

BIM STANDARDS AND CONTRACT SUBMITTAL REQUIREMENTS

at the University of Southern California

Begin with the End in Mind

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Program Manager
USC Facilities Management Services
BS in Civil Engineering
24 Years Experience

Some Facts About USC

- **2 main campuses**
 - University Park Campus
 - Heath Science Campus
- **Various satellite campuses**
 - Alhambra, CA
 - Catalina Island, CA
 - Downtown Los Angeles, CA
 - Marina Del Rey, CA
 - Orange County, CA
 - San Diego, CA
 - Sacramento, CA
 - Washington D.C.
- 34,000 students
- 18.5 million square feet
- 420 Buildings



What Are The BIM Contract Deliverables?

*BIM Deliverables to FMS do not currently replace our paper and CAD deliverables.

- Revit Design Model
- Revit As-built (As Constructed) model from AE
- Native format CAD models from the GC and Subs
- COBie Data and Docs from GC

3.2 MODEL AND DATA DELIVERY

The final delivery of the BIM and associated data to USC will be in the form of:

- Fully coordinated architectural, structural, civil and MEP 3D models in Revit at 100% CD by the Design Team.
- All equipment schedules must be generated from the parameters of objects.
- "As constructed" native format MEPF and structural models provided by the Design Team in accordance with the requirements as detailed in Appendix B.*
- Complete "as constructed" Revit models provided by the Design Team in accordance with the requirements as detailed in Appendix B.*
- The following COBie 2.4 standard worksheets*, submitted by the General Contractor, shall emphasize on the MEPF systems, shall be provided (at minimum) to meet the following Management Goals:
 - Contact (all fields)
 - Facility (all fields)
 - Floor (all fields)

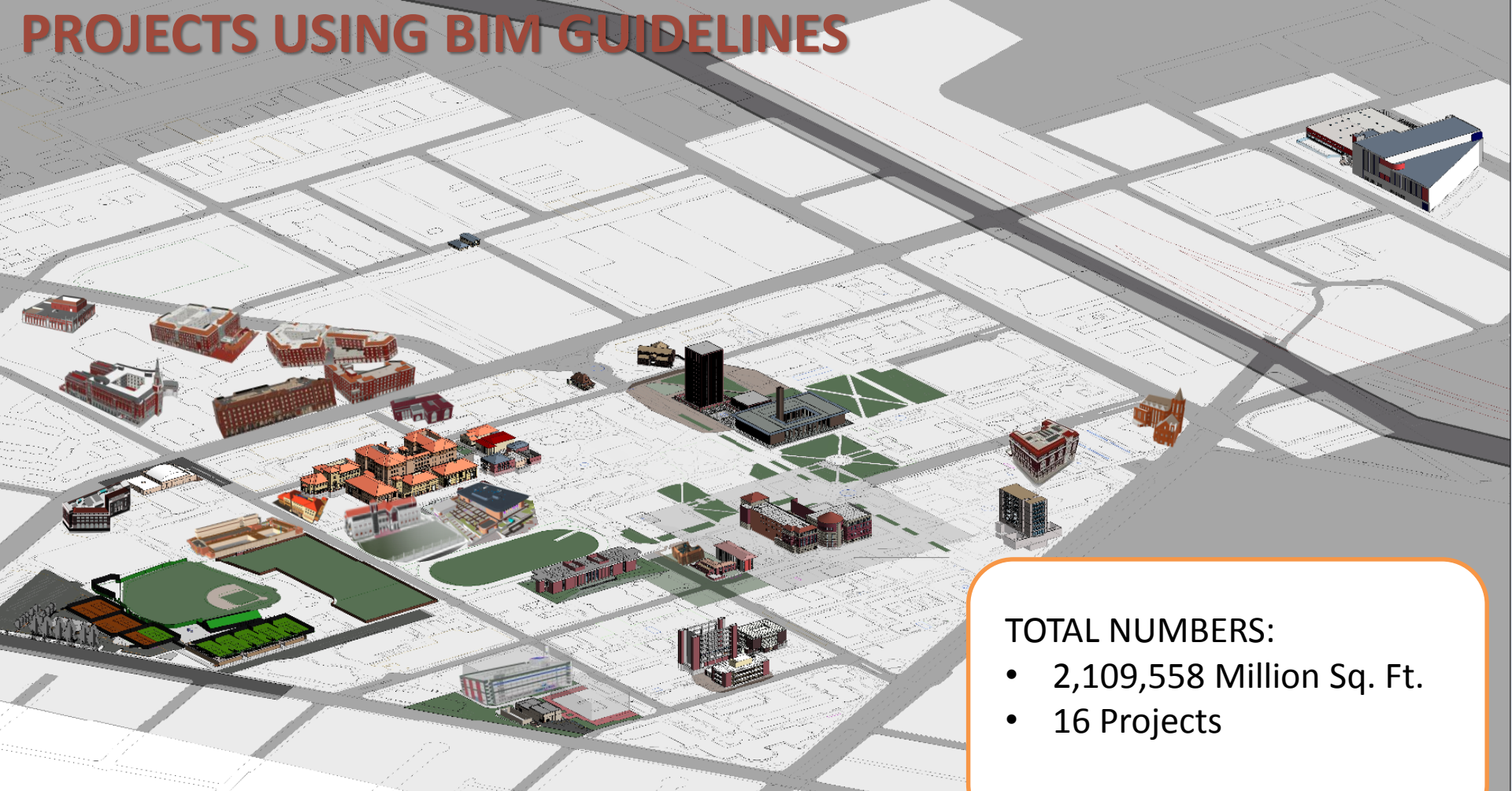
6. Design Phases

6.1 DELIVERABLE SCHEDULE AND MILESTONES (to be completed by the end of each phase)

Milestone	Deliverable
Contract Award	Final BIM Execution Plan
Schematic Design Phase	Architectural Model Civil Model COBie Design Data <ul style="list-style-type: none">ContactFacilityFloorSpaceZone
Design Development Phase	Architectural Model Civil Model MEPF Model or Models Structural Model COBie Design Data <ul style="list-style-type: none">ContactFacilityFloorSpaceTypeComponent
Construction Phase	Architectural Model Civil Model MEPF Model or Models Structural Model COBie Design Data <ul style="list-style-type: none">ContactFacilityFloorSpaceZoneType

2.6.12 Record Documents, Record Drawings and As-built Drawings. As further detailed in Exhibit 6, no later than thirty (30) calendar days after receipt of As-built Drawings from Contractor and as a condition precedent to final payment to Architect, Architect and its Consultants shall review for accuracy, correct where necessary, and forward to Owner Record Drawings produced by Architect from the redline As-built Drawings received from Contractor, including applicable addenda, bulletins, clarifications, submittal information, changes and selections made during construction. In addition, Architect shall provide to Owner, Record Construction Documents including all civil, architectural, structural, plumbing, mechanical, electrical, landscape, special systems, and updated specifications, which shall reflect Contractor's As-built Drawings and submittal information. As further detailed in Exhibit 6, the Record Documents, including the Project Manual, and all engineering calculations shall be provided by Architect to Owner in three (3) full size documents and three (3) electronic versions on disks in CAD and BIM format and shall be clearly identified near or in the title block on each sheet as "RECORD DRAWINGS". All CAD and BIM record documents shall be prepared in accordance with AIA layering system standards or BIM Drawing Standards as contained in Exhibit 5. The medium for transmittal of all AutoCAD files and BIM document files shall be as agreed by Owner. If any inconsistencies or ambiguities arise between this provision and Exhibits 5 and 6, such inconsistencies shall be resolved by Architect complying with the more stringent requirements. Owner recognizes that the CAD and BIM documents may be subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error or human alteration. Accordingly, the CAD and BIM record documents are provided to Owner for informational purposes only and not as an end product. Owner agrees to waive any claims by Owner against Architect resulting from the unauthorized alteration, misuse or reuse of the CAD and BIM record documents.

PROJECTS USING BIM GUIDELINES



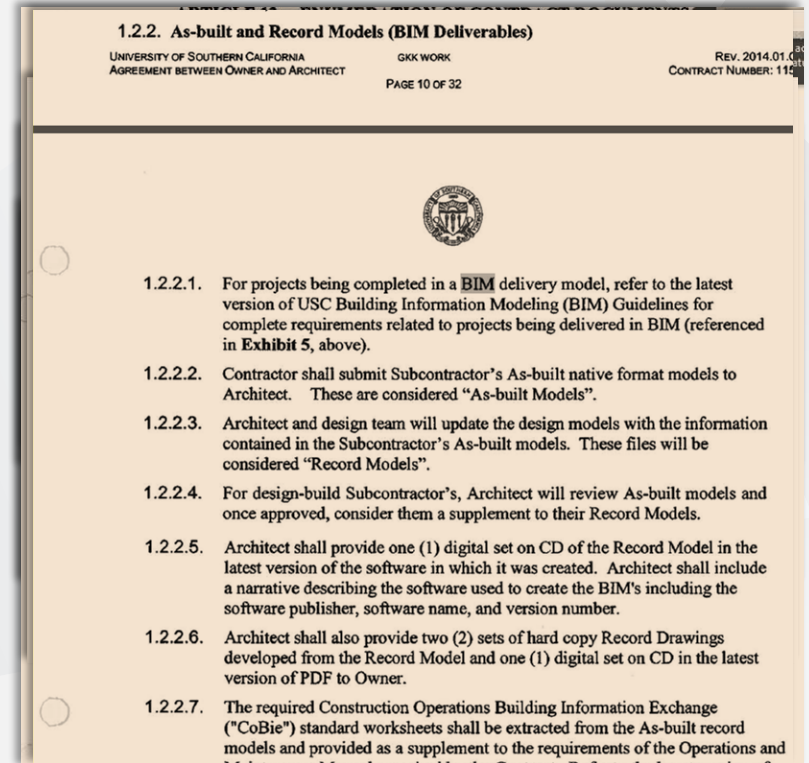
TOTAL NUMBERS:

- 2,109,558 Million Sq. Ft.
- 16 Projects

Criteria

- . New Buildings
- . Renovations

- > \$5 million
- Significant MEP work
- Model Exists for the Building



Promise of BIM

- Building Information Management , catalyst for
- PARAMETRIC – Data Driven
- Powerful virtual representation of building and its systems
- Enable collaborative delivery
- Downstream data delivery
- Promote systems integration
- Analysis tool or supplement to
- Aide in the turn over of information necessary for FM

End in Mind BIM+FM Goals

- Operate building on day turned over
- Efficiently carry out planned maintenance and better respond to unplanned maintenance
- More effectively trouble shoot and communicate with customers
- Improve integration across all FM information systems and units
- Empower all players throughout FM response chain
- Make access to information intuitive and seamless
- Maintain up to date account of buildings and their systems



THE MEN AND WOMEN OF FMS

The men and women of FMS are proud to help build and maintain the grounds and facilities that assist USC in attracting world-class students, faculty, staff and athletes. We are especially proud to support USC's wide range of leading-edge research, academic, and patient care programs.

As one of the largest service organizations within USC, Facilities Management Services is responsible for the day-to-day operation, repair and maintenance of the University of Southern California's buildings and infrastructure on the University Park and Health Sciences campuses, the Wrigley Institute and various other leased space. We are also responsible for maintaining five athletic fields.

We strive to maintain USC's \$7 billion physical plant with an unyielding dedication to quality services, sustainability, and cost efficiency.

