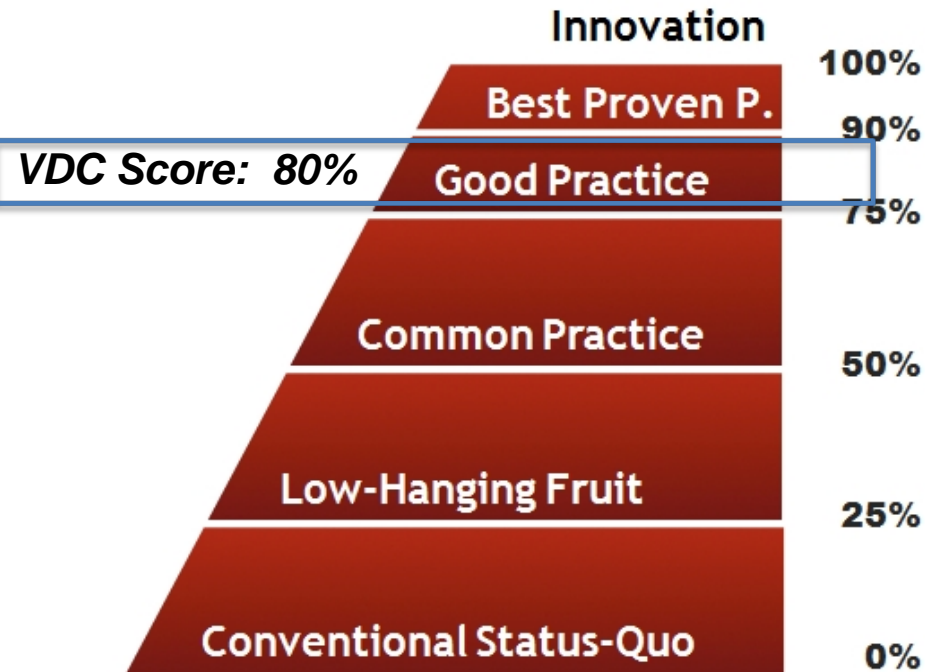
Confidence Level: 30%
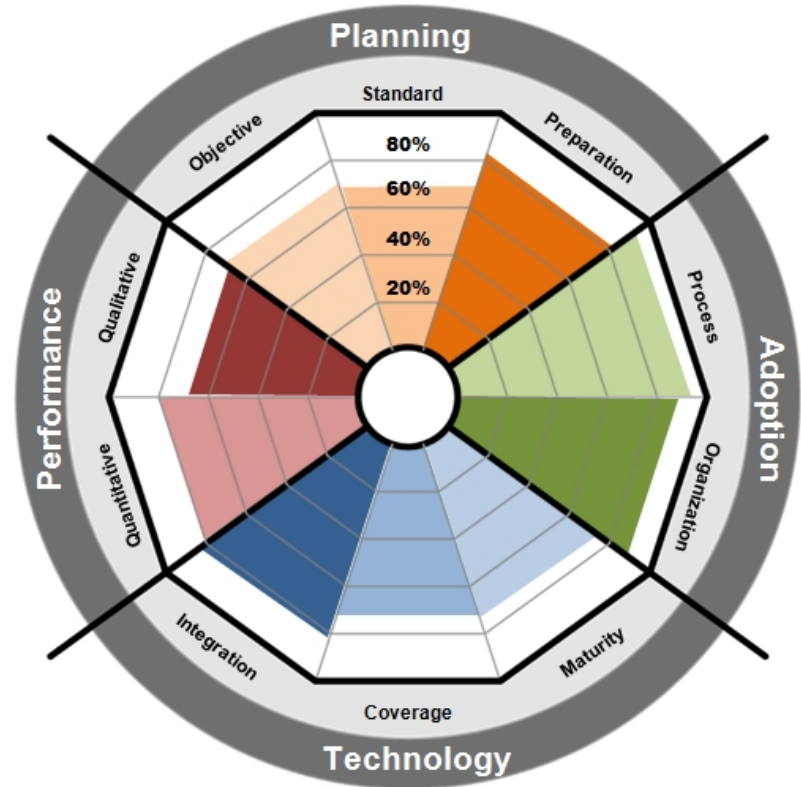
Stanford VDC / BIM Scorecard
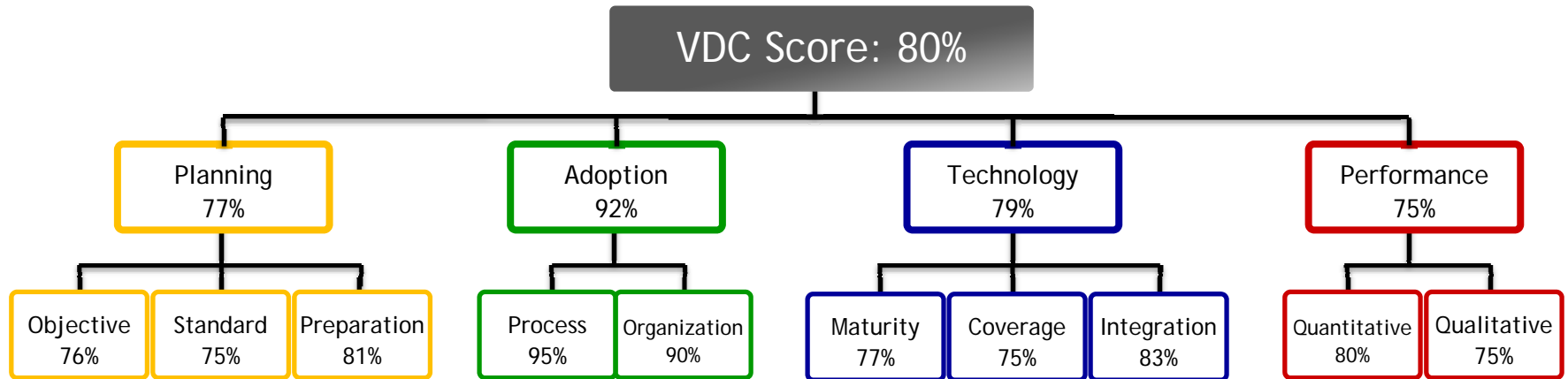
Findings from 22 Cases

