



BIM for facilities management

Capturing operational efficiencies and cost savings

NOW

Agenda

Item 1

Who Is EcoDomus

Item 2

The Future of Facility Management

Item 3

Lack of Information leads to a lifetime of inefficiency

Item 4

Real Life Case studies

Item 5

Revised Data Collection and Usage/COBie

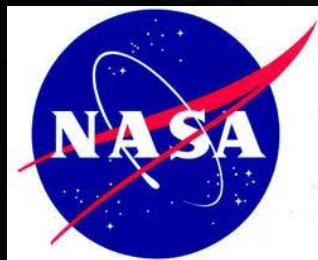
Item 6

Final Thoughts



About EcoDomus

- Software and consulting firm with headquarters in San Francisco, with regional offices in Washington DC, Chicago and New York
- Focus on BIM and Lean for Building Lifecycle Management
- Some of our clients:



Excerpts from



THE UNIVERSITY of
NEW MEXICO

BIM SURVEY The Future for Facilities Management



Francisco Forns-Samso, graduate student in the Construction Program at UNM in collaboration with BIM Workx conducted a research study in the area of Building Information modeling and Facilities management. Some of the preliminary results of that study follow

The Future for Facilities Management



- Over 50% of the respondents manage campus type facilities in excess of 1 M gsf, and 35% over 5 M gsf
- Respondents were a good cross section of Education, Office, Government, Laboratory
- The majority handled over 30,000 work orders per year



The Future for Facilities Management



Respondents were asked to view a video about Building Information Modeling (BIM)

After viewing they were asked how often would they use BIM if they could access information as shown in the video?

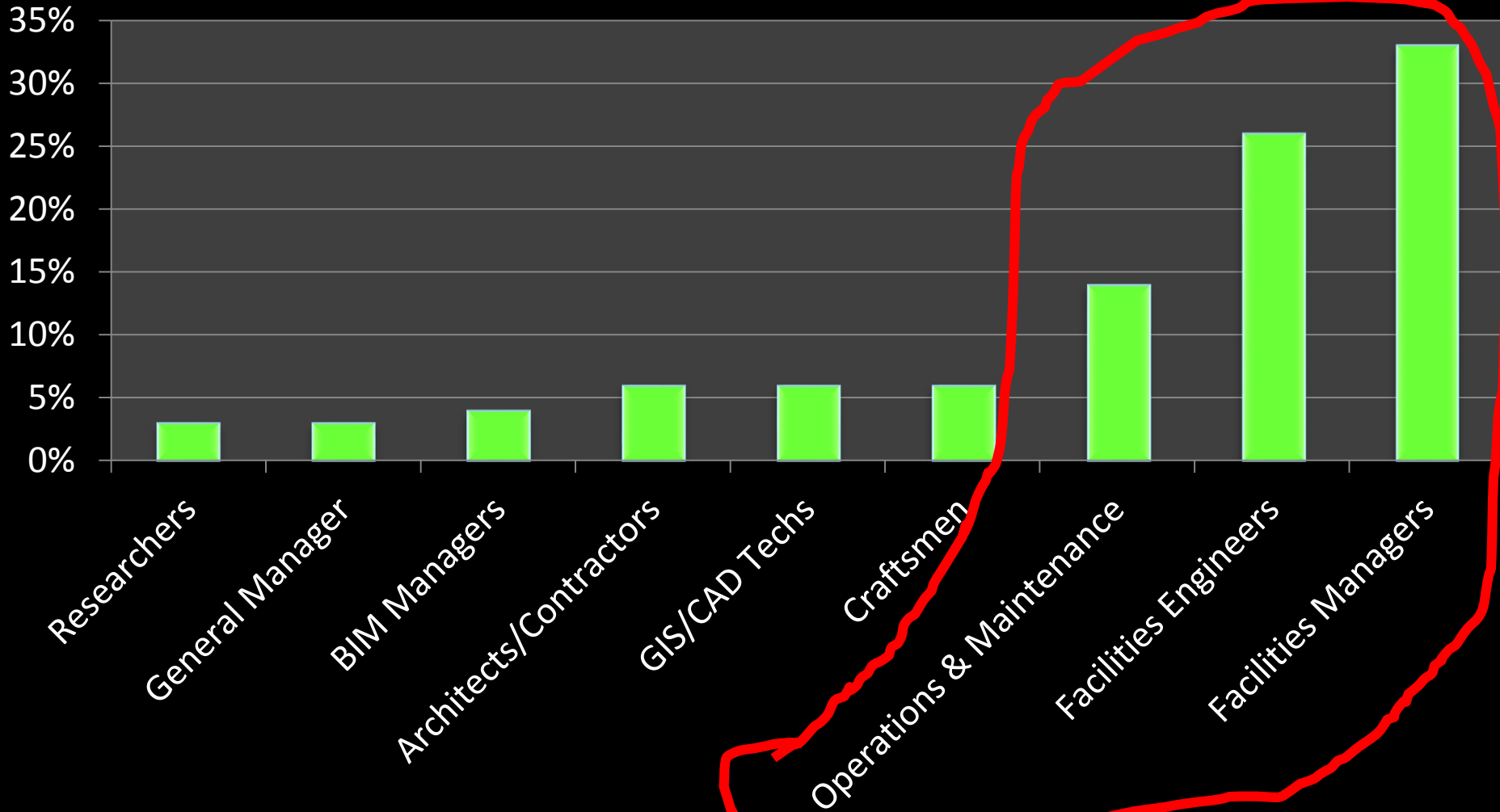
- 63% said they would use it often or all the time
- 39% could see a possible savings between 20-40% per work order