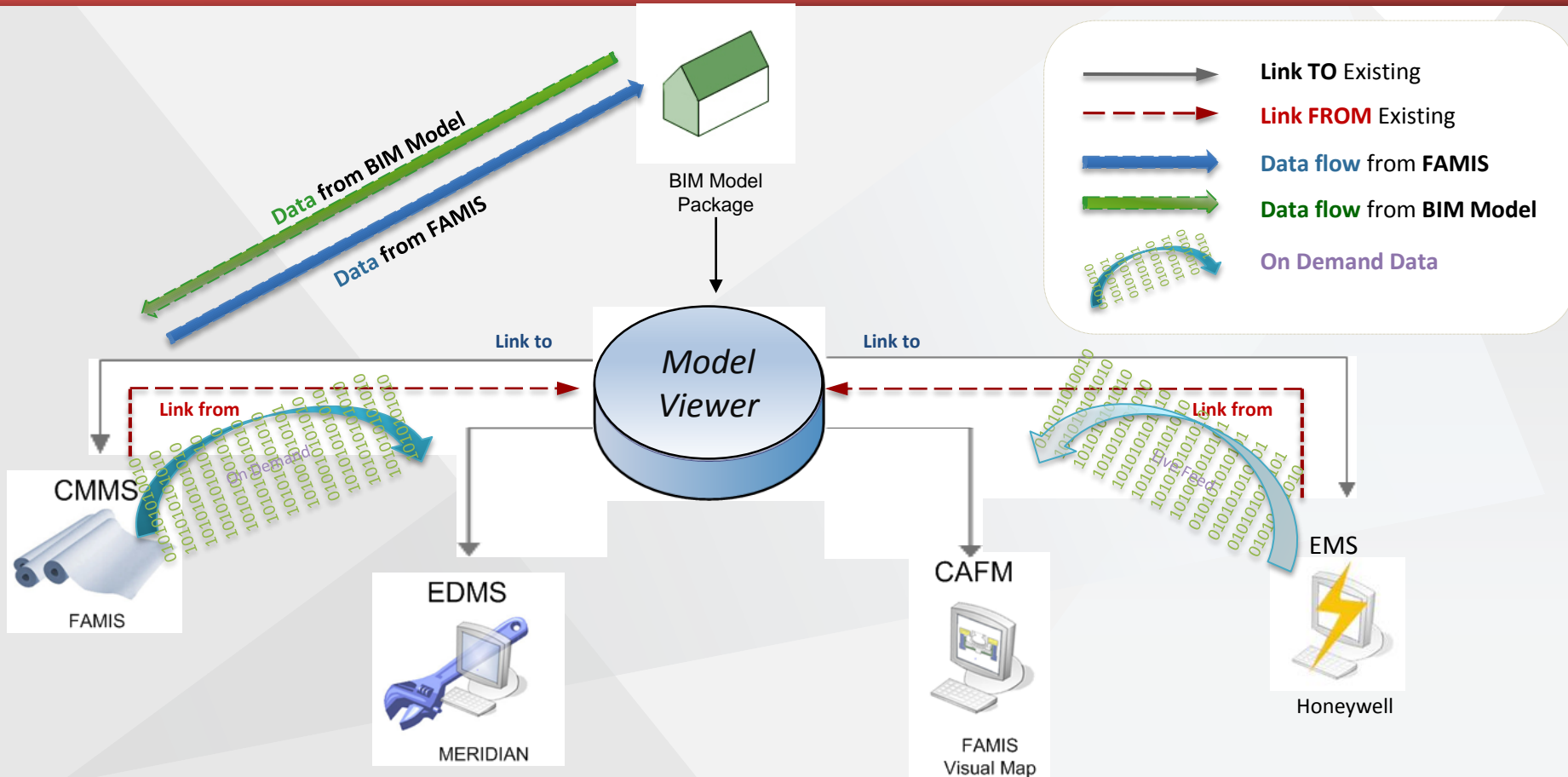
*Sustaining the spaces that shape the Trojan experience...
ensuring that our Living University endures
for generations to come.*

AT FACILITIES MANAGEMENT SERVICES WE:



- Handle over 40,000 work orders per year – that is approximately 3,500 a month while our Customer Resource Center fields 5,500 calls per month.
- Haul approximately 650 tons of trash every month.
- Paint over 200 classrooms each summer.
- Maintain the campus swimming pools.
- Operate and maintain 200 elevators using our own crew and elevator technicians.
- Maintain and repair over 400 University vehicles.
- Maintain more than 4,000 trees, 1,000 planters and 108 ornamental gardens, in addition to the benches which enhance our green spaces.
- Utilize a computerized energy and resource management system to help control costs for electricity, gas and water.
- Provide keys (approximately 3 million cut by our own locksmiths) to 160,000 different campus doors and locks.

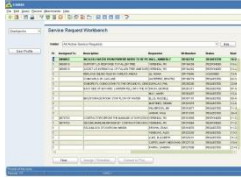
Leveraging BIM from Facilities Management



BIM Integration with Existing FM Systems

CMMS

Computerized Maintenance Management Systems

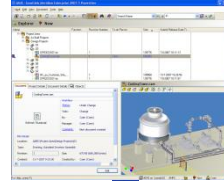


Service Requests, Work Orders

Asset Management

EDMS

Electronic Document Management Systems



Content Management

Revision Management

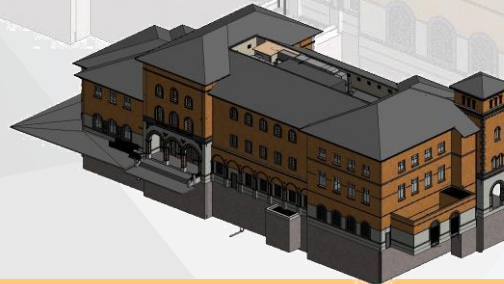
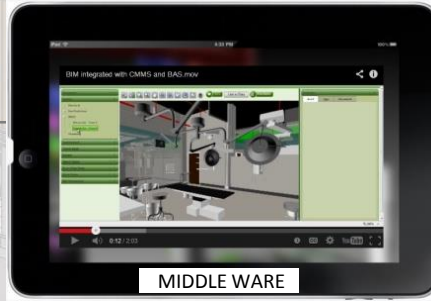
BACS

Building Automation and Control Systems

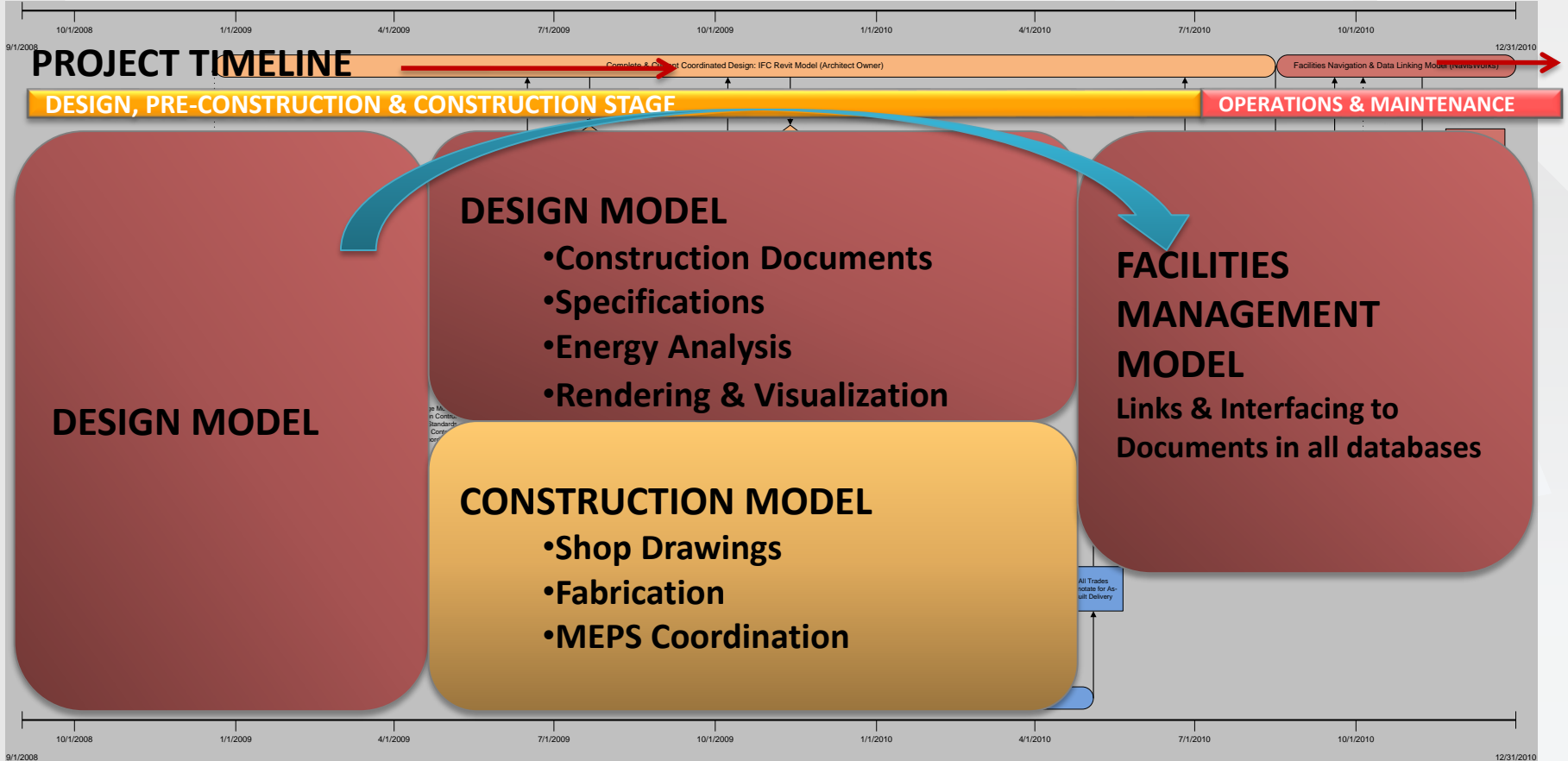


Building Automation

Real Time Monitoring of Bldg. Systems



BIM Execution Plan



O & M

Service Requests

- Hot/Cold Calls
- Equipment Break Downs
- Leakages
- Flooding
- Electricity Shut Offs

Design Data vs. Live Data
Location of Equipment
Warranties, Control Drawings

Work Orders

Preventive Maintenance

- Annual/Semi Annual
- Preventive Tasks List
Parts List
Warranties etc.

CAPITAL CONSTRUCTION

Renovations

- As-Built Floor Plans
- Site Surveys
- Specs
- Project Manuals
- Final Submittals
- Warranties
- O&M Manuals
- Expected Life
- Replacement Costs

PLANNING

Asset Management

- Projections of remaining serviceability
- Capital and maintenance budget requirements
- Cost estimates to correct current deficiencies
- Replacement cost estimates
- Depletion rate of assets
- Long-range budget forecasts
- Cost impact of deferring treatments (Business case)
- Inventory of physical conditions
- Prioritized work orders based on condition and/or expected service life

Depreciation Tracking

- Cost Segregation Method

COMMIS- SIONING

Close Out

Documents @CO

- Equipment Start - Up Reports
- Test & Balance Reports

Documents After CO

- O&M Manuals
- Final submittals
- Warranties
- Spare Parts List
- Valve Charts
- System Control Diagrams

BACS

Real Time Building Monitoring

- Set Points
- Cooling Set Point
- Heating Set Point
- SP Override
- Damper % Open
- Room Temperature
- Supply Air Temperature
- Discharge Air Temperature
- HWS Temperature
- Static Pressure
- Discharge Air Flow (CFM)

via sensors on equipment (control points)

Real Time Building Controls

Will Brown



“Ensuring that customers can rely on the quality of our work is paramount”

Age: 40
Current Job Experience: 5 yrs
Overall Experience: 15 years as CAD drafter
Education: Bachelors Degree
Goals:

- To create and maintain accurate building floor plans
- To learn new technologies that improve efficiency and help better meet our customers' needs

CAD Project Specialist

Innovation: Will is an expert technologist. Having worked as a CAD drafter for many years, he is accustomed to being in a production type position. Step 1: evaluate customer needs. Step 2: find more efficient way to use technology to meet these demands. Step 3: always learning more

Customer Service: technology processes to

Role Description: plans are created, removed, or any other bid to reflect cu

Will uses the AutoCAD: V with rooms various room

Meridian: V Power User

AISB: Will use floor plan. A

FAMIS: Will from AISB in

FAMISCAD: Thematic TIC addition, Fa

Will's needs:

James Conroy



“It is important that the system is reliable and always stays running”

Age: 40
Current Job Experience: 6 yrs
Overall Experience: 20 years as energy management technician
Education: Associates Degree
Goals:

- To decrease university energy consumption by optimizing building system performance
- To always be improving the current energy management system

Energy Management Administrator

Innovation: James is a tech-savvy person who is always looking for ways to improve the quality of information delivered to his customers. While the size of the energy management system is always expanding, James takes advantage of any tools that can help increase efficiency in supplying and

Customer Service: that by keeping

Role Description: system perform programming th such as room tel while he navigat contractor to int amounts for uni converts chiller

James uses the EBI: James is the ensure the new navigation to pe

Meridian: James basis to create g

James needs: Chilled Water B historical perfor customers. A tot

Connect EBI will: would help mak

Irene Gonzalez



“I help maintain the highest level of quality for university buildings”

Age: 32
Current Job Experience: 5 yrs
Overall Experience: 10 years as Engineer
Education: Bachelors Degree
Goals:

- To get valuable information regarding building systems to those who need it most
- Develop a standard process for project close-out to increase efficiency

Commissioning Manager

Innovation: Irene is an experienced engineer always looking to learn more about building systems. She is looking for new ways to make her job more efficient such as establishing process standards and utilizing technology.

Customer Service: on campus. By e hard to make su

Role Description: establishes, mai 3rd party commis reports in addit close-out, irene completeness an information that but not respons

Irene uses the EBI: irene uses t commissioning s

FAMIS: Irene use she is only fami

Excel: irene keep is unique and irr

Irene's needs: Project Close-Out with established information for

Standard Process: managers. Once receiving all the

Peter Smith



“The most important part of my job is keeping the customers happy at all hours of the day”

Age: 52
Current Job Experience: 7 yrs
Overall Experience: 25 years as HVAC Installer/Engineer
Education: High School + Education on HVAC Systems
Goals:

- To maintain a good relationship with customers
- To find the simpler way to solve problems

University HVAC Maintenance Manager

Innovation: Having so many year experience, Peter still enjoys the hands-on work of being out in the field as well as taking care of his administrative duties back in the office. Even though Peter understands how the HVAC control system and mechanical equipment work, he still enjoys learning about new, time-efficient ways to solve problems. After all, the job isn't as interesting when you're not learning something new.

Customer Service: Peter enjoys keeping his customers happy. Peter takes time everyday to return phone calls, calm disgruntled customers, and be seen on the university campus. Peter will even gladly take phone calls during the night to make sure that everyone on campus is comfortable. To provide the best customer service, Peter needs to know about all of the problems that occur (e.g., temperature deviations, non-operating equipment, etc.) as soon as possible.