	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%
	6	United Therapeutics	DPR	Office	1	54%
AIA BIM Award →	6	McCoy FB Modernization	GSA	Federal Bldg.	1	54%
AIA BIM Award →	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%
	12	Journey to Madagascar	Scenario	Theme Park	1	49%
	14	Lucille Packard Children's Hospital	DPR	Medical	1	46%
AIA BIM Award →	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%

Stanford VDC / BIM Scorecard

Establish more quantitative objectives

Establish guideline for off-site fabrication

Improve cost performance to maximize profit sharing

Use VDC applications for design reviews

Consider VDC for O&M phase

Planning

Standard

Objective

Preparation

60%

40%

20%

Qualitative

Process

Performance

Adoption

Quantitative

Organization

Integration

Maturity

Coverage

Technology

Overall Score: 80%

Confidence Level: 30%

Legend: **R**

Recommendation

Final Concept BIM

Design-Intent BIM

Construction BIM

As-Built/Record BIM

Equipment Information, Type, Warranty; Fabrication Model

IFC + NavisWorks + COBIE + Native (tekla / cadduct / quickpen)

BIM-FM during Operations

- **Inventory**
  - Equipment/component
  - Spatial location (vs. room #)
  - Specifications (vs. in a book)
  - Integration with CMMS
- **Maintenance and Repair Preparation**
  - Location of equipment / components
  - Parts breakdown (like in a repair manual)
  - System schematics (feeds, disconnects, control devices)
  - Parts and special tools
- **Extended and Continuous Commissioning**