The Future for Facilities Management

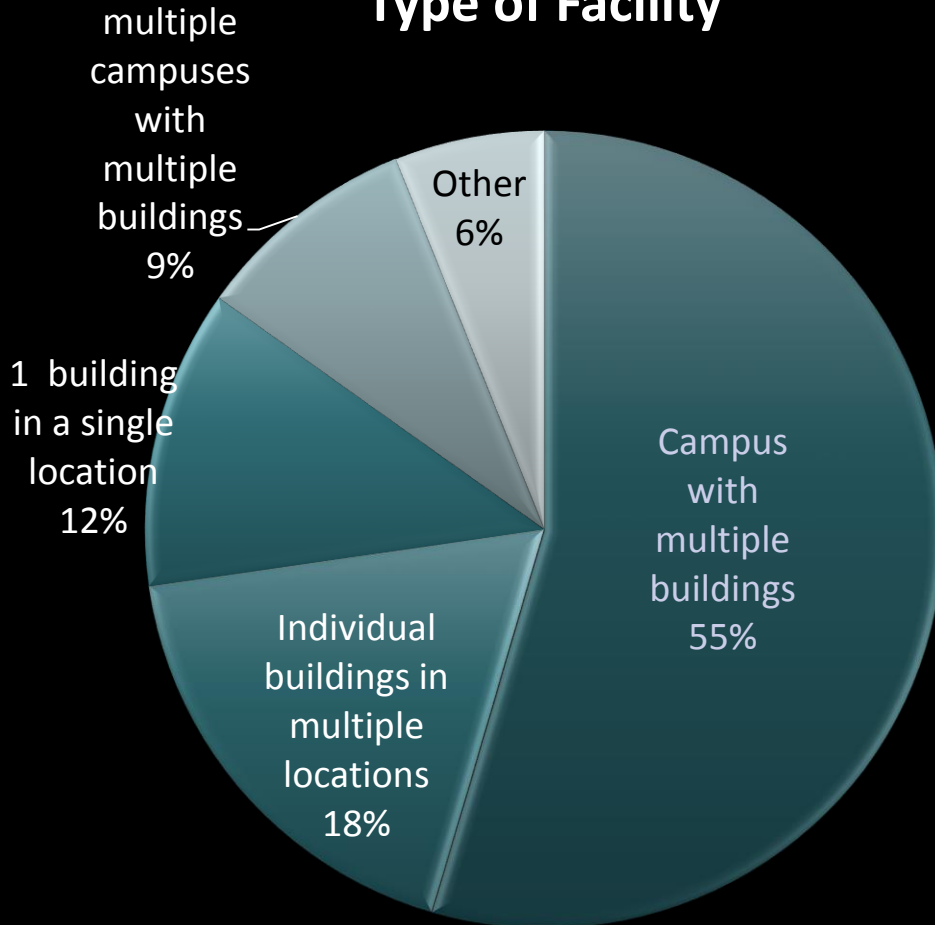


Owner

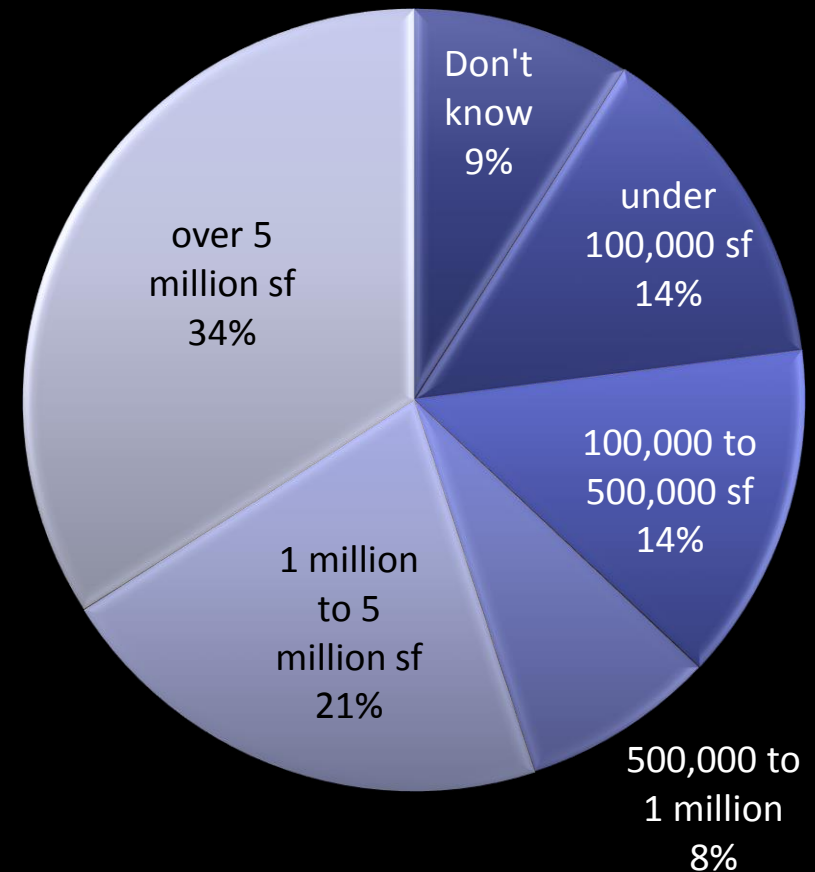


The Future for Facilities Management

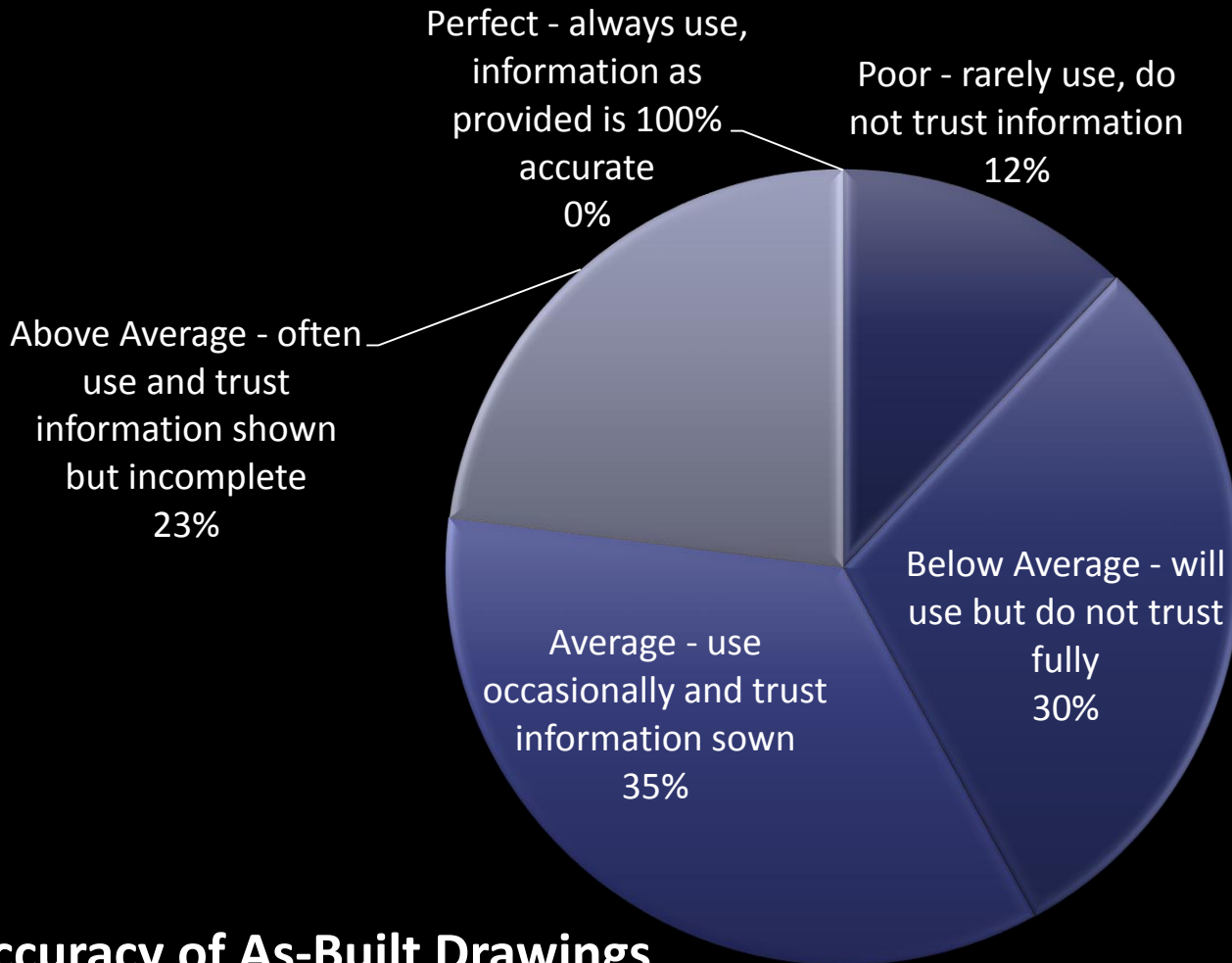
Type of Facility



Size of Facility

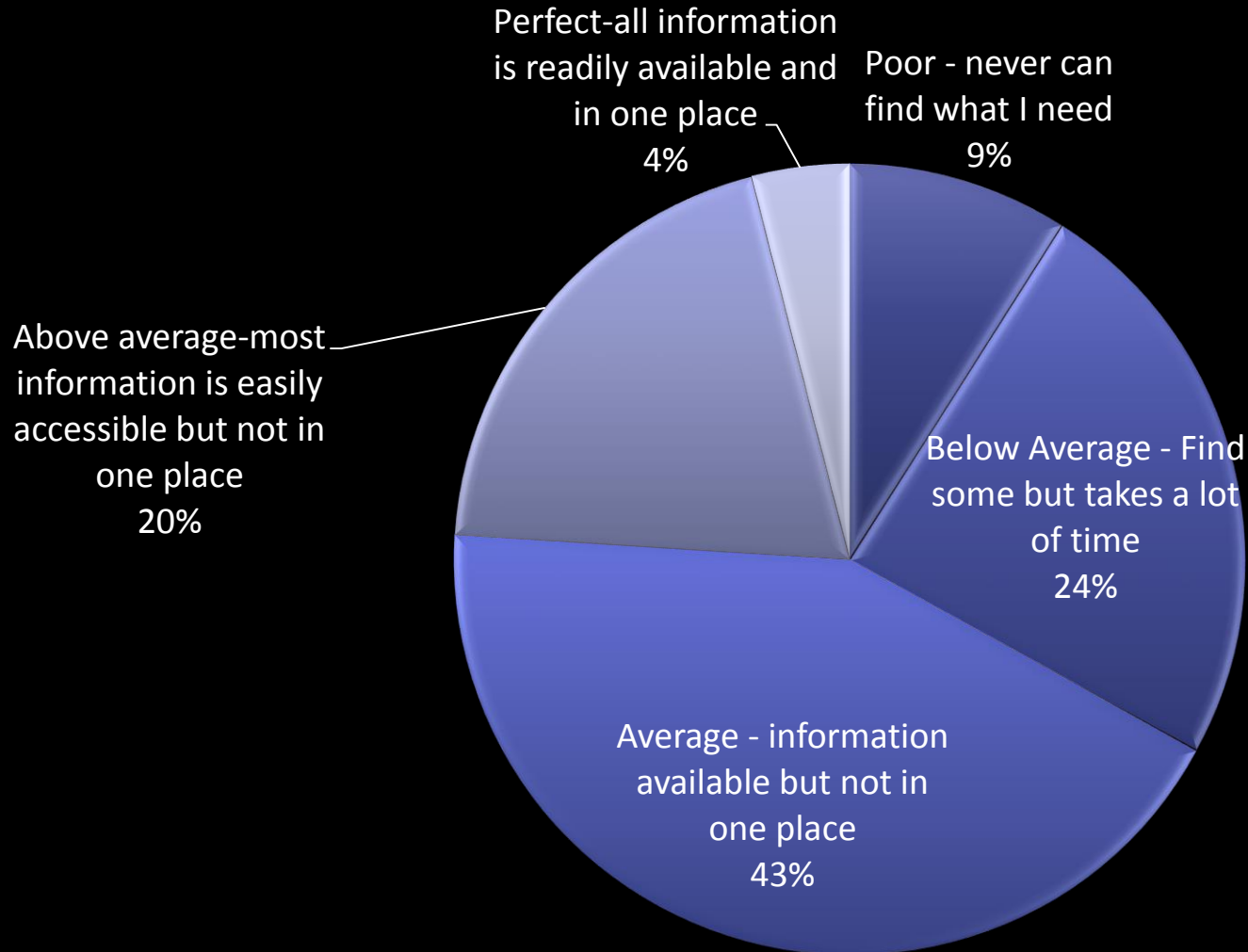


The Future for Facilities Management



Accuracy of As-Built Drawings

The Future for Facilities Management



Current accessibility to O&M information

The Future for Facilities Management

Birgitta Foster (BSME, MBA) of Sandia National Labs conducted a “straw man” survey of her operation