Role Description: Peter starts his day at a mandatory report meeting, where he discusses with his crew about the various HVAC problems around campus. Peter will make sure that the Priority 1 jobs (critical areas and non-operating equipment) jobs are addressed as soon as possible and the Priority 2 (hot/cold calls) jobs are addressed by the end of the day. For the next few hours, Peter will spend time at his computer issuing/closing work orders, calling customers, ordering parts, and other managerial tasks. In addition, Peter will use EBI to scan the buildings on campus to see if there are any temperature-related or mechanical problems with the HVAC systems. Next, Peter will visit with university personnel—maintaining a relationship with his customers is important to him. In the afternoon, Peter will help his crew who are out in the field by adjusting parameters in EBI, running to get equipment, or going into the field to do some hands-on work. In the late afternoon, Peter will look at the newest hot and cold calls to try to address the problems that have arose throughout the day. By the end of the day, Peter will have worked 9 to 12 hours.

Peter uses the following tools:
EBI: Peter uses EBI to navigate through university buildings and look up parameters associated with mechanical equipment (e.g., space temperature, flow rates, etc.). Peter finds this tool helpful and easy to navigate, but dislikes having to search for hidden points that are not shown within the graphics. To add to his frustration, some of the points do not have descriptive names. In addition, some of the buildings do not have a complete set of graphics.
FAMIS: Peter uses FAMIS to schedule work orders. Peter also uses FAMIS to access the backlog that he maintains, reopen/close work orders, and put notes in some work orders. He also oversees the assigning of work order to his crew. Peter may have 200+ work orders in one week, so he appreciates that FAMIS is available to help him organize all of the problems. Even though Peter is content with the function of FAMIS, he would like to see it linked to EBI.
AISB: Peter uses AISB to order parts. This program interfaces to the stock room. In AISB, Peter is also able to approve P.O.s, requisitions, and materials that are needed. Peter finds this program unintuitive and difficult to use.

Peter's needs:
Integrated software: Peter would like to have his work orders integrated with the location of the problematic equipment, graphics of the equipment, equipment manuals, and information about how to fix the equipment. Currently, all of this information is distributed.
A spatial understanding of equipment location: Currently, Peter's crew have to find mechanical equipment (e.g., VAV boxes) by following the duct work and trial-and-error. Sometimes EBI has limited information about location, but Peter would like software that would tell him and his crew about the exact location and layout of the mechanical equipment.

Using the "I" In BIM: Emergency Response

The screenshot shows a BIM software interface with a 3D model of a building. A large orange text overlay reads "How Do We Leverage Existing Platforms?". The interface includes a left sidebar with navigation options like "Viewpoints", "Asset Search", and "Reports". A top toolbar contains various view and navigation icons. On the right, there are two data panels: "Asset - GTV (10)" and "Type - Gate Valve 2-12 Inch: GTV Gate Valve 1\"", each with a table of parameters and values. A yellow circle highlights a yellow fire alarm pull station on the building's facade.

Asset - GTV (10)

Parameter	Value
Group: Identity Data	
Description	GTV
Barcode	
Comments	O&M
Design Option	Main Model
Edited by	
Honeywell	
InstanceDescription	
InstanceName	GTV
Mark	33
Meridian Equipment	http://meridian3/bcente
Serial Number	
Tag Number	

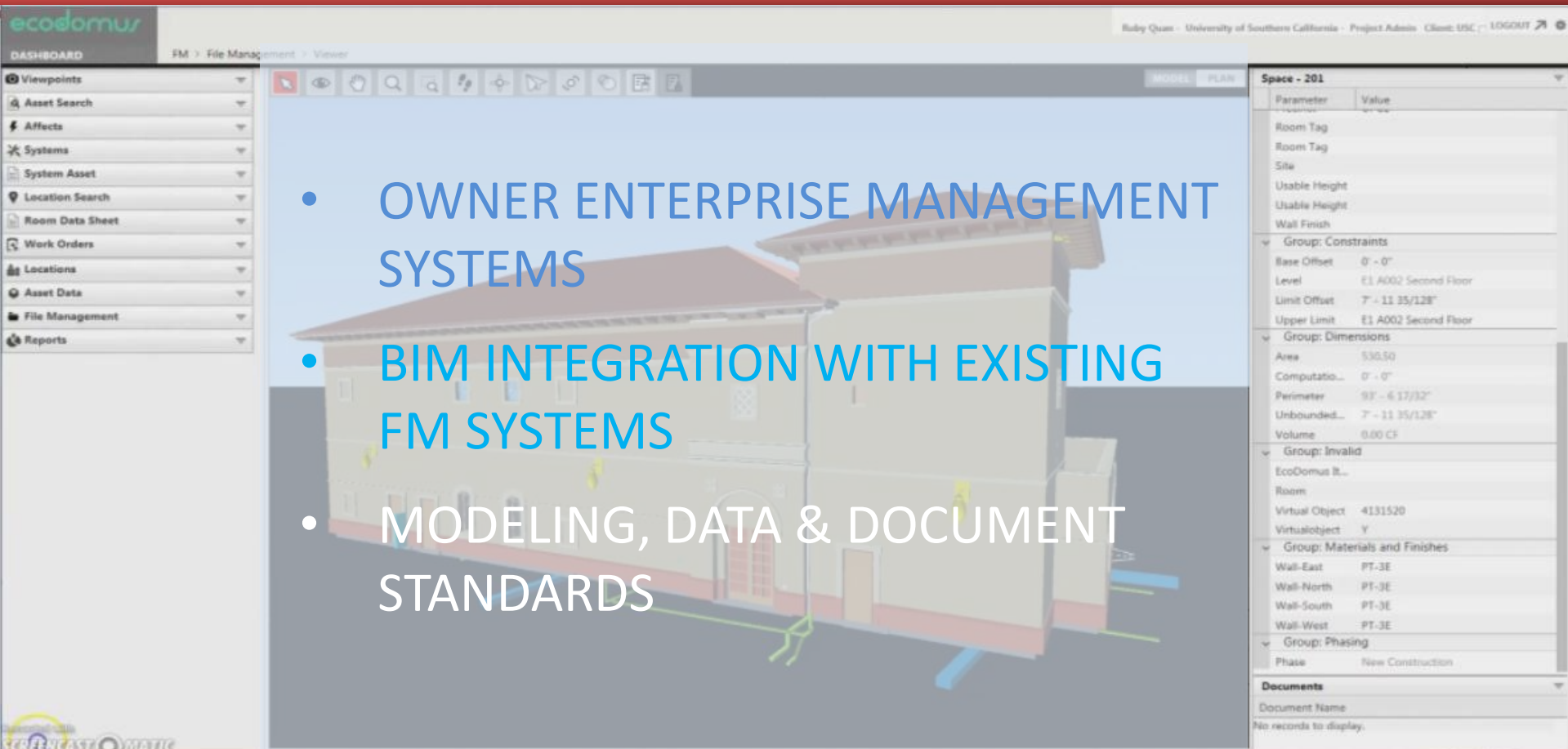
Type - Gate Valve 2-12 Inch: GTV Gate Valve 1"

Parameter	Value
Group: Identity Data	
Description	
Assembly Code	
Assembly Description	
Cost	0.00
Description	
Edited by	
Expected Life	
Keynote	
Manufacturer	
MasterFormatNumber	
Model	
Model Number	

Documents

Document Name
No records to display.

Using the "I" In BIM: Hot and Cold Call



The screenshot displays the EcoDomus software interface. On the left is a navigation sidebar with categories like Viewpoints, Asset Search, Affects, Systems, System Asset, Location Search, Room Data Sheet, Work Orders, Locations, Asset Data, File Management, and Reports. The main area shows a 3D perspective view of a multi-story building model. On the right, a 'Space - 201' data panel is open, displaying various parameters and their values.

Parameter	Value
Room Tag	
Room Tag	
Site	
Usable Height	
Usable Height	
Wall Finish	
Group: Constraints	
Base Offset	0' - 0"
Level	E1 A002 Second Floor
Limit Offset	7' - 11 35/128"
Upper Limit	E1 A002 Second Floor
Group: Dimensions	
Area	530.50
Computatio...	0' - 0"
Perimeter	93' - 6 17/32"
Unbounded...	7' - 11 35/128"
Volume	0.00 CF
Group: Invalid	
EcoDomus It...	
Room	
Virtual Object	4131520
Virtualobject	Y
Group: Materials and Finishes	
Wall-East	PT-3E
Wall-North	PT-3E
Wall-South	PT-3E
Wall-West	PT-3E
Group: Phasing	
Phase	New Construction

Documents
Document Name
No records to display.

- OWNER ENTERPRISE MANAGEMENT SYSTEMS
- BIM INTEGRATION WITH EXISTING FM SYSTEMS
- MODELING, DATA & DOCUMENT STANDARDS

Joint BIM Execution Plan



Addendum for Negotiated Contracts | Joint BEP

APPENDIX I

Replaces V1.6 Appendix I in its entirety.

JOINT BUILDING INFORMATION MODELING (BIM) EXECUTION PLAN

FOR
[PROJECT TITLE]

DEVELOPED BY
[AUTHOR COMPAN(IES)]

DATE:
(DATE EXECUTED)

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SECTION I: MODEL ORGANIZATION

SECTION J: PROJECT DELIVERABLES
SECTION K: MINIMUM MODELING MATRIX (M)
SECTION L: ATTACHMENTS
SECTION M: JOINT SIGNATURE PAGE

Architects - Initial _____

General Contractor - Initial _____

October 12, 2012 Addendum #1 - Joint BIM Execution Plan

PLAN (NIC)		DESIGN		CONSTRUCT		OPERATE (NIC)
PROGRAMMING	X	DESIGN AUTHORIZING		SITE UTILIZATION PLANNING		BUILDING SYSTEM ANALYSIS
SITE ANALYSIS	X	PROGRESS REVIEWS		CONSTRUCTION SYSTEM DESIGN		ASSET MANAGEMENT
	X	INTERFERENCE MANAGEMENT (3D COORDINATION)	X	INTERFERENCE MANAGEMENT (3D COORDINATION)		SPACE MANAGEMENT / TRACKING
		STRUCTURAL ANALYSIS	X	DIGITAL FABRICATION		DISASTER PLANNING
		LIGHTING ANALYSIS		3D CONTROL AND PLANNING		
		ENERGY ANALYSIS	X	RECORD MODELING		OPERATION & MAINTENANCE RECORD MODELING
		PROGRAM VALIDATION		FIELD / MATERIAL TRACKING		
		MECHANICAL ANALYSIS		DIGITAL LAYOUT		
		OTHER ENG. ANALYSIS				
		SUSTAINABILITY (LEED) EVALUATION				
		CODE VALIDATION				
PHASE PLANNING (4D)		PRELIMINARY CONSTRUCTION SCHEDULING (4D)		CONSTRUCTION SCHEDULING (4D)		BUILDING MAINTENANCE SCHEDULING (4D)
COST ESTIMATION (5D)		COST ESTIMATION (5D)		COST ESTIMATION (5D)		COST ESTIMATION (5D)
EXISTING CONDITIONS MODELING	X	AS CONSTRUCTED MODELING		EXISTING CONDITIONS MODELING		EXISTING CONDITIONS MODELING
CONSTRUCTION OPERATIONS BUILDING INFORMATION EXCHANGE (COBie)	X	CONSTRUCTION OPERATIONS BUILDING INFORMATION EXCHANGE (COBie)	X	CONSTRUCTION OPERATIONS BUILDING INFORMATION EXCHANGE (COBie)		CONSTRUCTION OPERATIONS BUILDING INFORMATION EXCHANGE (COBie)

Joint BIM Execution Plan

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SECTION G: QUALITY CONTROL

SECTION H: TECHNOLOGICAL INFRASTRUCTURE

NEEDS

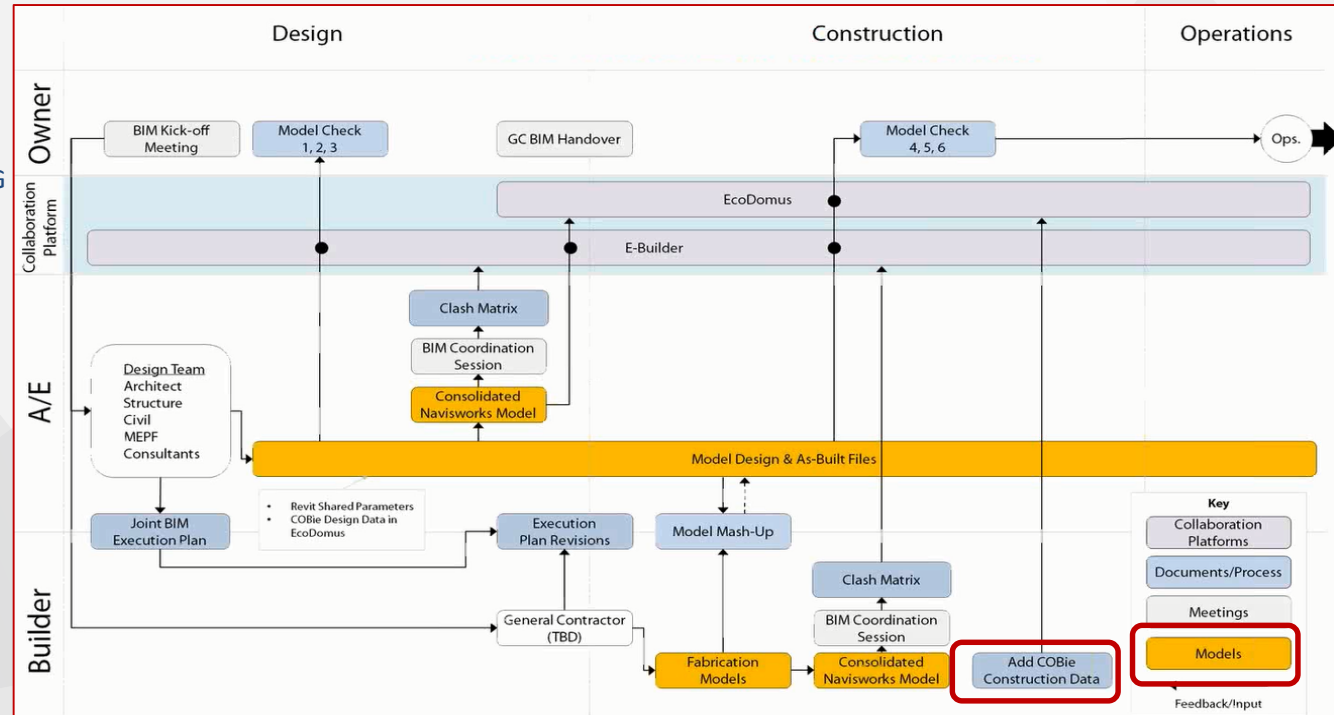
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SECTION J: PROJECT DELIVERABLES

SECTION K: MINIMUM MODELING MATRIX (M)3

SECTION L: ATTACHMENTS

SECTION M: JOINT SIGNATURE PAGE





Minimum Modeling Matrix (M3)

GENERAL INSTRUCTIONS

1. Modify Column F on Tab "03. Scope-LOD-Grade" to indicate the Elements included in the Project scope.
2. Filters are available to sort and limit column data in the table.
3. Bi-directional hyperlinks are available in column headers, Element IDs and Modeling Requirements.