Maintenance and Repair Preparation

ARGON   COMPRESSED AIR   NITROGEN   ELECTRICAL
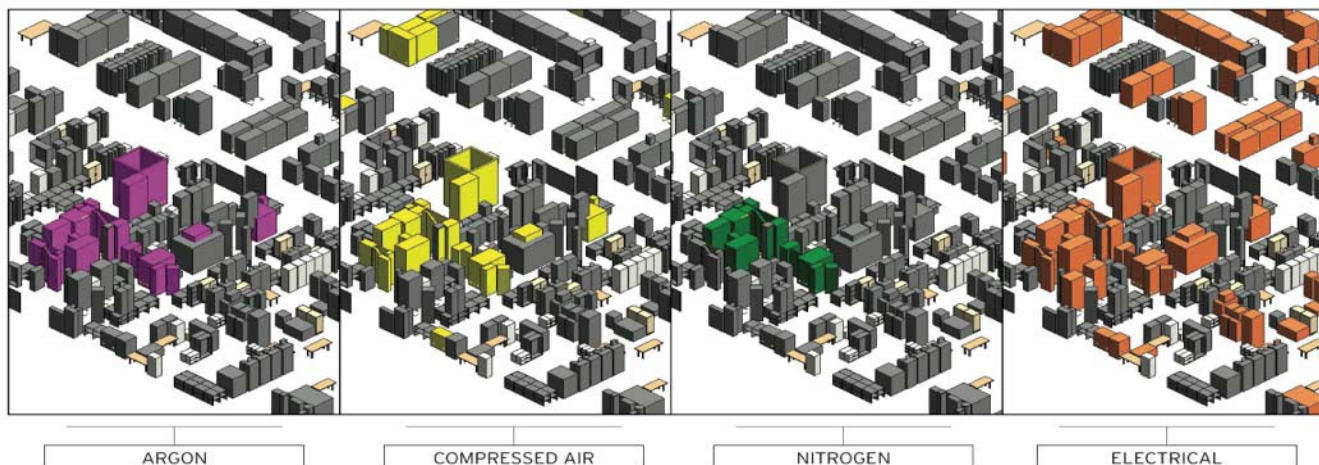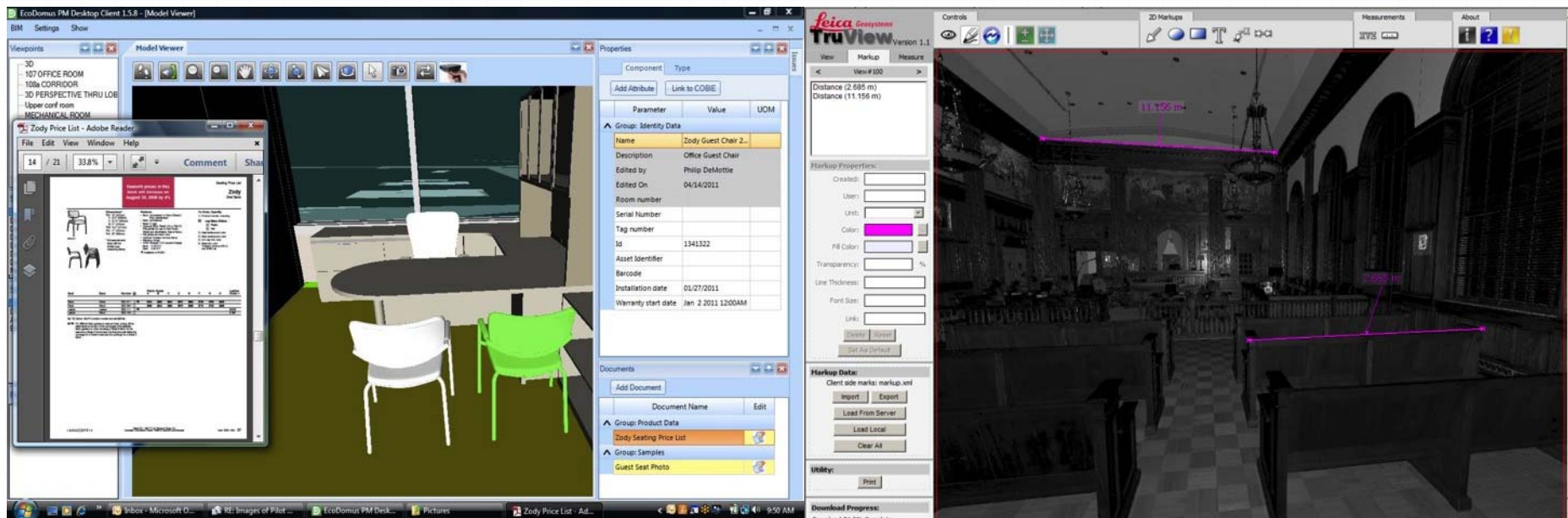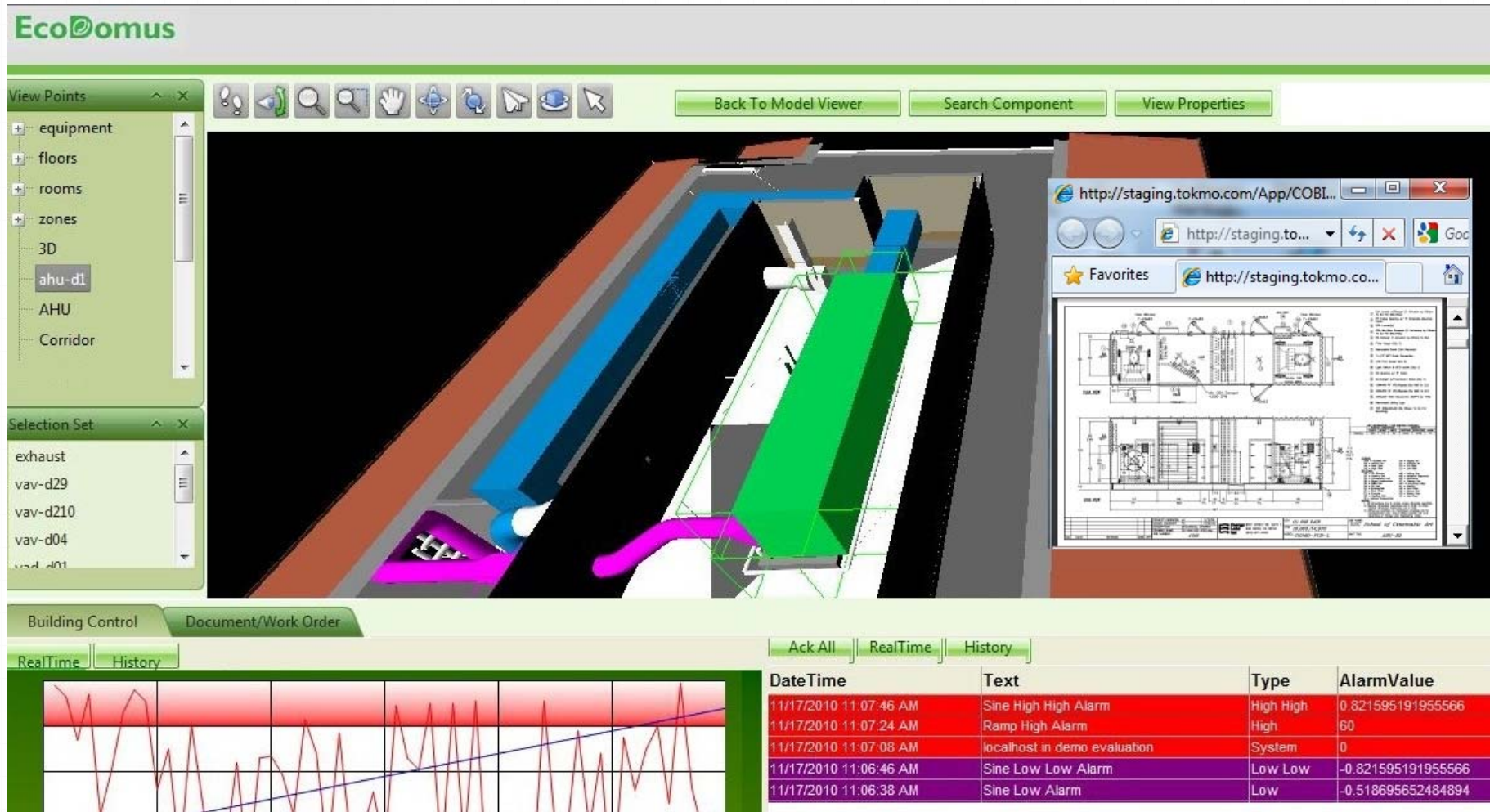
Connecting BIM and CMMS

Other FM Uses

- **Visualize Special Inventories**
  - Hazardous Locations
  - HAZMAT
- **Flexible Office Space Initiative**
  - Employee assignments
  - Familiarizations (exits, restrooms, etc.)
  - Janitorial scheduling
- **Working with tenant customers**
  - Space visualization
  - Tenant communications
- **Integration with GIS**

GSA BIM Guide Series 08: BIM and Facility Management

Section 1: BIM and Facility Management – Overall vision and objectives for using BIM during facility management.

Section 2: Implementation Guidance – Implementation guidance to GSA associates and consultants.

Section 3: Technology Assessment – Technology requirements for creating and using BIMs for facility management.

Section 4: Modeling Requirements –BIM object and attribute requirements for use during facility management.