- Studied 24,000 work orders out of over 32,000 annually
- Average labor per work order 5 hours
- Time spent by technician researching 2 hrs
- Finding and reviewing O&M manuals
- Finding and reviewing other documents
- Finding work object within the building
- Locating access point to work object
- Does not include locating parts or other material



The Future for Facilities Management

Sandia “straw man” survey - FINDINGS

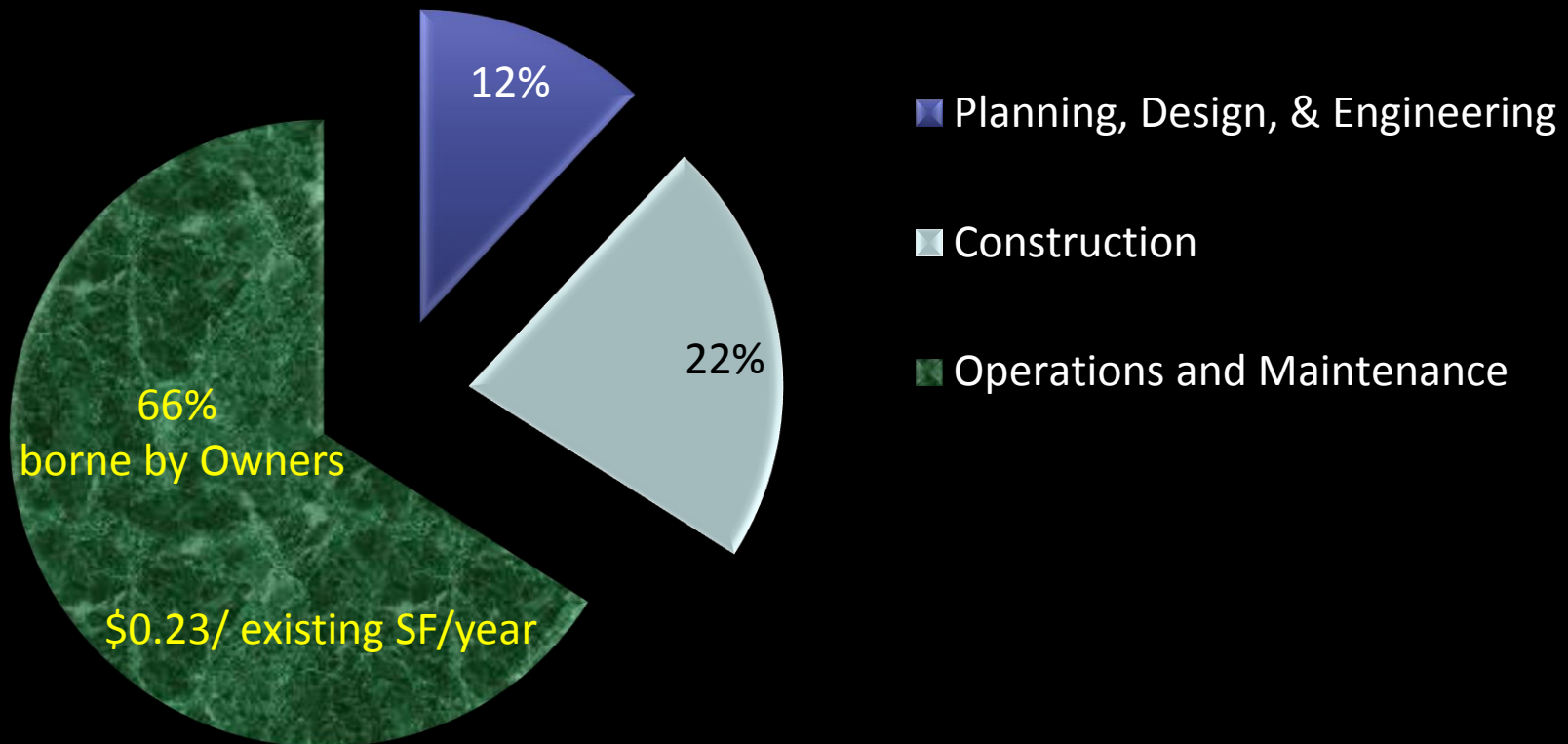
- 40% of the work order is lost labor
- Labor cost is \$50.00
- Sandia completes over 32,000 work orders per year
- If research labor could be reduced 1 hour
 - $32,000 \text{ WO} * 1 \text{ hr} * \$50.00/\text{hr} =$
 $\$1,600,000.00$
- Reducing research to 5 minutes
 - $32,000 \text{ WO} * 1.97 \text{ hr} * \$50.00/\text{hr} =$
 $\$3,066,720.00$



The Future for Facilities Management

National Institute of Standard and Technology

Study GCR 04-867, Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities

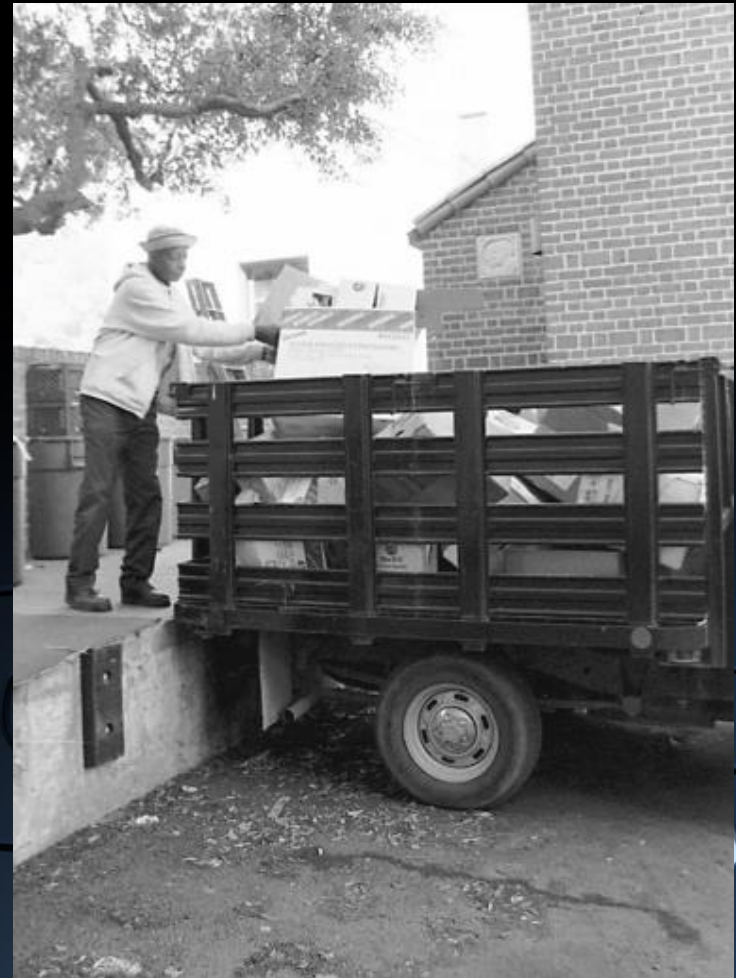


Lack of Information - a lifetime of inefficiencies

At the financial completion of a project the construction manager typically delivers a truck-full of boxes of paper (or CD's containing e-paper) to the facility manager.

It is assumed that this information can assist the Facility Manager to maintain, operate, and track assets within the building.

More often than not this information is delivered months or years after the building has been occupied



US Army Corps of Engineers, Engineering Research and Development Center (c) 2009

Lack of Information - a lifetime of inefficiencies

When it is delivered, it is ultimately placed in a storage room (or if it's electronic in a drawer) where it is never used.

Typical close out documents are:

- As Built drawings (design data remains, or partially replaced)

- Air Balance reports

- Commissioning reports

- O & M Manuals



Lack of Information - a lifetime of inefficiencies

By one estimate a 50,000 sq.ft. office building would require over 2000 man hours (that is 1 man 1 year) to enter component data into a CMMS application.