Minimum Modeling Matrix (M3)										
Document Release: 20120913										
								DESIGN MODEL (CONSTRUCTION DOCUMENTS)	RECORD MODEL (AS-BUILTS)	
Level	Element ID	Descr Class	Uniformed ID	Master Format ID	Included in Facility or Site? Exchange to M3 at next year of program scope	LOD	GRADE (CS)	GRADE (AS)	Primary Discipline (This will allow design team to identify discipline specific areas of content)	Notes
Level 1	SUBSTRUCTURE	21-01 00 00	A							
Level 2	Foundations	21-01 10	A310							
Level 3	Standard Foundations	21-01 10	A3100							
Level 4	Wall Foundations	21-01 10 10	A3100.10							
Level 4	Column Foundations	21-01 10 10	A3100.30			300	A	Ar	Structural	
Level 4	Standard Foundation Supplementary Components	21-01 10 10 30	A3100.90			300	C	Cr	Structural	
Level 3	Special Foundations	21-01 10 20	A3100	\$1 60 00						
Level 4	Driven Piles	21-01 10 20 10	A3100.10	\$1 62 00	Yes	300	A	Ar	Structural	
Level 4	Bored Piles	21-01 10 20 15	A3100.15	\$1 63 00	Yes	300	A	Ar	Structural	
Level 4	Caissons	21-01 10 20 20	A3100.20	\$1 64 00	Yes	300	A	Ar	Structural	
Level 4	Special Foundation Walls	21-01 10 20 30	A3100.30	\$1 66 16	Yes	300	A	Ar	Structural	
Level 4	Foundation Anchors	21-01 10 20 40	A3100.40	\$1 68 00	Yes	300	C	Cr	Structural	
Level 4	Underpinning	21-01 10 20 50	A3100.50	\$1 68 00	Yes	300	C	Cr	Structural	
Level 4	Raft Foundations	21-01 10 20 60	A3100.60	00 71 00	Yes	300	A	Ar	Structural	
Level 4	Pile Caps	21-01 10 20 70	A3100.70		Yes	300	A	Ar	Structural	
Level 4	Grade Beams	21-01 10 20 80	A3100.80		Yes	300	A	Ar	Structural	
Level 2	Subgrade Enclosures	21-01 20	A20		Yes				Architectural, Structural	
Level 3	Wall/for Subgrade Enclosures	21-01 20 10	A2010		Yes				Architectural, Structural	
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10		Yes	300	A	Ar	Architectural, Structural	

M3 Modeling Matrix

Minimum Modeling Matrix (M3)



					DESIGN MODEL (CONSTRUCTION DOCUMENTS) <i>Entered by Design Team</i>		RECORD AS BUILT DESIGN MODEL (Updated from GC BIMs) <i>Entered by Design Team</i>		CONSTRUCTION (AS-BUILTS) <i>Entered by GC</i>					
Level	Element ID	OmniClass ID	UniFormat ID	MasterFormat ID	Included in Facility or Site? (change to NO if NOT part of project scope)	LOD	GRADE	LOD	GRADE	Primary Discipline	LOD	GRADE	Primary Trade (Subcontractor)	Notes
Level 1	SUBSTRUCTURE	21-01 00 00	A		Yes	•	•	•	•	Structural	•	•		
Level 2	Foundations	21-01 10	A10		Yes	•	•	•	•	Structural	•	•		
Level 3	Standard Foundations	21-01 10	A1010		Yes	•	•	•	•	Structural	•	•		
Level 4	Wall Foundations	21-01 10 10	A1010.10		Yes	200	A	300	A+	Structural				
Level 4	Column Foundations	21-01 10 10 10	A1010.30		Yes	100	A	300	A+	Structural				
Level 4	Standard Foundation Supplementary Comp	21-01 10 10 30	A1010.90		Yes	300	C	200	C+	Structural				
Level 3	Special Foundations	21-01 10 20	A1020	31 60 00	Yes	•	•	•	•	Structural	•	•		
Level 4	Driven Piles	21-01 10 20 10	A1020.10	31 62 00	Yes	300	A	300	A+	Structural				
Level 4	Bored Piles	21-01 10 20 15	A1020.15	31 63 00	Yes	300	A	200	A+	Structural				
Level 4	Caissons	21-01 10 20 20	A1020.20	31 64 00	Yes	200	A	300	A+	Structural				
Level 4	Special Foundation Walls	21-01 10 20 30	A1020.30	31 66 16	Yes	300	A	300	A+	Structural				
Level 4	Foundation Anchors	21-01 10 20 40	A1020.40	31 68 00	Yes	100	C	100	C+	Structural				
Level 4	Underpinning	21-01 10 20 50	A1020.50	31 48 00	Yes	100	C	100	C+	Structural				
Level 4	Raft Foundations	21-01 10 20 60	A1020.60	03 71 00	Yes	300	A	300	A+	Structural				
Level 4	Pile Caps	21-01 10 20 70	A1020.70		Yes	300	A	300	A+	Structural				
Level 4	Grade Beams	21-01 10 20 80	A1020.80		Yes	300	A	300	A+	Structural				
Level 2	Subgrade Enclosures	21-01 20	A20		Yes	•	•	•	•	Architectural, Structural	•	•		
Level 3	Walls for Subgrade Enclosures	21-01 20 10	A2010		Yes	•	•	•	•	Architectural, Structural	•	•		
Level 4	Subgrade Enclosure Wall Construction	21-01 20 10 10	A2010.10		Yes	300	A	300	A+	Architectural, Structural				
Level 4	Subgrade Enclosure Wall Interior Skin	21-01 20 10 20	A2010.20		Yes	300	A	300	A+	Architectural				
Level 4	Subgrade Enclosure Wall Supplementary Co	21-01 20 10 90	A2010.90		Yes	200	C	200	C+	Architectural, Structural				

BIM Clash Matrix

2 USC BIM CLASH/ISSUE MATRIX

4 **PROJECT:**

5 Insert Project Name Here

6

7 **FILENAME:**

8 Insert Current Navisworks Filename Here

9

10 **CURRENT DATE:**

11 mm/dd/yy

12

PRIORITY Color Autofill ON

1 Major Priority Prior to 100%CD

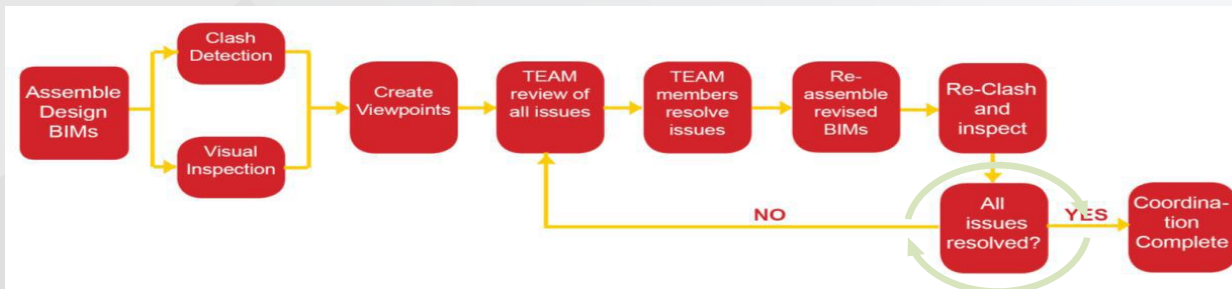
2 Priority Prior to 100% CD

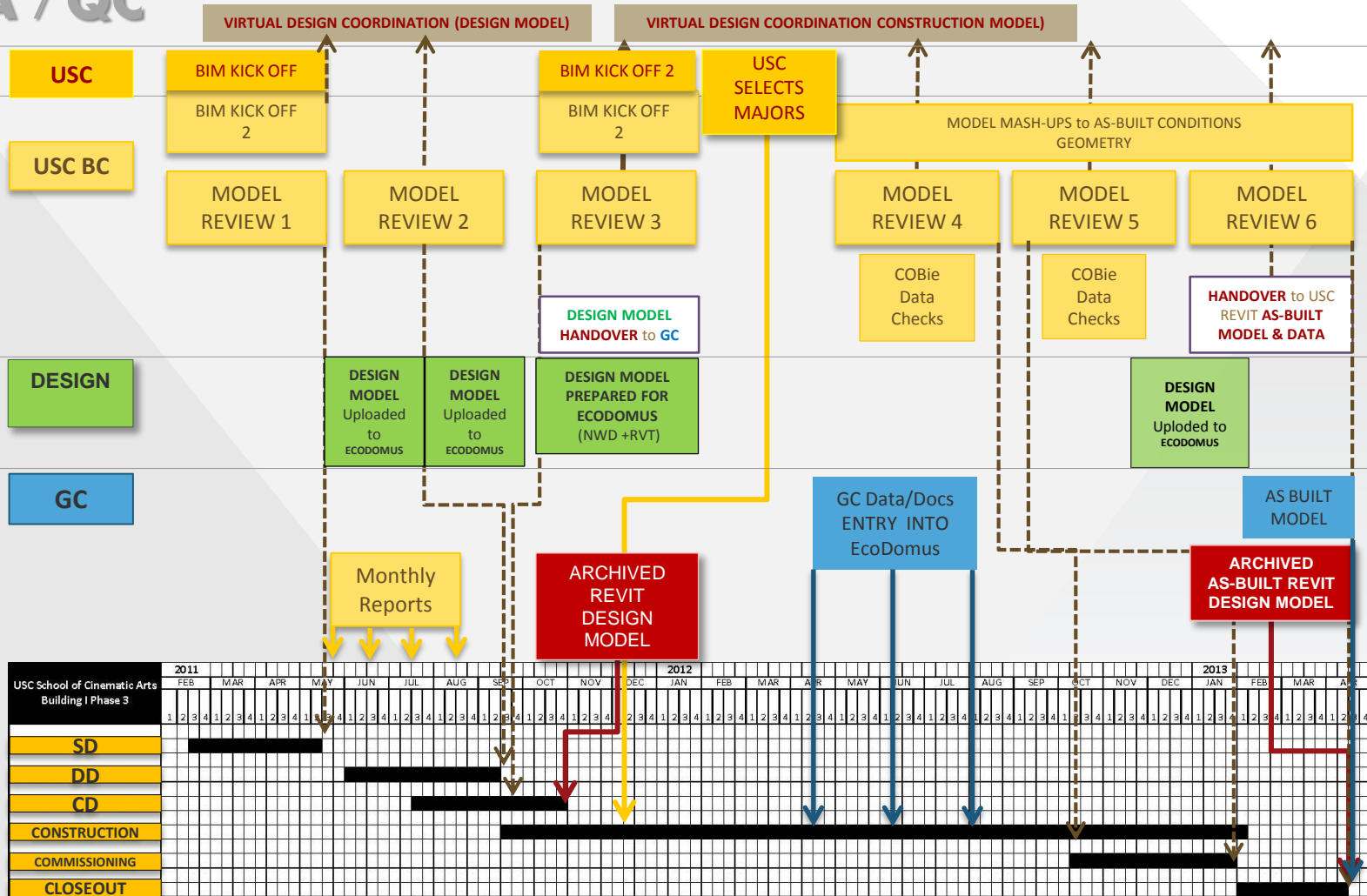
3 Best Practice Prior to 100% CD

4 Construction Coordination Priority

5 Construction Coordination Issue

Viewpoint # and Name Insert Viewpoints From the Navisworks File Below	Level	Priority # from priority list above	Responsible Party Design Discipline or Subcontractor	Date Generated mm/dd/yy	Resolved? Y/N	Date Resolved mm/dd/yy	Days Open	Designer or Design Modeler's Notes and/or Subcontractor's notes	Need USC Input? Y/N	BIM Facilitator Comments	Total Days to Resolve