Section 5: Pilot Projects – Description of GSA Pilot Projects for BIM and FM

GSA's 3D 4D BIM Program Lessons Learned

Questions & Discussion
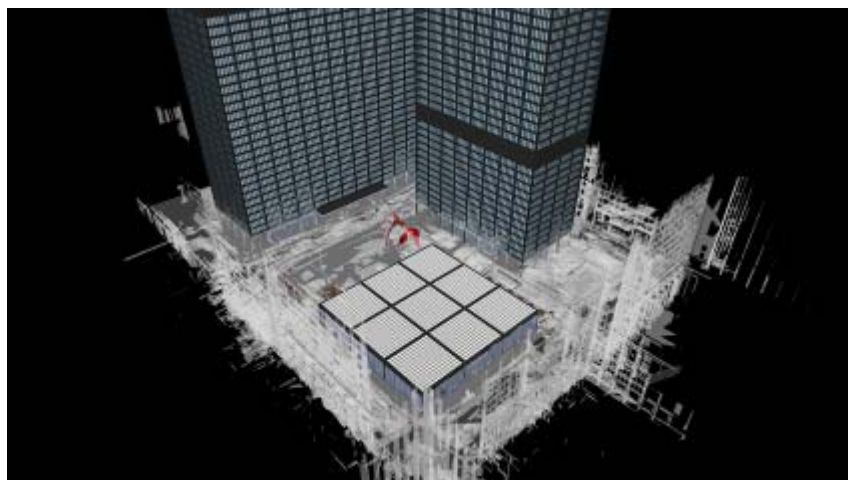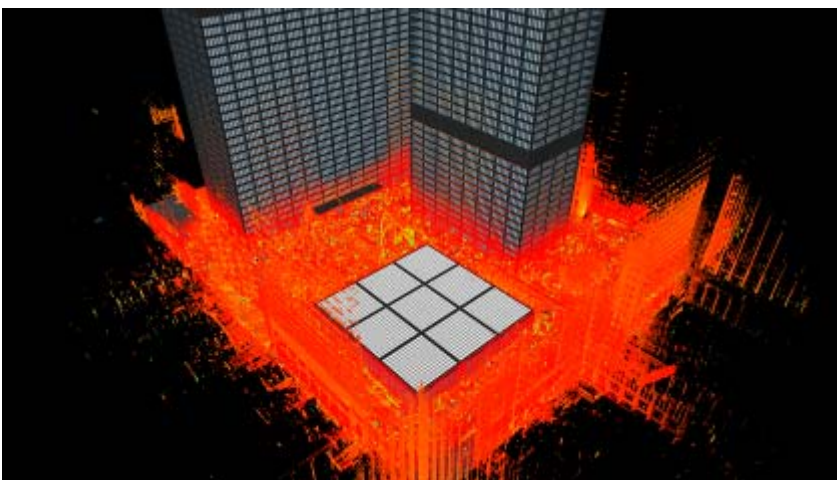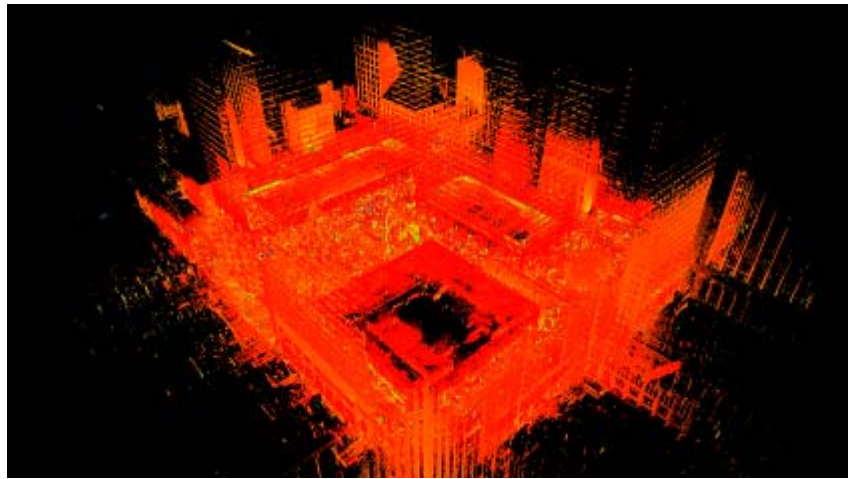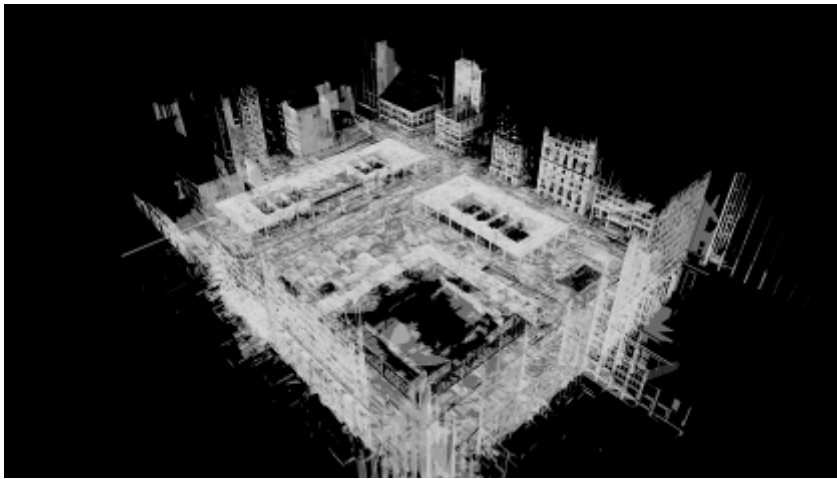
CFC / Region 5 – GSA BIM Deployment Process

- BIM Forum Finalist Presentation (Excerpts): Feb 11, 2011
- AIA TAP Process Innovation Category: Citation Award, May 11, 2011

- Chicago Federal Center > R5 > BIM Champions Process

- BIM Standards/Wiki Site Overview
    - SOW/BEP/Templates/LOD modules

- Embedded Data Standards
    - Property Fields/COBie

- BIM Standards Wiki Site Navigation

GSA   GHAFARI

Region 5 BIM Issues

- ARRA Guidelines
- 10 BIM Models done by 10 D&C Teams
- 10 Different ways and methods
- Inconsistency on All Deliverables
- Lack of BIM Standards

Region 5 BIM Initiatives

- Establish BIM Standards In Addition to GSA BIM Series
- Utilize the National IDIQ BIM Contract