This assumes that all data was properly collected and formatted from the designers, contractors, and commissioning agents.

The cost of data entry for the owner is over \$80,000.

That is on top of what the designer, contractor, and commissioning agent spent to collect the data in the first place.



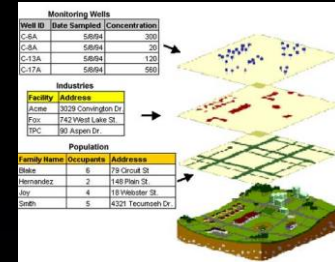
Solution

Integrate BIM with FM/O&M Applications

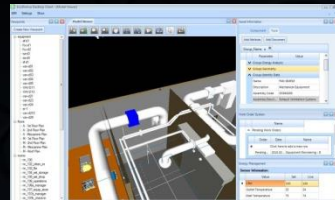


BIM Model (Revit, other)

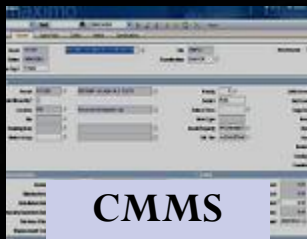
Compare “As Designed” with “As Operated” and “As Maintained” for intelligent decision making



GIS Apps (ESRI, Google Earth)

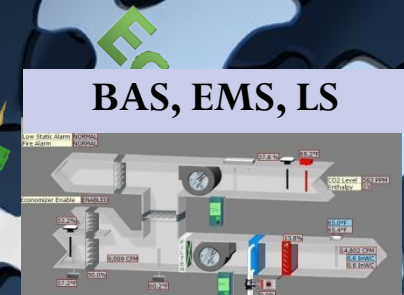


Lifecycle Building Support Provider



CMMS

Maximo, TMA, AssetWorks, FAMIS, other FM software



BAS, EMS, LS

Honeywell, Siemens, Johnson Controls, automated systems

Real Life Case Studies

1. Maintenance Work Order Management
2. Emergency Service Request / Disaster Recovery
3. Energy Systems Analysis / “Greening” of Facilities
4. Visual Work Orders
5. Leasing Presentations and Analysis
6. Visual Inventorying / Assets Reconciliation
7. Facility Condition Assessment
8. Life Safety Assets Inspections



FM Workflow 1: Maintenance Work Orders

Step 1 – Work Order is received in CMMS. You can review the work order instantly and formulate a plan of action. Click the Link to the O & M Portal to view the equipment that needs servicing.

The screenshot displays the MAXIMO Work Order Tracking interface within a Windows Internet Explorer browser window. The browser address bar shows the URL: `http://localhost:7001/maximo/ut/maximo.jsp?event=loadapp&value=wotrack`. The page title is "MAXIMO - Work Order Tracking".

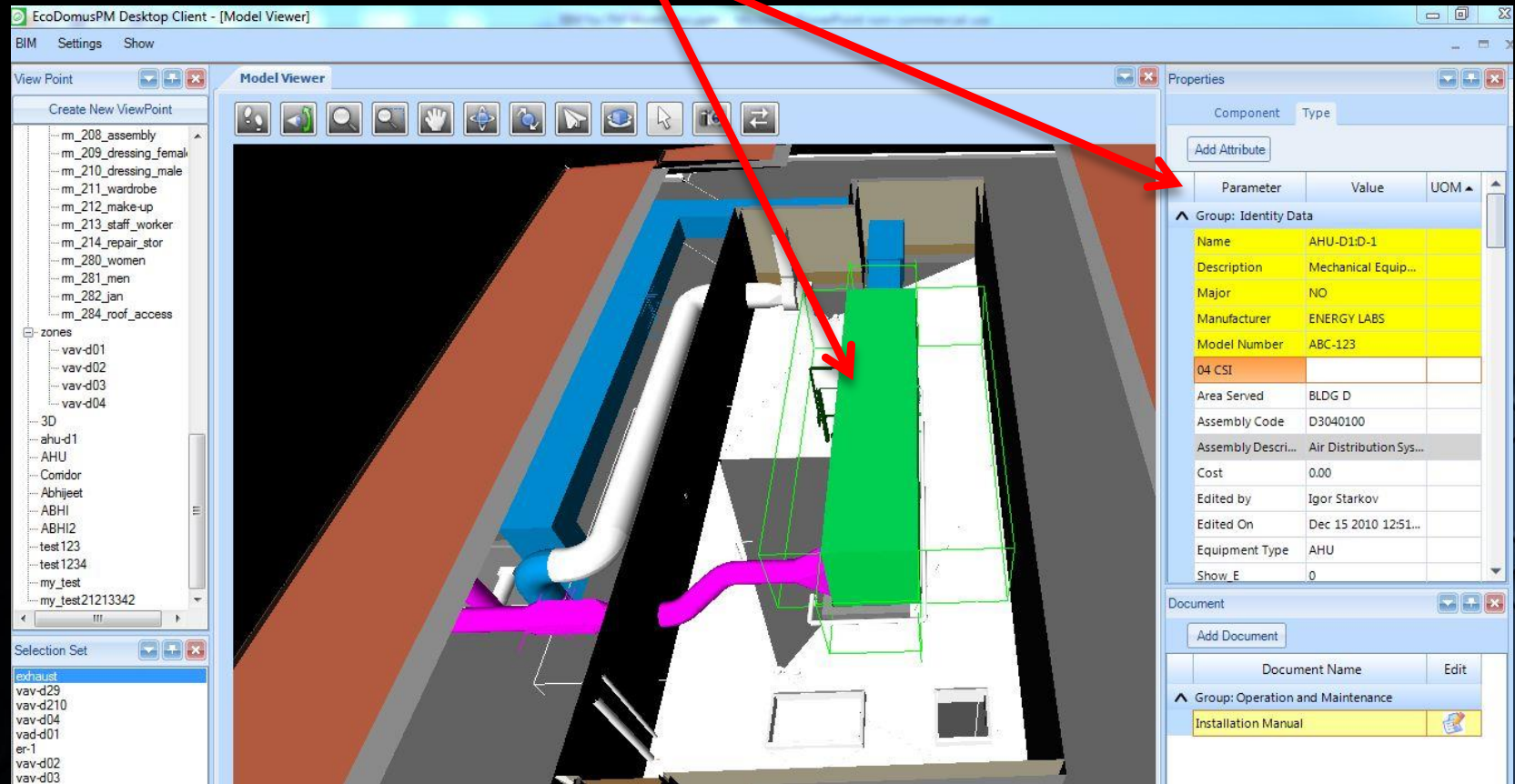
The main content area is divided into several sections:

- Work Order Details:** Includes fields for Work Order (5015), Location (SHIPPING), Asset (12100), Parent WO, Classification, Description, Site (BEDFORD), Class (WORKORDER), Work Type (PM), GL Account (8500-300-??), Failure Class, Problem Code, Attachments, Status (WAPPR), Status Date (12/31/98 4:12 PM), Inherit Status Changes? (checked), Accepts Charges? (checked), and Is Task? (unchecked).
- Job Details:** Includes Job Plan (NS12100), PM, Safety Plan, Contract, Asset Up? (checked), Warranties Exist? (unchecked), SLA Applied? (unchecked), Charge to Store? (unchecked), Asset/Location Priority (3), Priority (3), Priority Justification, and Risk Assessment.
- Scheduling Information:** Includes Target Start (1/1/99 9:00 AM), Actual Start, Target Finish, Actual Finish, Scheduled Start, Duration (1:00), Scheduled Finish, Time Remaining, Originating Record, Originating Record Class, Has Follow-up Work? (unchecked), and Interruptible? (unchecked).
- Responsibility:** Includes Reported By (WINSTON), Reported Date (12/28/98 12:00 AM), On Behalf Of, Phone, Supervisor (BOYD), Crew, Lead, Work Group, Vendor, Owner, Owner Group, Service Group, and Service.

The browser's taskbar at the bottom shows the Start button, several icons, and the system tray with the time 12:35 PM and date 12/28/98.

FM Workflow 1: Maintenance Work Orders

Step 2 – The O & M Portal opens a 3D view of the equipment that should be serviced. Equipment properties are displayed automatically.



FM Workflow 1: Maintenance Work Orders

Step 3 – The equipment's corresponding documents are attached, and can be accessed immediately.

The screenshot displays the EcoDomusPM Desktop Client interface. On the left, a PDF viewer shows the 'Waukesha Cherry-Burrell' manual, specifically the 'Introduction' page. The manual includes a technical drawing of an air handler unit (AHU) with parts labeled A through N. A red arrow points from the PDF viewer to a 3D model of the AHU in the center, which is highlighted in green. Another red arrow points from the 3D model to the 'Properties' panel on the right. The 'Properties' panel shows the component details for 'AHU-D1D-1' and a list of attached documents under the 'Operation and Maintenance' group, including 'Installation Manual'.