Facilitate

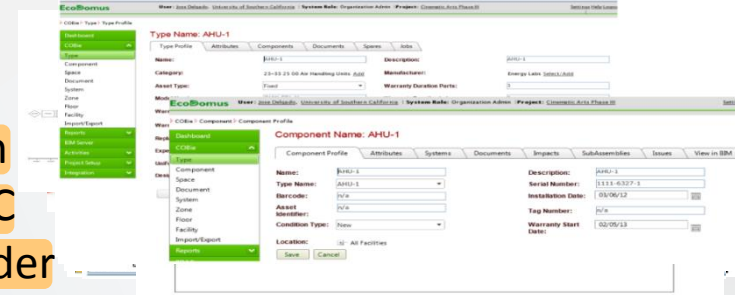
Train

Oversight

Produce

Scope of Services

1. BIM Guidelines, Addendums, Etc.
2. Provide BIM Facilitation & Collaboration
3. Produce Monthly Status Reports for USC
4. Ensure Documents are posted to e-Builder
5. Review A/E and GC JBEP for USC BIM Compliance
6. Review and Comment on BIM Coordination Meetings and Process
7. Interface Between A/E Team, GC Team and USC Stakeholders
8. Regular Scheduled Model Content Checks
9. Provide Overview and Observation for Clash Detection and Coordination
10. Provide BIM Review of Design Model for EcoDomus Upload
11. Schedule Milestone Mashups and Adjust Model to As-Built Conditions
12. Review Final As-Built Model Prior to Turnover



...serve as the Owner's eyes and ears throughout the Virtual Design and Construction process

Data Content & Workflow

FROM DESIGN TO CONSTRUCTION Data Content Overview & Workflow

Design

➤ DESIGN MODEL GEOMETRY

- Fully coordinated
- Acts as a placeholder for data

➤ SCHEDULED DATA

- Performance Data

➤ OWNER MASTER DATA

- Enables connection between Owner/Client's Operational Management Databases

➤ MEP SYSTEMS CONNECTED

➤ ZONES DEFINED

Owner BIM - FM Platform

CLOUD

✓ AS BUILT MODEL GEOMETRY

- Loaded onto Cloud (Autodesk® NavisWorks Model)
- Acts as a placeholder for data

✓ SCHEDULED DATA

- Performance Data

✓ OWNER MASTER DATA

- Enables connections between FM databases

✓ COBie DATA

- Type & Component or Instance Data

✓ MEP SYSTEMS CONNECTED

✓ ZONES DEFINED

✓ DOCUMENTS

LOADED ONTO CLOUD

Construction

➤ CONSTRUCTION MODEL GEOMETRY

- Fully coordinated Model to reflect As-Built Conditions

➤ COBie DATA ENTERED

• TYPE DATA

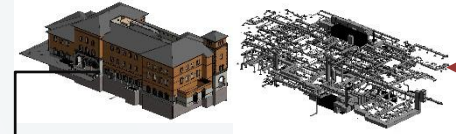
- Manufacturer
- ModelNumber
- WarrantyGuarantorParts
- WarrantyDurationParts
- WarrantyGuarantorLabor
- WarrantyDurationLabor
- WarrantyDurationUnit
- PartNumber
- Replacement Cost
- ExpectedLife

• COMPONENT/INSTANCE

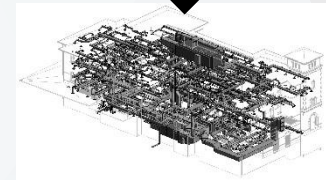
- SerialNumber
- InstallationDate
- WarrantyStartDate
- BarcodeNumber

➤ DOCUMENTS

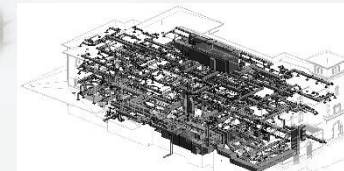
- Air Balance Reports
- Warranties
- O&M Manuals
- Final Submittals
- Panel Board Circuit Directories
- Valve Charts etc.



Design Models
Arch + MEP



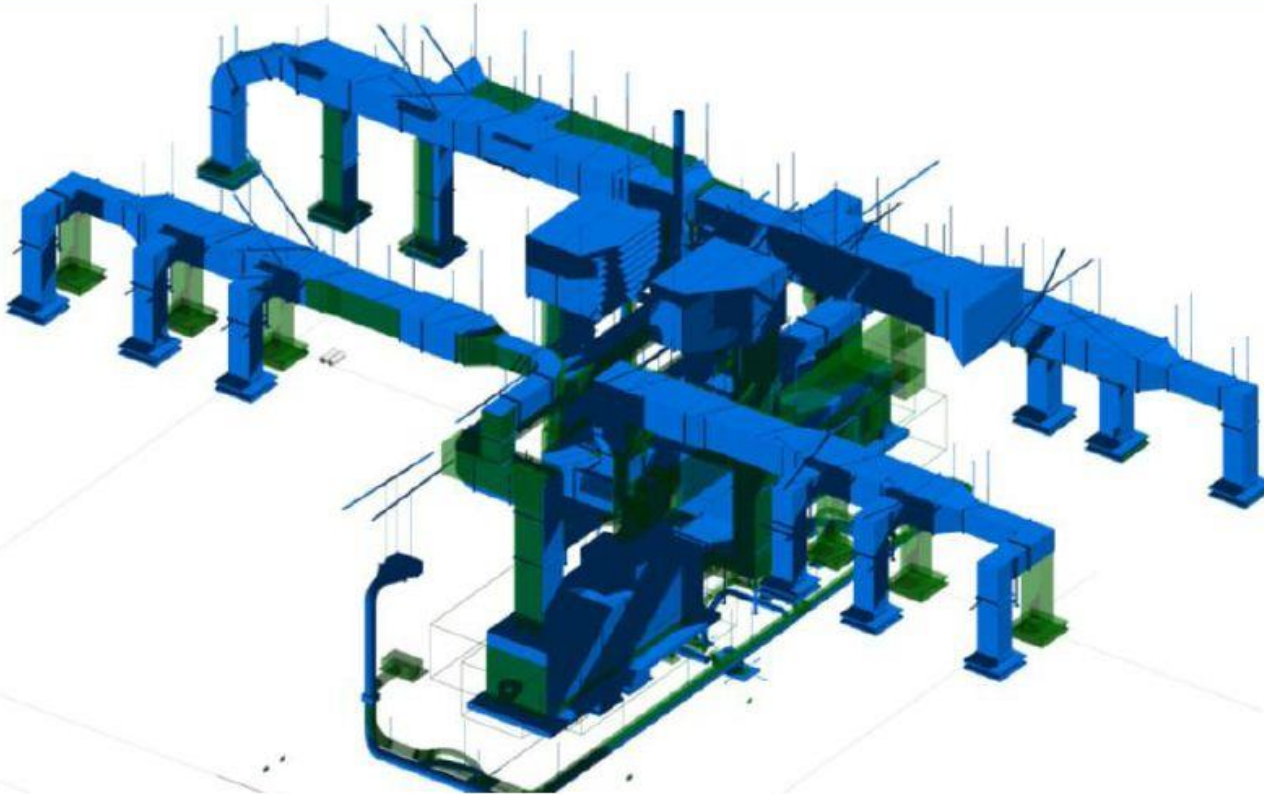
Cloud Model
Navisworks NWD



Construction Model
MEP

AS-BUILT

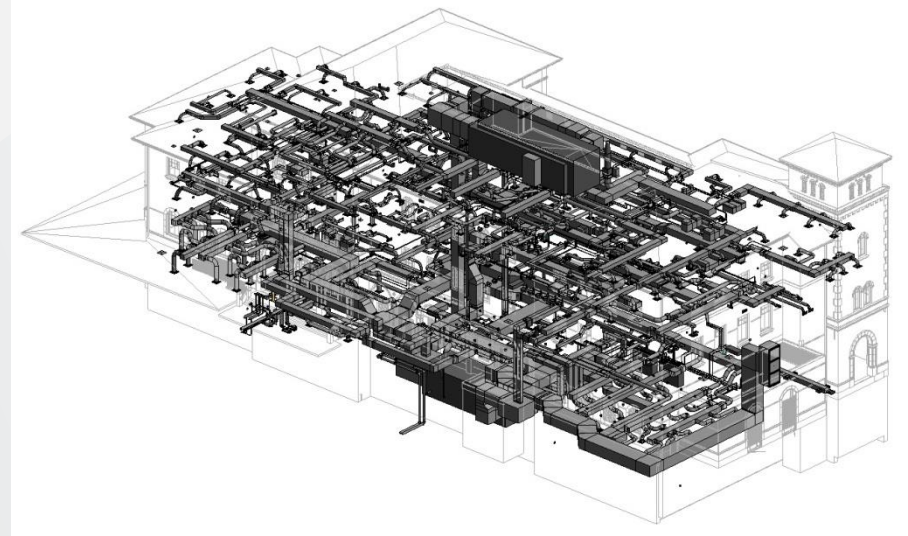
Mash-up Of Design Model To Construction Model



Sample mash-up of ductwork. Green duct must be adjusted to match as built blue duct.

OWNER REQUIREMENTS :

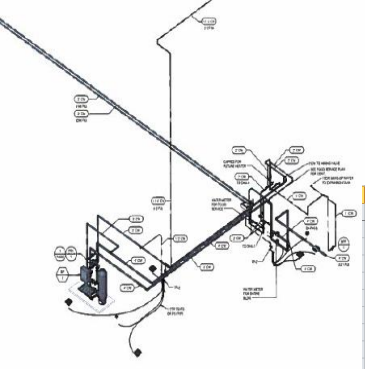
- NOMENCLATURE
- PARAMETERS & DATA
- SYSTEMS
- ZONES
- CLOUD MODEL PREPARATION
- COBie DOCUMENT REQUIREMENTS
- PRINT FROM MODEL



Major Managed Assets

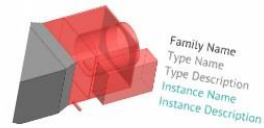
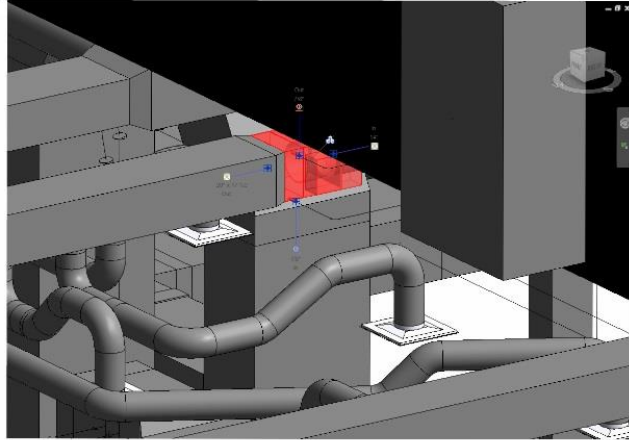
BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION

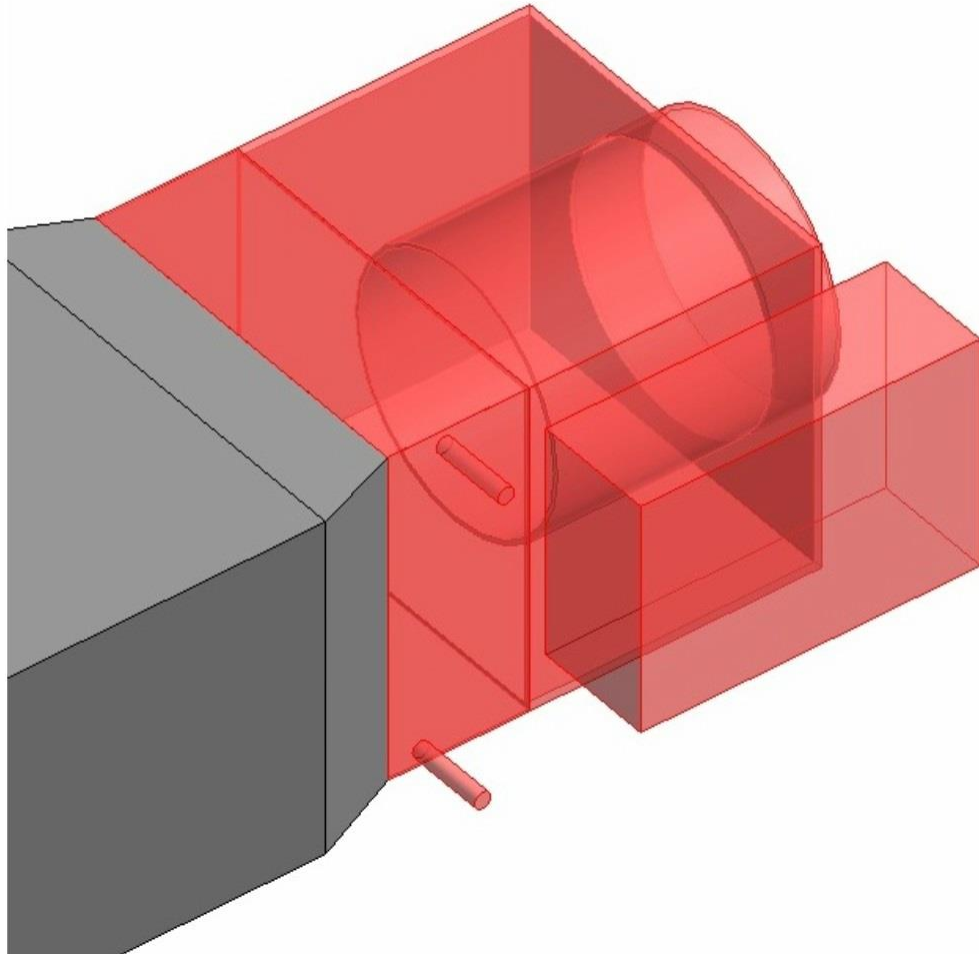
NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	TOTAL PRICE
1	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				
2	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				
3	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				
4	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				
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99	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				
100	BOOSTER PUMP SYSTEM - DOMESTIC WATER CALCULATION				