GSA GHAFARI
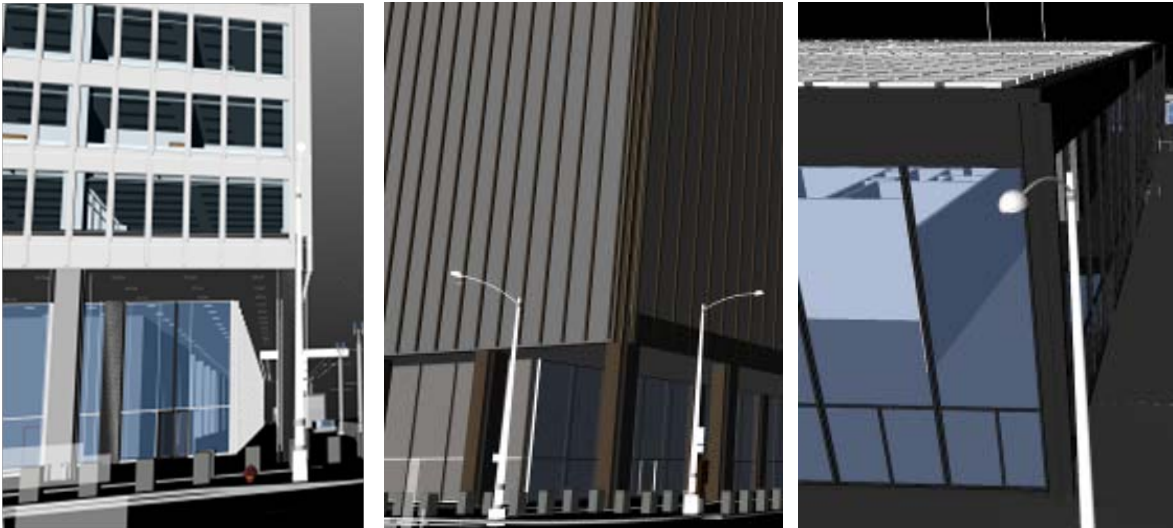
a. File Names

b. Embedded Intelligence

c. Methods
(i.e. One entity with multi-elements)

d. Level of Details
(i.e. mechanical element)

e. Naming Convention
(i.e. room, equipment, building component, abbreviation, etc)

f. Families, Colors, etc
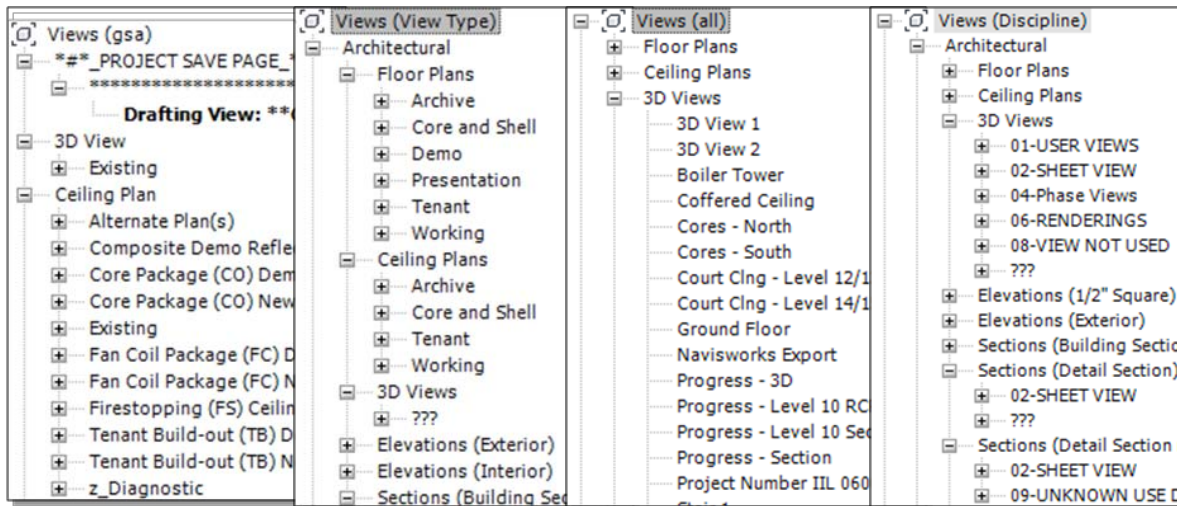
CFC BIM Standards Process - IPD

Step 1

- **Objectives**
  - **What** Benefits?
  - Cost
  - Time

- **Stakeholders**
  - **Who** Benefits?
  - D&C Team
  - FM Team
  - Asset Team

Step 2

- **Requirements**
  - Designers
  - Constructors
  - Facility Managers
  - Asset Managers