Figure 3 - Common Part Identification

Parameter	Value	UOM
Group: Identity Data		
Name	AHU-D1D-1	
Description	Mechanical Equip...	
Major	NO	
Manufacturer	ENERGY LABS	
Model Number	ABC-123	
04 CSI		
Area Served	BLDG D	
Assembly Code	D3040100	
Assembly Descri...	Air Distribution Sys...	
Cost	0.00	
Edited by	Igor Starkov	
Edited On	Dec 15 2010 12:51...	
Equipment Type	AHU	
Show_E	0	

Document Name	Edit
Group: Operation and Maintenance	
Installation Manual	

FM Workflow 2: Emergency Service Request

Given: Major water pipe burst. No time to lose – an immediate response is required. Technicians are looking for the shut off valve.

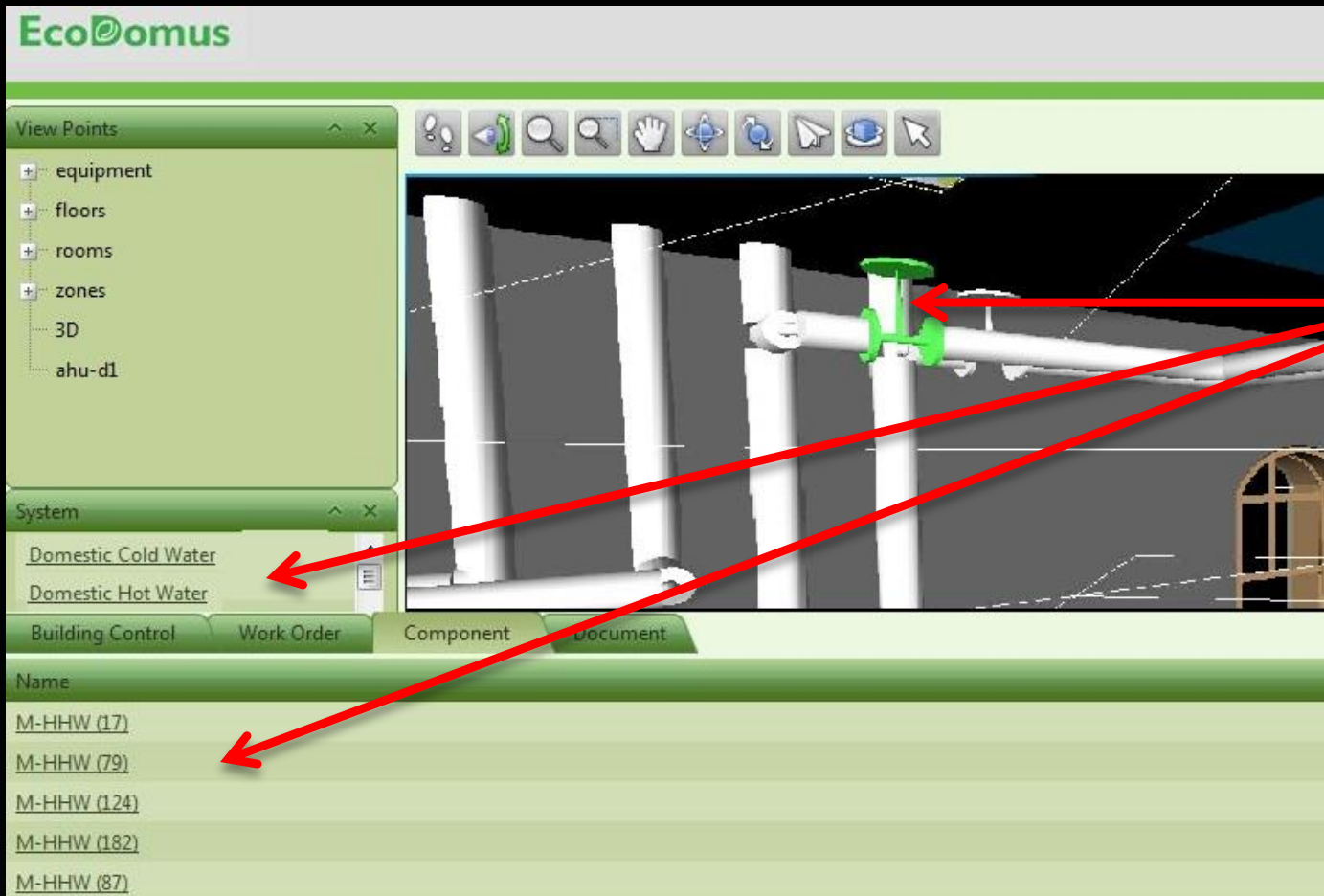
Task: How to mitigate the risk ASAP?

Solution: Use the O & M Portal to find the shut off valve for the hot water system within seconds.



FM Workflow 2: Emergency Service Request

Select the Hot Water System in the list of Systems. Review the components of the system. Select a shut off valve from the list. See where the shut off valve is located within the building.



FM Workflow 3: Energy Systems Analysis

The screenshot displays the EcoDomus Desktop Client interface. On the left, the Viewpoints panel shows a tree structure with categories like equipment, floors, and rooms. The central Model Viewer shows a 3D rendering of a building's interior with a network of white pipes. A blue highlight is placed on a specific pipe. On the right, the Asset Information panel shows a table of parameters for the selected component. Below it, the Work Order System panel shows a table of pending work orders. At the bottom, the Energy Management panel shows a table of sensor information.

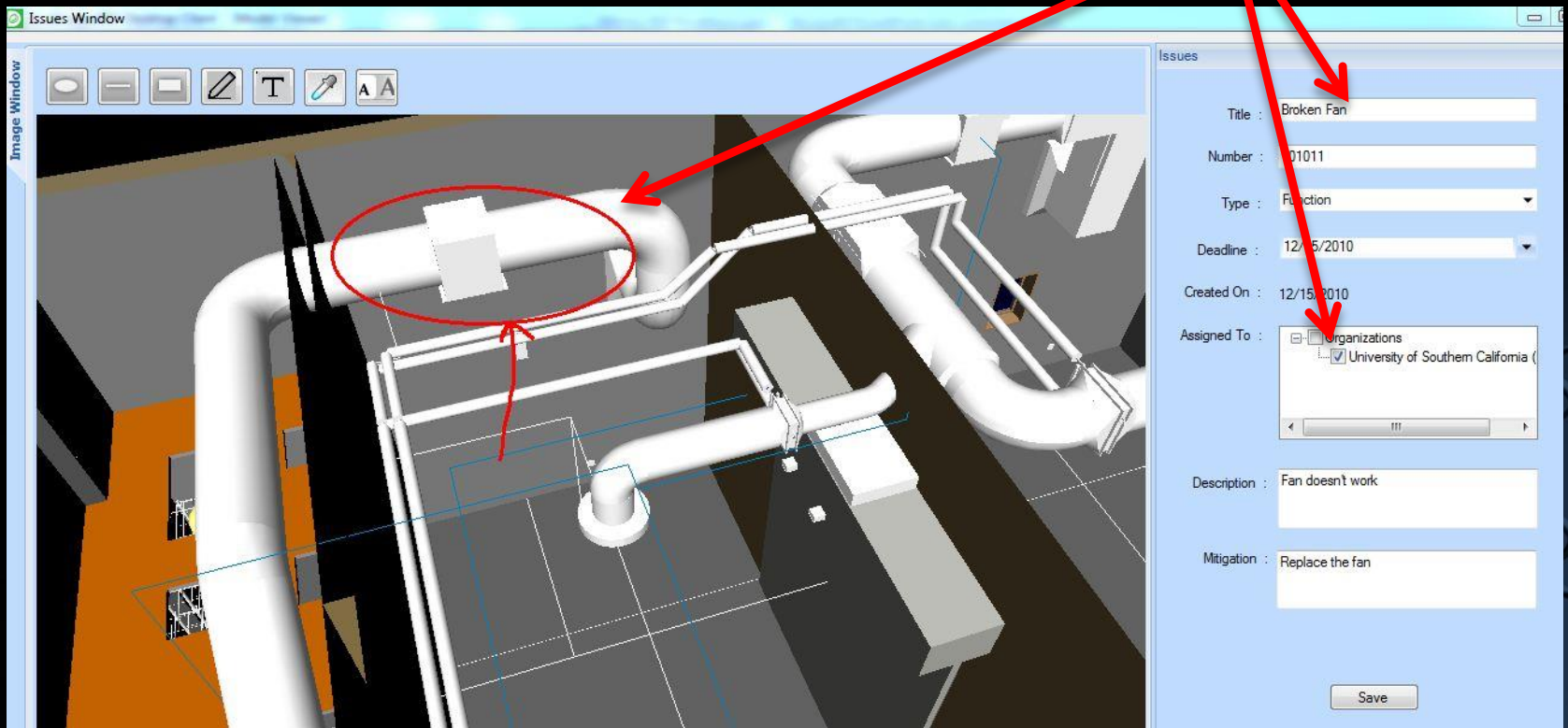
Group_Name	Parameter	Value
Group: Energy Analysis		
Group: Geometry		
Group: Identity Data		
Name	FAN SIMPLE	
Description	Mechanical Equipment	
Assembly Code	D304020	
Assembly Descri...	Exhaust Ventilation Systems	

Order	Date	Name
*		Click here to add a new row
Pending...	2010-02...	Equipment Reordering - II

Value	Set	Live
CFM	130	120
Outlet Temperature	55	54
Inlet Temperature	75	74

FM Workflow 4: Visual Work Orders

Use the Issues function to redline the areas of concern, create a notification that will be emailed to the technician as an image file, and will create a work order in the CMMS.