USC Major Managed Asset Types							Major Managed Asset Types			
Element Name	USC OmniClass Title	OmniClass	MasterFormat	UniFormat	In Type Name as	OmniClass Title	Number	Number	Number	as well as
Electric Lighting Types:							0		0	
Fluorescent Interior Lighting Fixtures	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	FLUOR INT LT FIX	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	FLUOR INT LT FIX
Halogen Interior Lighting Fixtures	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	HAL INT LT FIX	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	HAL INT LT FIX
High Intensity Discharge Interior Lighting Fixtures	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	HID INT LT FIX	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	HID INT LT FIX
Incandescent Interior Lighting Fixtures	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	INCAND INT LT FIX	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	INCAND INT LT FIX
Light Emitting Diode Interior Lighting Fixtures	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	LED INT LT FIX	Non Weather Rated Lighting Fixtures	23 35 47 11 11	26 51 13	D5040	LED INT LT FIX
Fluorescent Exterior Lighting Fixtures	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	FLUOR EXT LT FIX	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	FLUOR EXT LT FIX
Halogen Exterior Lighting Fixtures	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	HAL EXT LT FIX	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	HAL EXT LT FIX
High Intensity Discharge Exterior Lighting Fixtures	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	HID EXT LT FIX	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	HID EXT LT FIX
Incandescent Exterior Lighting Fixtures	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	INCAND EXT LT FIX	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	INCAND EXT LT FIX
Light Emitting Diode Exterior Lighting Fixtures	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	LED EXT LT FIX	Weather Rated Lighting Fixtures	23 35 47 11 15	26 56 00	D5040	LED EXT LT FIX
Mechanical Equipment Types:							0		0	
Air Handler Unit	Air Handling Units	23 33 25 00 00	23 73 00	D3040	AHU	Air Handling Units	23 33 25 00	23 73 00	D3040	AHU
Air Handler Unit- Customized Indoor	Customized Indoor Air Handling Units	23 33 25 13 11	23 73 23	D3030	AHU	Customized Indoor Air Handling Units	23 33 25 13 11	23 73 23	D3030	AHU
Air Cool Condensing Unit	Air Cool Condensing Unit	23 33 43 11 00	23 63 13	D3030	ACCU	Air Cool Condensing Unit	23 33 43 11	23 63 13	D3030	ACCU
Condenser- Air Cooled, Split	Air Cooled Condenser Units	23 33 43 11 00	23 63 13	D3030	ACCU	Air Cooled Condenser Units	23 33 43 11	23 63 13	D3030	ACCU
Air Source Heat Pump	Air Source Packaged Heat Pumps	23 33 17 11 11	23 81 43	D3030	ASHP	Air Source Packaged Heat Pumps	23 33 17 11 11	23 81 43	D3030	ASHP
Back Draft Damper	Backdraft Dampers	23 33 29 13 00	23 33 13	E1010	BDD	Backdraft Dampers	23 33 29 13	23 33 13	E1010	BDD
Back Flow Preventer	Backflow Preventors	23 27 31 11 00	33 12 13	D2020	BFP	Backflow Preventors	23 27 31 11	33 12 13	D2020	BFP
Boiler Pump	Boiler Components	23 33 11 23 00	23 52 00	D3030	BP	Boiler Components	23 33 11 23	23 52 00	D3030	BP
Building Management Control Panel	Building Automated Control Panels	23 27 13 13 11	26 24 00	D3060	BMCP	Building Automated Control Panels	23 27 13 11 11	26 24 00	D3060	BMCP
Management Control System	Building Control Systems	23 27 13 13 00	26 24 00	D3060	MCS	Building Control Systems	23 27 13 13	26 24 00	D3060	MCS
Roof Top Unit	Built Up Rooftop Air Handling Units	23 33 25 11 13	23 74 13	D3040	RTU	Built Up Rooftop Air Handling Units	23 33 25 11 13	23 74 13	D3040	RTU
Butterfly Valves	Butterfly Valves	23 27 31 17 00	35 20 19	D2020	BFV	Butterfly Valves	23 27 31 17	35 20 19	D2020	BFV
Monitoring System, Carbon Monoxide	Carbon-Monoxide Detection Sensors	23 75 65 14 17	28 31 49	D3069	COMS	Carbon-Monoxide Detection Sensors	23 75 65 14 17	28 31 49	D3069	COMS
Centrifugal Fans	Centrifugal Fans	23 33 31 19 13	23 34 16	D3060	CF F	Centrifugal Fans	23 33 31 19 13	23 34 16	D3060	CF F
Chilled Water Pump	Centrifugal Pumps	23 27 17 13 00	23 20 00	D3050	CF CWP	Centrifugal Pumps	23 27 17 13	23 20 00	D3050	CF CWP
Centrifugal Separator	Centrifuge Liquid Separators	23 27 55 35 11	43 22 23	D3093	CF S	Centrifuge Liquid Separators	23 27 55 35 11	43 22 23	D3093	CF S
Check valve	Check Valves	23 27 31 19 00	49 02 00	D3020	CHKV	Check Valves	23 27 31 19	49 02 00	D3020	CHKV
Heat Shift Water Chiller	Chillers	23 33 21 00 00	23 64 00	D3030	HSWC	Chillers	23 33 21 00	23 64 00	D3030	HSWC
Air Cooled Chiller	Chillers	23 33 21 13 00	23 64 00	D3030	ACCH	Chillers	23 33 21 13	23 64 00	D3030	ACCH
Commercial Boilers	Commercial Boilers	23 33 11 00 00	23 52 00	D3020	BLR	Commercial Boilers	23 33 11 00	23 52 00	D3020	BLR
Air Compressor	Compressors	23 27 21 00 00	22 15 19	D3041	CAIR	Compressors	23 27 21 00	22 15 19	D3041	CAIR
Constant Air Volume Terminal Units	Constant Air Volume	23 33 41 17 11	23 36 16	D3050	CAV					
Cooling Tower	Cooling Towers	23 33 23 00 00	23 65 00	D3030	CT	Cooling Towers	23 33 23 00	23 65 00	D3030	CT
Electric Duct Heater	Electric HVAC Heaters	23 33 15 25 00	23 71 00	D3041	ELEC DCT HT	Electric HVAC Heaters	23 33 15 25	23 71 00	D3041	ELEC DCT HT
Generator, Emergency	Electrical Generators	23 35 11 00 00	48 10 00	D3040	EMER GEN	Electrical Generators	23 35 11 00	48 10 00	D3040	EMER GEN
Turbine meter assembly	Electrical Meters	23 35 25 11 00	35 20 19	F1059	TURB M ASSY	Electrical Meters	23 35 25 11	35 20 19	F1059	TURB M ASSY
Elevator Machine	Elevators	23 32 11 11 00	14 20 00	D1010	ELEV MACH	Elevators	23 32 11 11	14 20 00	D1010	ELEV MACH
Grilles Exhaust Air	Exhaust Air Grilles	23 33 49 23 11	23 37 13	D3040	GRL	Exhaust Air Grilles	23 33 49 23 11	23 37 13	D3040	GRL
Expansion Tanks	Expansion Tanks	23 27 29 19 00	23 71 13	D3020	ETK	Expansion Tanks	23 27 29 19	23 71 13	D3020	ETK

1 Nomenclature





NOMENCLATURE

Family Name

Type Name

Type Description

Instance Name

Instance Description

REFERENCE:



Building Information Modeling
(BIM) Guidelines *version 1.6*

For Design Bid Build Contracts

USC Capital Construction Development
and Facilities Management Services

FINAL DRAFT_April 18, 2012

1 5.2 NOMENCLATURE

Naming conventions for equipment types should be **succinct, useful and descriptive**. The names provided should allow for easy identification and be easily understood in order to facilitate the operation, repair and maintenance of USC equipment (Page 11)

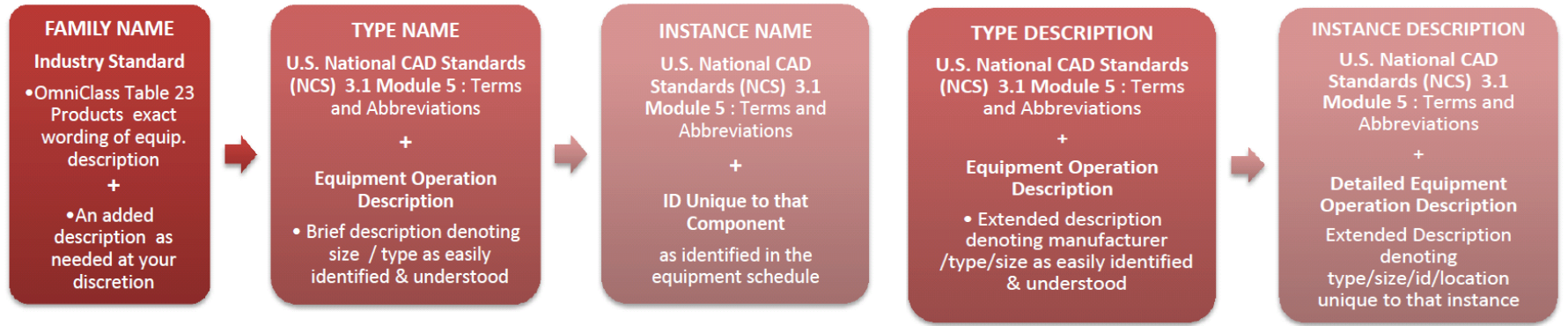
2 APPENDIX C

(Page 34)

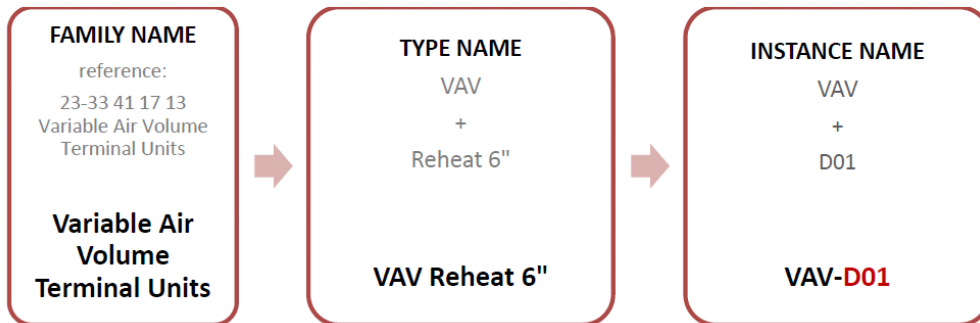
3 Revit Naming Requirements

.pptx
online

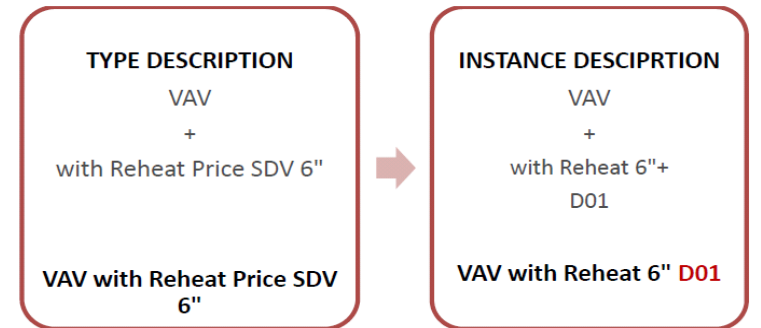
Nomenclature Requirements



For example: Variable Air Volume (VAV) Box with ID D01, the Type and Instance Names:

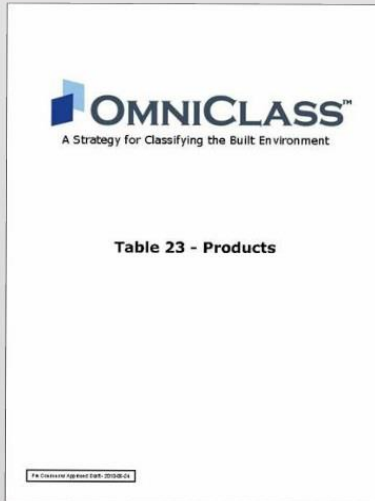


e: Variable Air Volume (VAV) Boxes Type and Instance Descriptions:

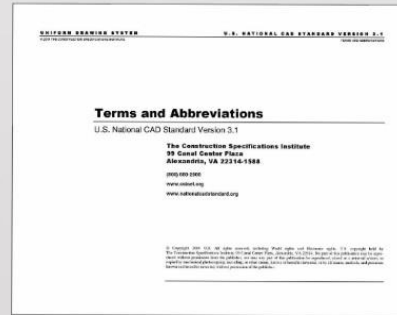


Nomenclature Legacy Sources

Family Names



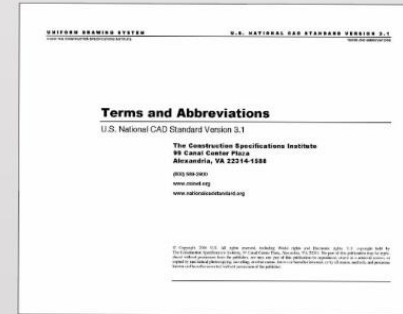
Type Name



Type Description

- Further description of type names at your discretion
- No legacy source required

Instance Name

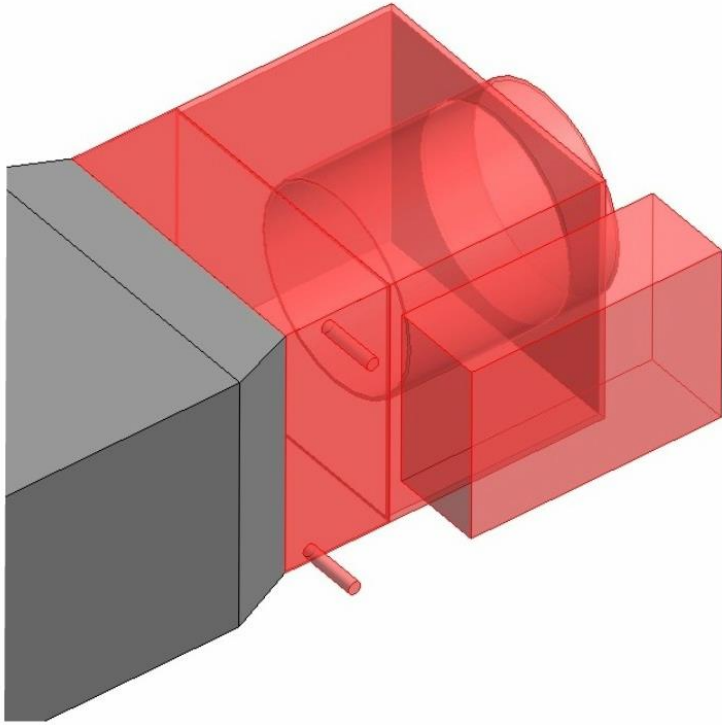


Instance Description

- Further description of instance names at your discretion
- No legacy source required

Parameters / Fields/ Data

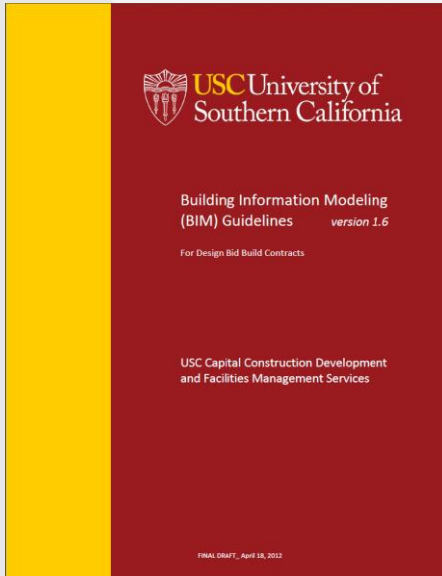
Parameters and Data Check



1. USC Master Attributes
2. Scheduled Data
3. COBieData
4. Extended Data

1. USC Master Attributes

REFERENCE:



5.1 SHARED PARAMETERS

(Page 11)

APPENDIX B

for required
parameter fields for **ALL**
MEPF system families.
(Page 29)

Parameters / Fields/ Data

DATA 1: USC MASTER ATTRIBUTES

USC Revit Parameters List (excel)

REVIT PARAMETER NAME	DESCRIPTION	UNITS	FORMAT/EXAMPLE	TYPE / INSTANCE	SYSTEM OR SHARED PARAMETER	GROUP UNDER (IN REVIT)	PLACE INTO WHICH REVIT CATEGORIES?(INREVIT/REVIT)
1 USC Site Code	USC Site Code Designation - Obtain official code from USC	N/A	UPC1	Type	Shared	Identity Data	Project Information
2 USC Building Number	USC Building Number Designation - Obtain official number from USC	N/A	0010	Type	Shared	Identity Data	Project Information
3 USC Floor Number	USC Floor Number Designation - Obtain official numbers from USC	N/A	N/A , or 1, 2, 3, M, B	Instance	Shared	Identity Data	Sheets
4 USCEquipmentNumber	Unique id assigned to selected pieces of USC equipment - Obtain official number from USC	N/A	1007040	Instance	Shared	Identity Data	Major Equipment & Element Categories *
5 USCEMS Id	Unique id assigned to selected pieces of USC equipment for Energy Management purposes - Obtain from USC	N/A	SCX-VAV-D01	Instance	Shared	Identity Data	Major Equipment Categories * & Rooms
6 Number	USC Room Number Designation. Obtain official Room Numbers from USC.	N/A	104B	Instance	System	Identity Data	Rooms, Room Tags, Spaces, Space Tags js
7 Name	USC Room Name Designation. Obtain official Room Names from USC	N/A	Office	Instance	System	Identity Data	Rooms, Room Tags, Spaces, Space Tags js
8 OmniClassNumber	Corresponding OmniClass XX-XX XX XX XX number from Table 23	XX-XX XX XX XX	23-27 15 00	Type	Shared	Identity Data	Major Equipment & Element Categories *
9 OmniClassTitle	Corresponding OmniClass description to the XX-XX XX XX XX OmniClass number from Table 23	Exact OmniClass Description	Building Automation and C	Type	Shared	Identity Data	Major Equipment & Element Categories *
10 UniFormatNumber	Corresponding products UniFormat number	XXXXX	D3060	Type	Shared	Identity Data	Major Equipment & Element Categories *
11 MasterFormatNumber	Corresponding products MasterFormat number	XX XX XX XX	25 13 00	Type	Shared	Identity Data	Major Equipment & Element Categories *
12 TypeName	Type Names according to the USC Nomenclature Guidelines*	N/A	VAV Reheat 6 Inches	Type	Shared	Identity Data	Major Equipment & Element Categories *
13 TypeDescription	Type Descriptions according to USC Nomenclature Guidelines*	N/A	VAV with Reheat Price SDwes	Type	Shared	Identity Data	Major Equipment & Element Categories *
14 InstanceName	Instance Names according to USC Nomenclature Guidelines*	N/A	VAV-D01	Instance	Shared	Identity Data	Major Equipment & Element Categories *
15 InstanceDescription	Instance Descriptions according to USC Nomenclature Guidelines*	N/A	VAV Reheat 6 Inches D01	Instance	Shared	Identity Data	Major Equipment & Element Categories *
notes							
1 Refer to the "Revit Categories" Worksheet in this file to determine which Revit categories to place major equipment and selected architectural element parameters into.							
2 Refer to USC BIM Guidelines version 1.6 Appendix C & USC Revit Naming Requirements.ppt as a guide							
3 The parameter, USCEquipmentNumber, does not apply for for Revit Architecture models							
4 The parameter, USCEMSId, does not apply for for Revit Architectural Elements but still applied to Revit Architectural Rooms							

USC Revit Parameters List (Excel)

1 MAJOR EQUIPMENT REVIT CATEGORIES

- Air Terminals
- Areas
- Assemblies
- Cable Tray Fittings
- Cable Tray Runs
- Cable Trays
- Communication Devices
- Conduit Fittings
- Conduit Runs
- Conduits
- Data Devices
- Detail Items
- Duct Accessories
- Duct Fittings
- Duct Insulations
- Duct Linings
- Duct Placeholders
- Duct Systems
- Ducts
- Electrical Circuits
- Electrical Equipment
- Electrical Fixtures
- Fire Alarm Devices
- Flex Ducts
- Flex Pipes
- Generic Models
- Grids
- HVAC Zones
- Levels
- Lighting Devices
- Lighting Fixtures
- Mass
- Materials
- Mechanical Equipment
- Nurse Call Devices
- Parts
- Pipe Accessories
- Pipe Fittings
- Pipe Insulations
- Pipe Placeholders
- Pipes
- Piping Systems
- Plumbing Fixtures
- Project Info
- Rooms
- Security Devices
- Sheets
- Spaces
- Sprinklers
- Switch Systems
- Telephone Devices
- Views
- Wire

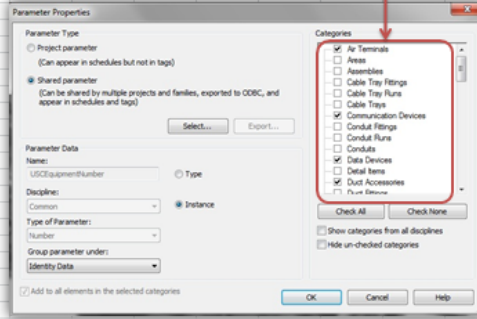


Fig. 1: Project Parameter dialog box in Autodesk® Revit highlighting the category box. Refer to list on the left to determine which category should parameter for major equipment to be attached to.

2 MAJOR ARCHITECTURAL ELEMENTS REVIT CATEGORIES

- Areas
- Assemblies
- Casework
- Ceilings
- Columns
- Curtain Panels
- Curtain Systems
- Curtain Wall Mullions
- Detail Items
- Doors
- Electrical Equipment
- Electrical Fixtures
- Floors
- Furniture
- Furniture Systems
- Generic Models
- Grids
- Levels
- Lighting Fixtures
- Mass
- Materials
- Mechanical Equipment
- Parking
- Parts
- Planting
- Plumbing Fixtures
- Project Information
- Railings
- Ramps
- Roads
- Roofs
- Rooms
- Shaft Openings
- Sheets
- Site
- Specialty Equipment
- Stairs
- Structural Beam Systems
- Structural Columns
- Structural Foundations
- Structural Framing
- Topography
- Views
- Walls
- Windows

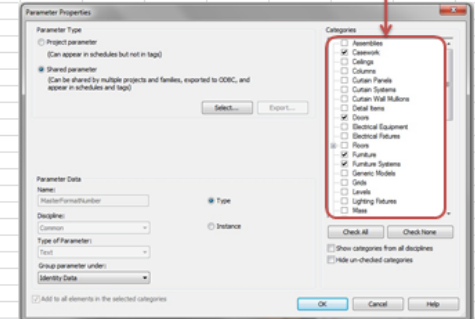
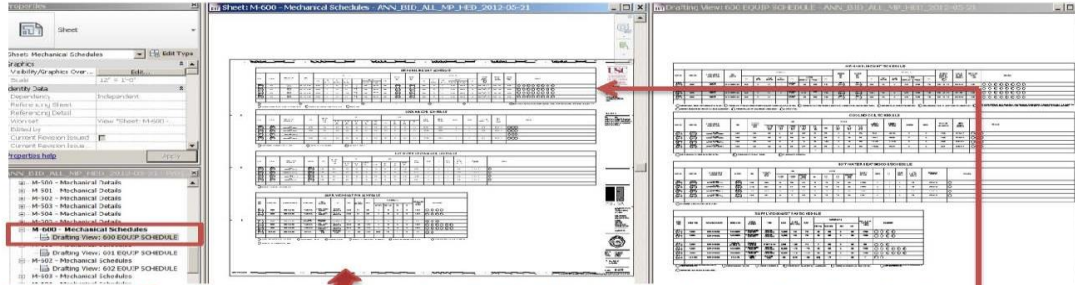


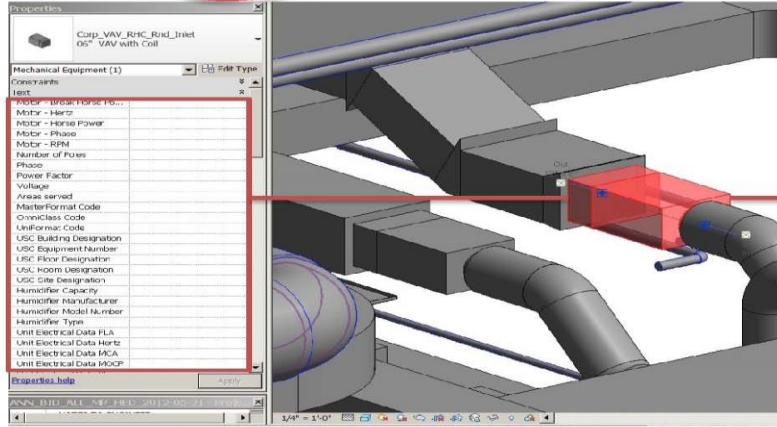
Fig. 2: Project Parameter dialog box in Autodesk® Revit highlighting the category box. Refer to list on the left to determine which category should parameter for major architectural elements to be attached to.