- **Communication Tools**
  - SOW
  - LOD
  - BEP
  - Template

Step 3

- **Process**
  - Workshops
  - Peer Reviews

- **Partnering**
  - D&C Team
  - FM Team
  - Asset Team

- **Collaboration**
  - Other GSA Regions

GSA   GHAFARI
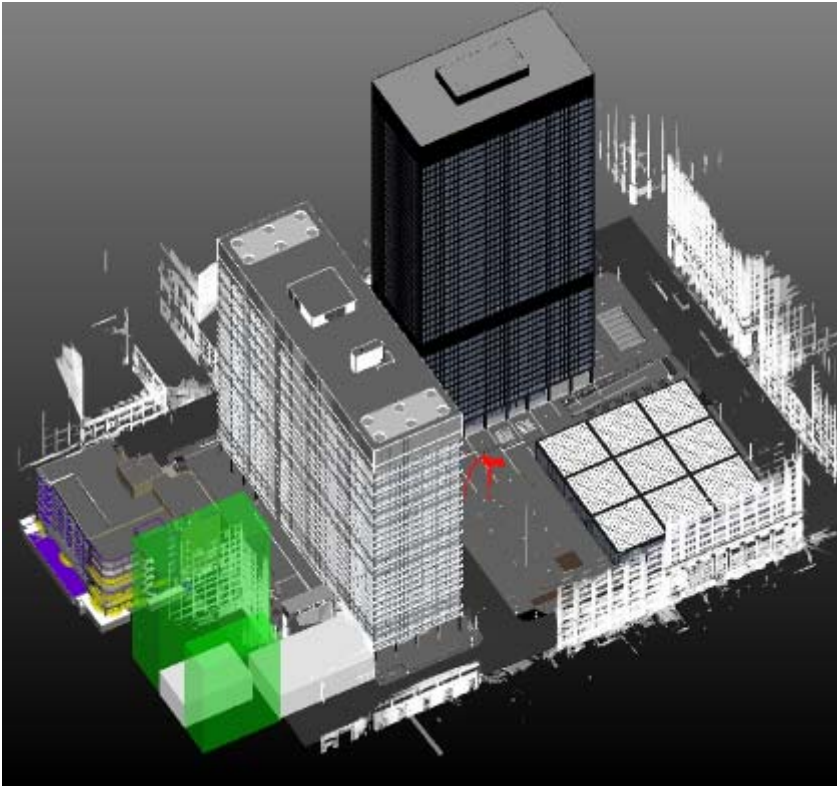
Workshops: Nov. '09, May '10, Sep. '10
Outreach PM/FM: Apr. '10, D&C: Aug. '10

- Identify Top 10 Improvements

- Rank by Cost / Benefit

- Outline Process (for development)
  - Why Selected
  - Cost/Benefit
  - Standards Protocol
  - Peer Review

- Outline Product (deliverable)
  - e.g., template

- Post to CFC BIM http or PW site

- CFC Design Teams (next meeting)

GSA   GHAFARI

BIM Standards Strategy
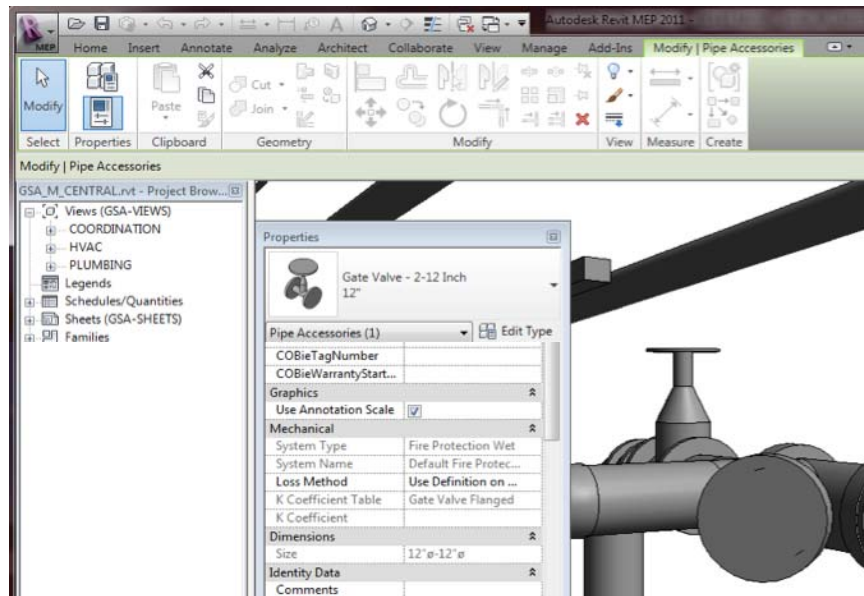
- Prescription vs. Performance Balance

- Process: **BIM Execution Plan**

- **BIM Add vs. BIM Enable**

- Platform Balance (vs Neutrality) Interoperability

- How share **Best Practices**

- **Templates** Baseline with Embedded Standards

GSA BIM Champions Workshop July 2010
GSA BIM Champions Workshop Nov. 2010

GSA GHAFARI

2. Scope of Work

Defines project BASIC and
now shows responsibilities
BIM hand-off and better pri
expectations are synchron

SOW Master ⤢ Edit for pro

SOW Options ⤢ - Optional

New for 2011: BEP Requir

Other Resources

User Guide

Tutorials

References

3. BIM Execution Plan

The BEP fine tunes the SOW's B
required of the AE & GC. It define
improve project workflows, minimi
the design to construction handof

BEPs require periodic, team orier
model coordination. The BEP con
supports a BIM enabled approach

BEP by AE ⤢ Copy; edit; submit
award

BEP by GC Work In Progress

Other Resources

User Guide - AE

User Guide - GC

Tutorials

References

4. A/S/M/E Templates

CFC projects require Revit BIM design files. Templates for all
disciplines embed select CFC Standards including min. IFC and
COBie compliance.

Revit Templates include User Guides, Audio/Visual Tutorials:

Architectural with SDM (Spatial Data Management)

Structural

Mechanical

Electrical

Other Resources

User Guide

Tutorials

References

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GSA BIM Implementation *Process*

- Navigational guidance on HOW to BIM Enable
- Applicable to GSA PMs & supply chain partners
- Modular expansion & sharing of best practices
- Wiki edits by GSA BIM Champions & BIM IDIQs