FM Workflow 5: Leasing Workflow / Space & Assets Review

- Given: Portfolio of properties. Millions of square feet. Hundreds of tenants.
- Task: Present existing properties to future tenants. Explain space properties, furniture and staffing projections. Visual inventory – compare with actual.
- Solution: Virtual facility presentation via FM Portal.



FM Workflow 6: Visual Inventorying

The screenshot displays a BIM software interface with a 3D model of a building interior. A staircase and green pipes are visible. A 'SearchCOBIE' dialog box is open, showing search results for 'door'. The 'Properties' panel on the right shows details for a selected door component, and the 'Document' panel shows a list of door-related submittals.

SearchCOBIE Dialog:

Search: door

Search Assign

Drag a column here to group by this column.

Select	Name	Description
<input checked="" type="checkbox"/>	Door-CUP 01-1000-a	Door Room 1000
<input type="checkbox"/>	Door-CUP 01-1000-c	Room 1000 Door
<input type="checkbox"/>	Door-CUP 01-1001-a	Room 1001 Door
<input type="checkbox"/>	Door-CUP 01-1001-b	Room 1001 Door
<input type="checkbox"/>	Door-CUP 01-1002-a	Room 1002 Door
<input type="checkbox"/>	Door-CUP 01-1002-c	Room 1002 Door
<input type="checkbox"/>	Door-CUP 01-1003-a	Room 1003 Door
<input type="checkbox"/>	Door-CUP 01-1003-b	Room 1003 Door
<input type="checkbox"/>	Door-CUP 01-1005-a	Room 1005 Door
<input type="checkbox"/>	Door-CUP 01-1006-a	Room 1006 Door
<input type="checkbox"/>	Door-CUP 01-1007-b	Room 1007 Door
<input type="checkbox"/>	Door-CUP 01-1002-b	Room 1002 Door
<input type="checkbox"/>	Door-CUP01-1007-a	Room 1007 Door
<input type="checkbox"/>	Door-Hatch-CUP 01-1002-d	Sub vault Door (Hatch) Room 1002
<input type="checkbox"/>	Door-Hatch-CUP 01-2000-a	Roof Door (Hatch) Room 2000
<input type="checkbox"/>	Sec-Card-CUP 01-1000-A	Card Reader Door 1000 A

Properties Panel:

Parameter	Value	UOM
Group: Identity Data		
Name	Door-CUP 01-100...	
Description	Room 1000 Door	
Serial Number	X78356	
Id	264019	

Document Panel:

Document Name	Edit
Group: Closeout Submittals	
08 71 13-003 Automatic Operators O&...	[Icon]
08 14 16-001 Flush Wood Doors Substi...	[Icon]
08 11 13-001 Hollow Metal Doors - CUP	[Icon]
08 16 15-002 Polymer Doors & Frames...	[Icon]
08 33 23-001 Overhead Door PD and S...	[Icon]
08 14 16-002 Flush Wood Door Sample	[Icon]
08 14 19-001 Polymer Clad Wood Doors	[Icon]
08 42 29-001 Automatic Entrances	[Icon]
08 71 00-002 Door Hardware - HPEB	[Icon]
08 71 00-008 Hardware Sample	[Icon]
08 17 00-001 Integrated Door Opening...	[Icon]
08 33 26-001 Overhead Colling Grilles	[Icon]
08 71 13-001 Automatic Operators Pro...	[Icon]
08 34 36-002 Revolving Darkroom Doo...	[Icon]
08 71 00-001 Door Hardware - Central...	[Icon]
08 71 00-009 Door Pro O&Ms	[Icon]
08 71 00-003 Door Hardware - MREB	[Icon]
08 16 15-001.R1	[Icon]
08 34 36-001 Revolving Darkroom Door	[Icon]

FM Workflow 7: Facility Condition Assessment

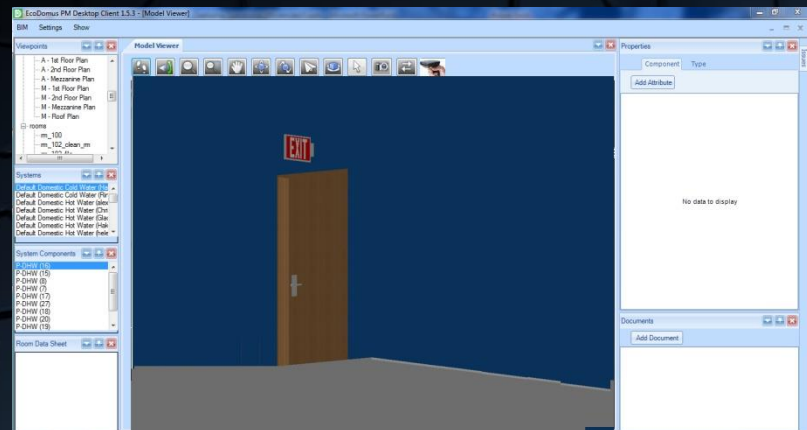
- Given: Tens or hundreds of buildings under management.
- Task: How to improve budgeting of repairs and renovations in the most optimal way.
- Solution: BIM-based Facility Condition Assessment for spaces and assets improved by real-time data from sensors.

The screenshot shows the EcoDomus software interface. On the left, there are two sidebar panels: 'View Points' and 'Selection Set'. The 'View Points' panel lists categories like equipment, floors, rooms, zones, 3D, ahu-d1, AHU, and Corridor. The 'Selection Set' panel lists exhaust, vav-d29, vav-d210, vav-d04, and vav-d01. The main area displays a 3D BIM model of a building with various components highlighted in different colors (blue, green, purple). At the top right, there are buttons for 'Back To Model Viewer', 'Search Component', and 'View Properties'. Below the model, there is a 'Building Control' and 'Document/Work Order' section. At the bottom, there is a 'RealTime' monitoring panel with a line graph and a table of sensor data.

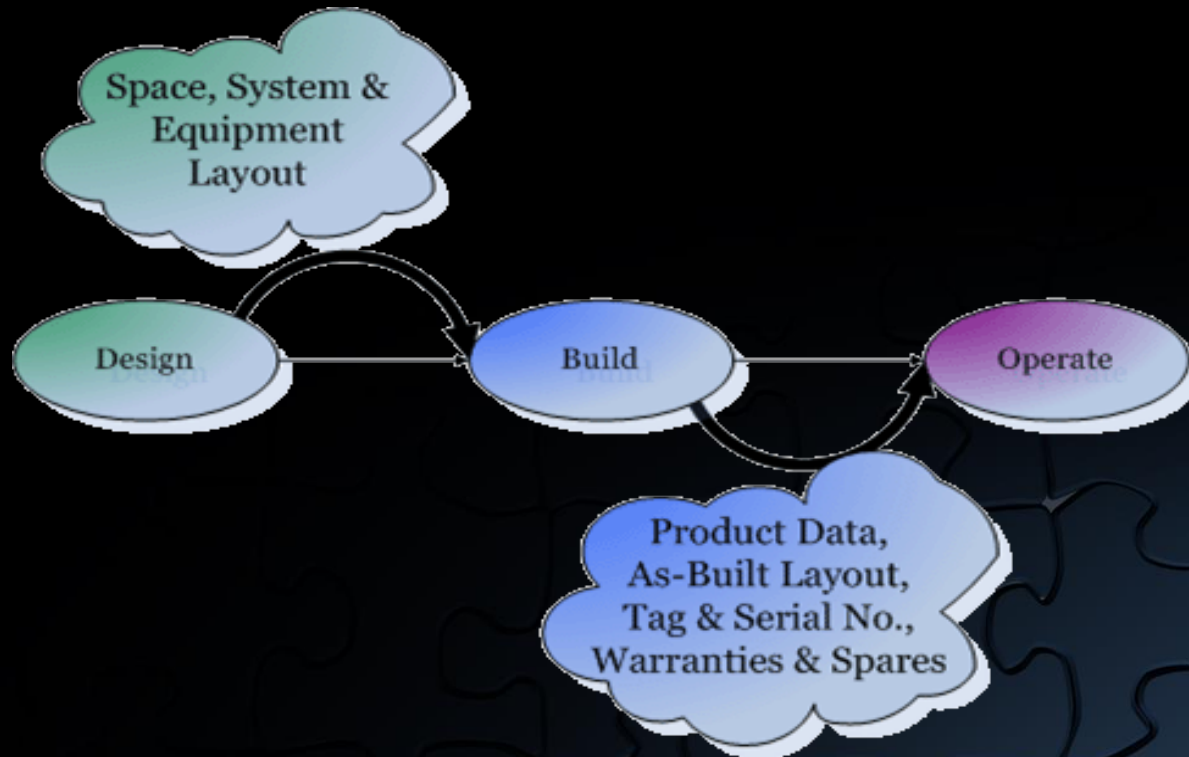
DateTime	Text	Type	AlarmValue
11/17/2010 11:07:46 AM	Sine High High Alarm	High High	0.821595191955566
11/17/2010 11:07:24 AM	Ramp High Alarm	High	60
11/17/2010 11:07:08 AM	localhost in demo evaluation	System	0
11/17/2010 11:06:46 AM	Sine Low Low Alarm	Low Low	-0.821595191955566
11/17/2010 11:06:38 AM	Sine Low Alarm	Low	-0.518695652484894