Model Checker	Record Model	As-Built Model	FM Checker
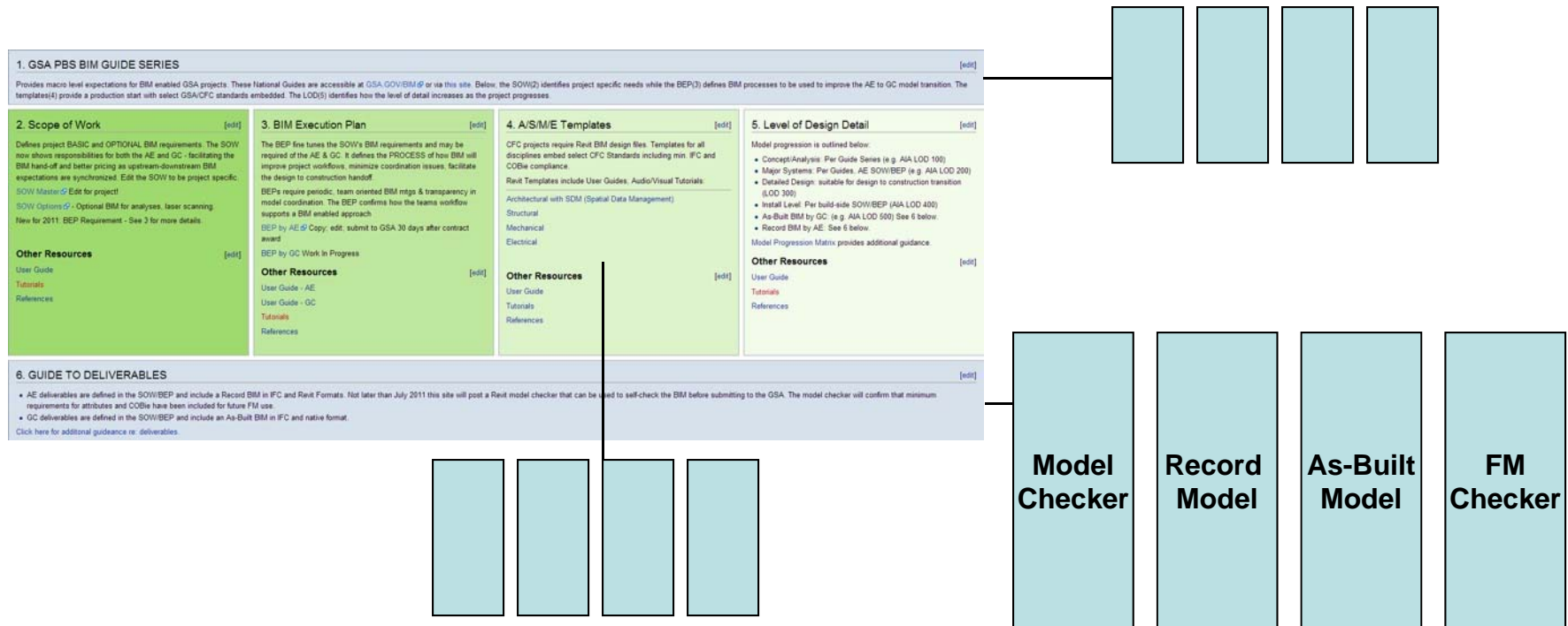
Everything is Related – Embedded Data Standards

- GSA BIM Standards – Provides understanding of required data

- SOW – Defines what data is needed

- BEP – Generally defines who will provide data and when

- A/S/M/E/P TEMPLATES – Environment (medium) to provide the data

- LOD – Defines the level of data entry per phase

- GUIDE TO DELVERABLES – Defines how the data is provided to the GSA

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Templates – Embedded Data Standards

- By using the Templates, you are to standard

  - Property fields have already been generated to control the type of information that is allowed.

  - All required fields already exist within the templates

  - Property fields can be transported to an existing project if needed.

- Family Templates – Content creation to standard

  - If additional content is needed for the project, family templates have been created containing the fields of information to be filled out by contractor or designer.

  - Property fields can be transported to existing Families

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Data Types – SDM Calculations

- Uses Area tools within Revit
- Uses Element information
- Available in all GSA Region 5 Revit Templates

PBS SPACE SCHEDULE

Space Type Description	PBS Space Category Code	PBS Space Category Description	CBR Number	Area	Required Area	Area Difference
Auditorium	12	Under Construction	CBR1234	160 SF	90 SF	-70 SF
Bridge	02	Building Common	CBR1234	160 SF	165 SF	5 SF
Cafeteria	05	Committed Under Alteration	CBR1234	103 SF	100 SF	-3 SF
Circulation Vertical	07	Facility Joint Use	CBR1234	121 SF	150 SF	29 SF
Laboratory	10	Unmarketable	CBR1234	96 SF	350 SF	254 SF
				641 SF	855 SF	214 SF
				641 SF	855 SF	214 SF

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Data Types – Elements

- CoBie data available in Revit Templates and in Revit Family Templates

- Data is passed to Navisworks and IFC format, when model is exported

- Majority is instance based, some are type based.

- Schedule information

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Data Types – System Information

Dr. 2										
8	PVC PIPE 8: Schedule 40 PVC		10		8' - 3"	14' - 1"	5' - 10"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K / B.K
15	PVC PIPE 15: Schedule 40 PVC	10	11		7' - 11"	7' - 11 1/2"	1' - 10"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K / B.K
R. Pl. Dr. 1										
1	PVC PIPE 1: Schedule 40 PVC		1		8' - 5 1/2"	14' - 3 1/2"	5' - 10"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	D.K / C.K
18	PVC PIPE 18: Schedule 40 PVC	1	4		8' - 2"	8' - 2 1/2"	3' - 3 1/2"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K
33	PVC PIPE 33: Schedule 40 PVC	4	6,5		8' - 1"	8' - 2"	8' - 3"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K / B.K
R. Pl. Dr. 2										
2	PVC PIPE 2: Schedule 40 PVC		2		8' - 4 1/2"	14' - 2 1/2"	5' - 10"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	D.K / C.K
36	PVC PIPE 36: Schedule 40 PVC	2	5		8' - 1"	8' - 1 1/2"	3' - 3 1/2"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K
R. Pl. Dr. 3										
3	PVC PIPE 5: Schedule 40 PVC		3		8' - 5"	14' - 3"	5' - 10"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	D.K / C.K
10	PVC PIPE 10: Schedule 40 PVC	3	7		8' - 1 1/2"	8' - 2"	3' - 3 1/2"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K
11	PVC PIPE 11: Schedule 40 PVC	7	9,8		8' - 0 1/2"	8' - 1"	4' - 5 1/2"	LPO LEVEL	CJE-PVC-UG-ST	15.K / 14.K	C.K / B.K