FM Workflow 8: Equipment Inspections

- Given: Thousands of life safety assets: sprinklers, fire extinguishers, Exit signs, etc.
- Task: Continuous inspection of life safety assets.
- Solution: BIM-based field inspections, supported by barcoding, and mobile 3D technology.



Framework: COBie and OmniClass



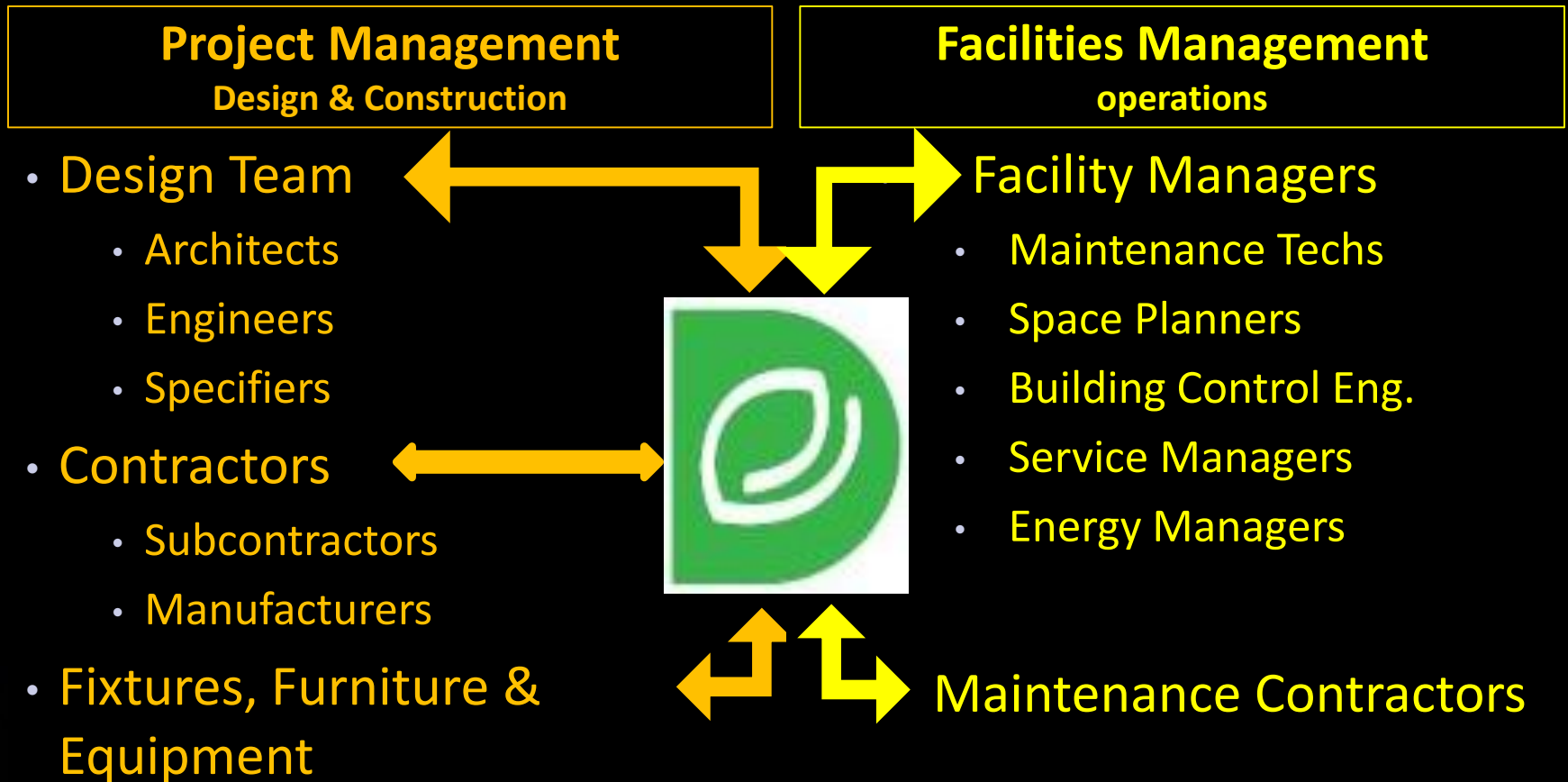
Some Adopters include:

- Department of Veteran Affairs
- NASA
- Department of State
- Texas A&M University
- Indiana University
- GSA
- US Army Corps of Engineers

US Army Corps of Engineers, Engineering Research and Development Center (c) 2009

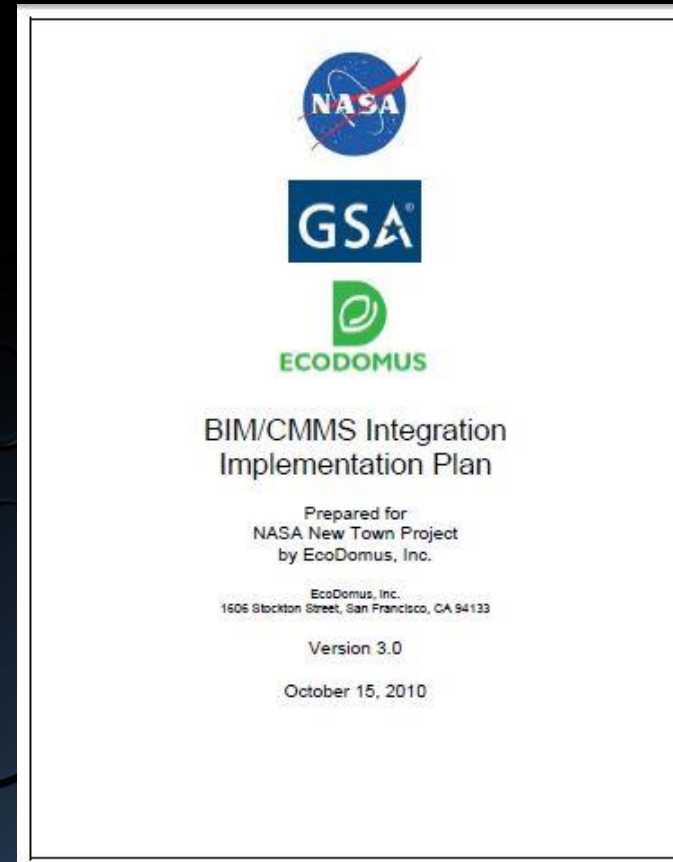
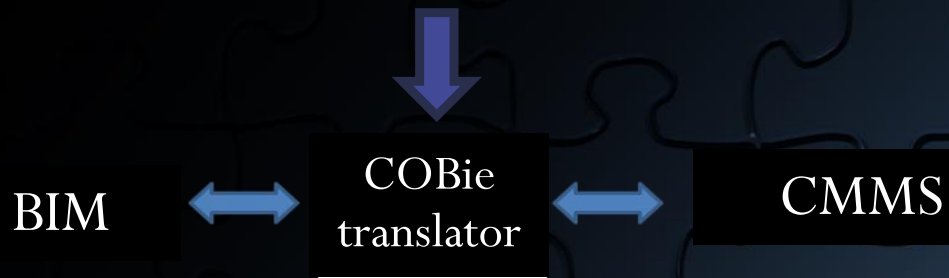


Data Collection and Usage



COBie Implementation Major Tasks

- Preparing BIM Model for FM Usage
- Defining Requirements for BIM Objects
- Defining Requirements for Documentation
- Scheduling Data Quality Control Actions
- Cleaning Data and Populating New Info
- Mapping BIM Data with FM Data Structure
- Exporting and Importing Data



Managing COBie Data Entry

- Easy-to-use online EcoDomus PM interface:
 - Edit information online, or upload partial information as Excel files for batch update (Warranty Info, Serial Numbers, etc.)
 - No BIM experience is needed to enter data
- Collaborative process: better than exchanging large Excel files

Type Name : AHU-D1:D-1

Profile | **Attributes** | Spares | Jobs | Resources | Components | FAMIS

Type Name:	AHU-D1:D-1	Description:	Mechanical Equipment			
OmniClass:	n/a	Manufacturer:	ENERGY LABS			
Asset Type:	Fixed	Facility:				
Model Number:	null	Warranty Duration Parts:	2			
Warranty Guarantor Parts:	Little Giant Pump Co.	Warranty Duration Labor:	1			
Warranty Guarantor Labor:	Jay R Smith Manufacturing Co.	Warranty Description:				
Replacement Cost:		Warranty Duration Unit:	n/a			
Expected Life:		MasterFormat	23 36 00 Air Terminal Units			
Uniformat:	N/A					
Documents:	<table border="1"><tr><td>Document Name</td></tr><tr><td>O&M Manual for AHU</td></tr><tr><td>Pre Fuctional Test Report</td></tr></table>			Document Name	O&M Manual for AHU	Pre Fuctional Test Report
Document Name						
O&M Manual for AHU						
Pre Fuctional Test Report						

Validating COBie Data

- Data validation via automated quality control – making sure COBIE rules are followed
- Owner requirements control – making sure right info is provided
 - OmniClass based rules for attributes, naming conventions, documentation

Organization : University of Southern California (USC)

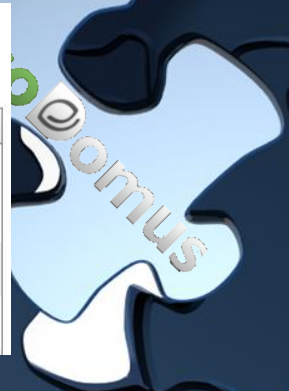
Search :

OmniClass	Required Attributes	Add/edit
23-75 70 21 24 14 Variable Volume Air Terminal Units	Radiated NC, Tag, Maximum CFM, Manufacturer, Model Number, Discharge NC, Minimum CFM, Branch Pipe Size, Operating Weight, Inlet Size	<input style="float: right;" type="button" value="+"/>
23-75 35 14 Air Handling Units	Manufacturer, Cooling/Heating Coil Fins Per Inch, Supply Fan Motor Break Horse Power, JohnMuseAttr, Supply Fan Motor Hertz, Model Number, Supply Fan Ext Static Pressure, Supply Fan Total Static Pressure, Cooling/Heating Coil CFM, Supply Fan CFM, Supply Fan Rotations Per Minute, Tag	<input style="float: right;" type="button" value="+"/>



Missing attributes

OmniClass Type ^	Name	Missing attributes
23-75 35 14 Air Handling Units	AHU-D1:D-1	Coil Type, Cooling/Heating Coil CFM, Cooling/Heating Coil Fins Per Inch, JohnMuseAttr, Manufacturer, Model Number, Motor Speed, Supply Fan CFM, Supply Fan Ext Static Pressure, Supply Fan Motor Break Horse Power, Supply Fan Motor Hertz, Supply Fan Rotations Per Minute, Supply Fan Total Static Pressure, Tag
23-75 70 21 24 14 Variable Volume Air Terminal Units	VAV w Reheat:10 Inch	Discharge NC, Manufacturer, Maximum CFM, Minimum CFM, Model Number, Operating Weight, Radiated NC, Tag
23-75 70 21 24 14 Variable Volume Air Terminal Units	VAV w Reheat:6 Inch	Branch Pipe Size, Discharge NC, Manufacturer, Maximum CFM, Minimum CFM, Model Number, Operating Weight, Radiated NC, Tag



The COBie Sandbox (Virtual FM)

- Learn how to run the facility before you move in: “Virtual Facility Management” (like “Virtual Design & Construction”)
 - Preventive Maintenance jobs created as information about equipment is specified / installed
 - Facility managers are trained to use equipment before they see it
 - Enough time to purchase service parts, materials and tools
 - Enough time to realize wrong equipment is installed

• Serial Number

• Manufacturer

Other fields:
Replacement Cost,
Installation Date,
Vendor, etc.

Assets

Find: Select Action

Asset: 12600 Conveyer System #1 Site: BEDFORD

Status: READY Type:

Attachments Moved?

Details

Parent: Maintain Hierarchy? Location: SHIPPING Shipping and Receiving Department Bin: Rotating Item: Condition Code: Meter Group: Calendar: COMPANY1 Shift: Priority: 4 Serial #: JA4309 Failure Class: CONVEYOR Item Type: Tool Rate:

Purchase Information

Vendor: PLUS Plus Industrial Conveyer Corporation Manufacturer: PLUS Plus Industrial Conveyer Corporation Installation Date: 9/16/98 Purchase Price: 13,500.00 Replacement Cost: 19,000.00

Costs

Total Cost: 0.00 YTD Cost: 0.00 Budgeted: 1,250.00 Inventory: 0.00

Downtime

Asset Up? Modified

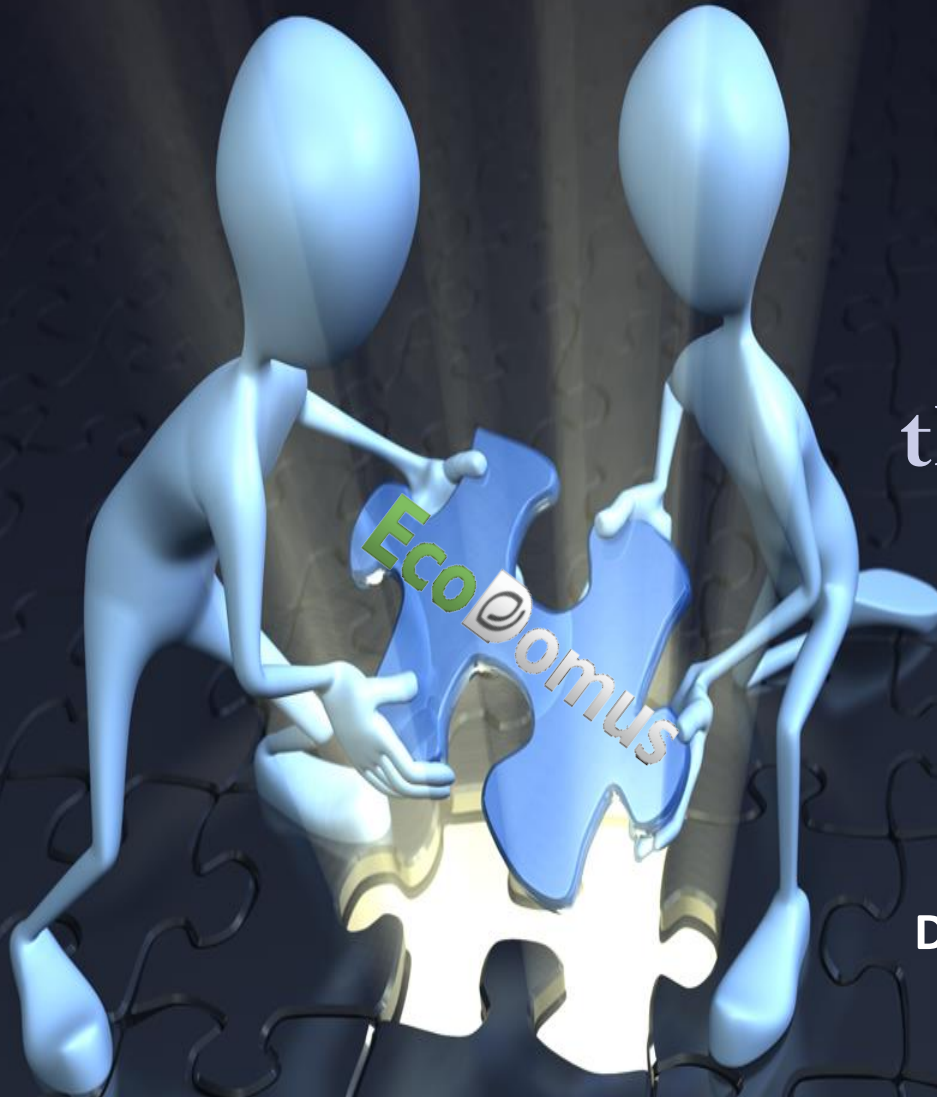
Last Changed Date: 7/8/00 4:02 PM Changed By: WILSON Changed Date: 2/7/05 10:20 AM

Total Downtime: 0.00

Final Thoughts

- BIM for Facilities Management process is applicable to both new and existing buildings.
- Works in 2-D or 3-D
- Make sure contractual language is very detailed and unambiguous if you want to save money
- The most important: ***start doing it!***
The best learning is acquired on real projects.





EcoDomus
Helping you put
the pieces in place
for improved
efficiency **NOW!**

Neil Parker
Director of Business Development
847-269-4522
nparker@ecodomus.com

Thank You!