Constraints	
Elevation	0' 0"
Moves With Nearby Elements	☐
Text	
Drain System	Dr. 2
PipeFittingEndMark	10
PipeFittingStartMark	
Hor. Col. Location	15.K / 14.K
Ver. Col. Location	C.K / B.K
Electrical - Loads	
Panel	
Circuit Number	
Mechanical	
System Type	
System Name	
Dimensions	
BottomOFPipe	8' 3 27/128"
TopOFPipe	14' 1 27/128"
Identity Data	
Comments	
Mark	8
Length/Angle	5' 10"
End Sizes	
Section Area	LPO LEVEL
Pipe Service	CJE-PVC-UG-ST
Elevation	B=34'-11"
Phasing	
Phase Created	New Construction
Phase Demolished	None
IFC Parameters	
IfcGUID	8$DjTQiOR_000000000G8i

Section: Section 2 – CJ ERICKSON PLUMBING_05.rvt

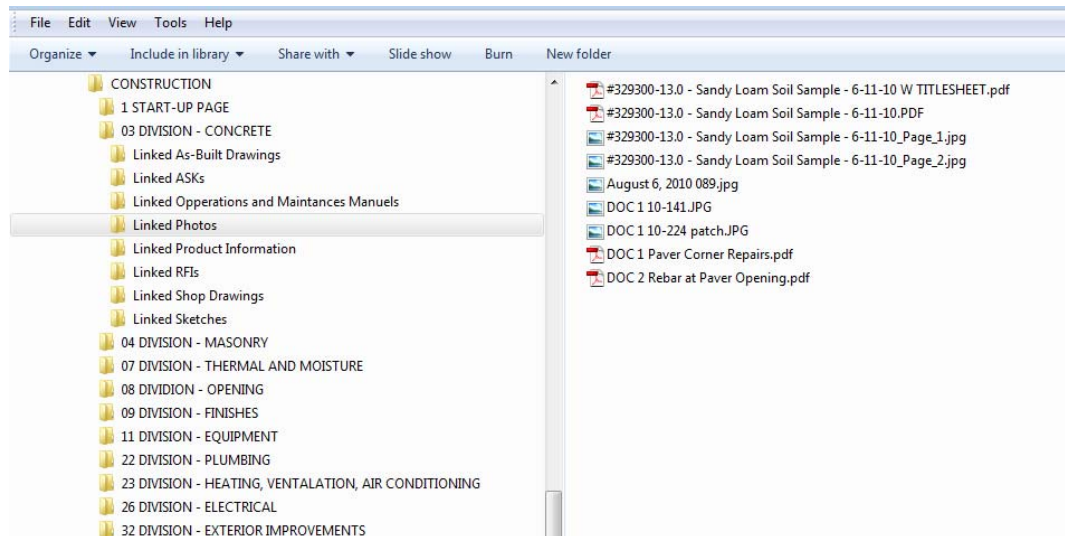1" = 20'-0"

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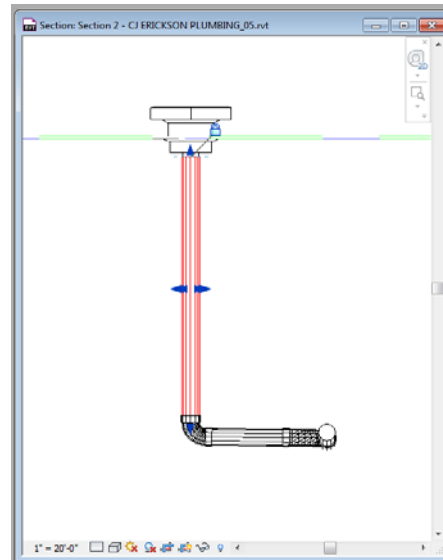
Data Types – Linked Data Any File Format

Data Organization

File/Folder Structure
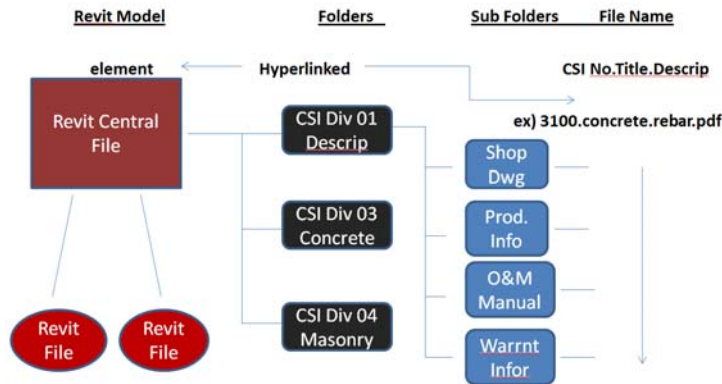
- Organized manner of reference files

- CSI divisions used

- Sub folders are defined and flexible

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R5 PROJECTS USING BIM STANDARDS

1. Renovation project, 10 W. Jackson, Chicago, IL
2. Whipple Federal Building, Ft. Snelling Minnesota
3. DEA Renovation, JCK Federal Building, Chicago IL
4. CFC Plaza Renovation, CFC, Chicago IL
5. ARRA Renovation, Bean Center, Indianapolis, IN
6. ARRA Renovation, Minton Capehart FB, Indianapolis, IN

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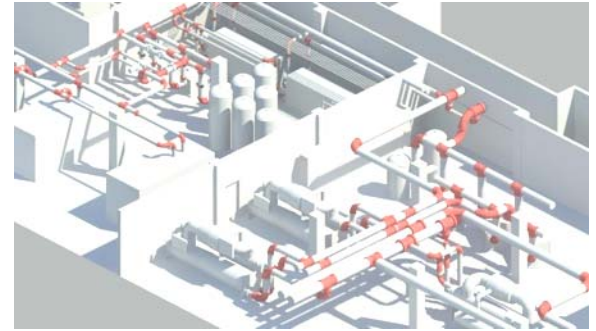
GSA BIM Standards Wiki Site Navigation
(Time Permitting)

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A Case Study of 2011 AIA BIM Awards
Chicago Federal Center

Questions & Discussion

Technology in
Architectural Practice
http://www.aia.org/TAP

twitter **#AIATAP**   Email: tap@aia.org