Parameters / Fields/ Data

DATA 2: Schedule Data



5 Scheduled data and parameters should come from the Revit Model and not from a drafting view in Revit



6 Insert Parameters needed here to make schedules in Revit

Design Modeling

Schedule from the model

The screenshot displays the Revit software interface with the following components:

- Top Ribbon:** Includes tabs for Home, Insert, Annotate, Analyze, Architect, Collaborate, View, Manage, Add-Ins, and Modify. The 'View' tab is active, showing options like 3D View, Section, Plan Views, and Schedules.
- Properties Panel (Left):** Shows the '3D View' properties for the selected element. The 'View Scale' is set to 1/8" = 1'-0".
- Project Browser (Bottom Left):** Lists project elements, including 'Schedules/Quantities' and 'AIR HANDLING UNIT SCHED'.
- Schedule: AIR HANDLING UNIT SCHEDULE - (Center):** A data table with the following content:

ITEM	MANUFACTURER	LOCATION	CFM	STATIC PRESSURE (IN.WC)			RPM
				EXT SP	TOTAL SP		
AHU-D1	ENERGY LABS	Roof	7000 CFM	2.00 in-wg	4.00 in-wg	1724	
- 3D View: 3D for NWC Export - (Right):** A 3D perspective view of the air handling unit and its associated ductwork and piping.
- Status Bar (Bottom):** Shows 'Plumbing : Pipes : Pipe Types : P-CD', 'Shared Levels and Grids', and 'Main Model'.

DATA 3: Master Attributes as it relates to COBie Data

6.3.4 COBie DESIGN DATA

The Design Team shall submit the design data in conformance with the most current version of COBie. This data set shall include those COBie “designer” worksheets related to the architectural program. The Designer shall specifically identify spatial and systems zoning to reflect the space circulation zones and building service zones that are reflected in the design drawings and specifications. The following COBie Design worksheets shall be provided in the Schematic Design Set:

- **Contact** (all fields)
- **Facility** (all fields)
- **Floor** (all fields)
- **Space** (all fields)
- **Zone** (all fields)
- **Type** (Name, CreatedBy, CreatedOn, Category, Description, AssetType, ExtSystem, ExtObject, ExtIdentifier)
- **Component** (Name, CreatedBy, CreatedOn, TypeName, Space, Description, ExtSystem, ExtObject, ExtIdentifier)
- **System** (all fields)

6.3.5 COLLISION DETECTION AND CONSTRUCTABILITY

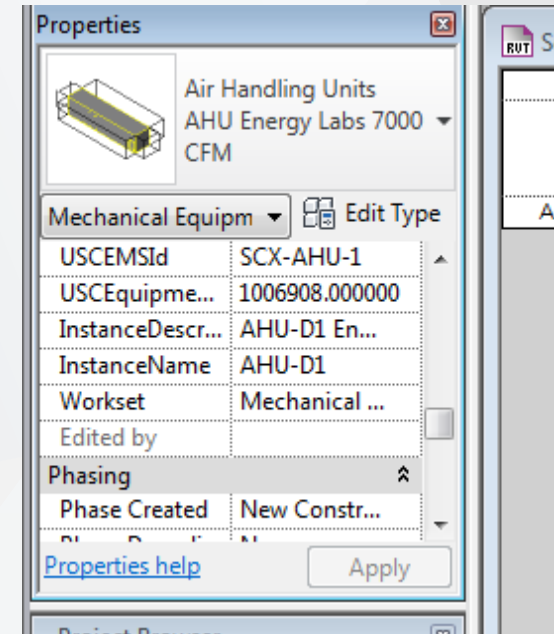
Repeat process described in [Appendix F](#).

6.4 CONSTRUCTION DOCUMENTS PHASE

6.4.1 GENERAL

The Design Team shall continue development of the models created in the Design Development Phase. Parametric links shall be maintained within the models to enable automatic generation of all plans, sections, elevations, custom details and schedules as well as 3D views. Deliverables are required as stated in the Deliverable and Milestones schedule, [item #6.1](#).

See [Appendix A](#) for the list of minimum required model elements.



(Page 12 -19)

Parameters / Fields/ Data

DATA 3: COBie Construction Data

SpaceID	FloorID	SpaceFunction	SpaceReferenceID	ExternalSystemName	ExternalNameID	SpaceNumber	SpaceName
44	1.Level 1	15 11 34 11 Office	SpaceIDPick			1109	UA
45	1.Level 1	75 41 99 Other Special Storage Space	SpaceIDPick			1110	Storage
46	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1111	Interview Room
47	1.Level 1	81 21 99 Other Facility Equipment Service Space	SpaceIDPick			1112	Elec
48	1.Level 1	15 11 34 11 Office	SpaceIDPick			1113	Cashier Booth
49	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1114	Interview Room
50	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1115	Interview Room
51	1.Level 1	15 11 34 11 Office	SpaceIDPick			1116	Officer
52	1.Level 1	15 11 34 11 Office	SpaceIDPick			1117	UA
53	1.Level 1	11 11 99 Other Gathering Space	SpaceIDPick			1118	Interview Window
54	1.Level 1	11 11 99 Other Gathering Space	SpaceIDPick			1200	Screening
55	1.Level 1	51 31 14 Queuing Space	SpaceIDPick			1201	Waiting Area, Queue Area, Writing Area
56	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1202	Interview Room
57	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1203	Interview Room
58	1.Level 1	11 11 99 Other Gathering Space	SpaceIDPick			1204	Writing Area
59	1.Level 1	11 21 41 Interview Room	SpaceIDPick			1205	Interview Room
60	1.Level 1	51 31 11 Waiting Room	SpaceIDPick			1206	Waiting Area
61	1.Level 1	15 21 17 11 Maintenance Closet (incl Janitor's Closet)	SpaceIDPick			1207	Janitor Closet/Storage
62	1.Level 1	41 11 14 21 Restroom	SpaceIDPick			1208	Restroom - Applicants (male)
63	1.Level 1	41 11 14 21 Restroom	SpaceIDPick			1209	Restroom - Applicants (female)
64	2.Level 2	85 21 11 Stairway	SpaceIDPick			2000A	Stair

User: [Jose Delgado](#), [University of Southern California](#) | System Role: Organization Admin | Project: [Cinematic Arts Phase II](#)

U-1

Attributes Components Documents Spares Jobs

AHU-1	Manufacturer:	Energy Labs
23-33 25 00 Air Handling Units	Warranty Duration Parts:	1
Fixed	Warranty Duration Labor:	1
	Warranty Description:	PARTS AND LABOR
	Warranty Duration Unit:	year
	Part Number:	
	MasterFormat:	
	UniFormat:	
	Contractor:	
	Designer:	

- System
- Zone
- Floor
- Facility
- Import/Export
- Reports
- BIM Server
- Activities
- Project Setup
- Integration

Model Number: CHW-FCL-H

Warranty Guarantor Parts: Energy Labs

Warranty Guarantor Labor: Energy Labs

Replacement Cost: 390000

Expected Life: 20

Facility: SCHOOL OF CINEMATIC ARTS BUILDING I

COBie > Type > Type Profile

Dashboard

COBie

Type

Component

Space

Document

System

Zone

Floor

Facility

Import/Export

Reports

BIM Server

Activities

Project Setup

Integration

Type Name: AHU-1

Type Profile

Attributes

Components

Documents

Spares

Jobs

Description:

AHU-1

Manufacturer:

Energy Labs

Category:

23-33 25 00 Air Handling Units

Warranty Duration Parts:

1

Asset Type:

Fixed

Warranty Duration Labor:

1

Model Number:

CHW-FCL-H

Warranty Description:

PARTS AND LABOR

Warranty Guarantor Parts:

Energy Labs

Warranty Duration Unit:

year

Warranty Guarantor Labor:

Energy Labs

Part Number:

Replacement Cost:

390000

MasterFormat:

Expected Life:

20

UniFormat:

Facility:

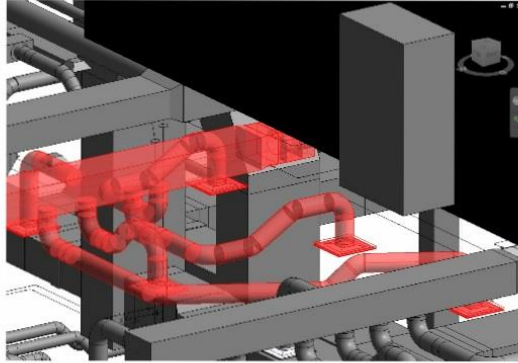
SCHOOL OF CINEMATIC ARTS BUILDING I Contractor:

Designer:

Edit

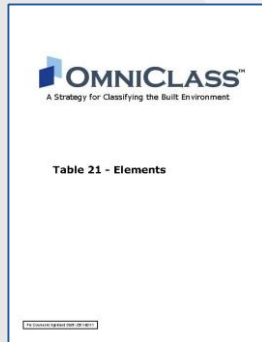
Delete

3 Systems



Mechanical Supply Air AHU-D1

OmniClass Table 21
21-04 30 60 10
HVAC – Ventilation – Supply
Air



Abbreviation : U.S.
National CAD
Standards

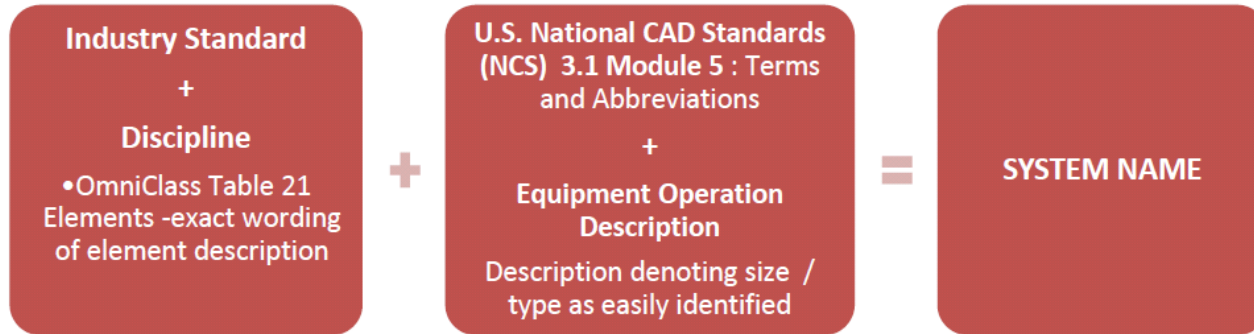
Term	Abbreviation	Related Abbreviation	Notes
acoustic	ACST		
acoustic ceiling	—		acoustic sealant
acoustical ceiling tile	ACT		
acoustical insulation	ACOIS INSL		
acoustical panel	ACOIS PNL		
acoustical panel ceiling	APC		
acoustical plaster	—		acoustical finish
acoustical tile ceiling	ATC		
acoustical wall treatment	AWT		
acrylic	ACR		
acrylonitrile butadiene styrene	ABS	abschda	
acid vinyl	AV	acid waste; architectural voorwerk	
addendum	ADDN		
addition	ADDL		
adhesive	ASH		
adjust	ASJ	adjusting; adjustable	
adjusting	ADJ	adjuster; adjustable	
adjustable	ADJ	adjuster; adjustable	
administration	ADMN	adjuster; adjusting	
aggregate	AGGR		
aggregate base course	ABC	Associated Building and Construction	
air conditioner	AC		
air conditioning unit	AC-UNIT		
air cooled condensing unit	ACCU		
air handling unit	AHU		
air pressure drop	APD		
air pressure return line	APR		
air separator	AS	smokester switch	
air supply unit	ASU		
air vent	AV	acid vent; audio visual	
air water pump	AWP		
alarm	ALSI		

Identification that **further** defines a piece of equipment from others

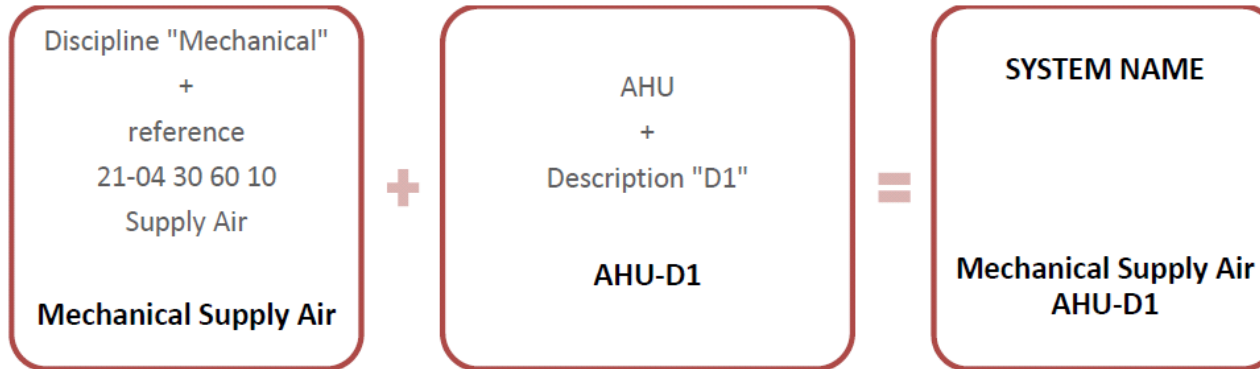
(usually a tag number or mark from the schedules)

“Supply Air” + “AHU” + “D1”

Systems Nomenclature Requirements



For example: Supply Air System for Air Handling Unit (AHU) D-1 = Mechanical Supply Air AHU-D1



For systems that are not directly connected to a piece of equipment, follow the convention below:

Systems: Record Design Models

3140 SCX MEP_2012-09-18 - 3D View: 3D with Building Ghosted

Modify | Duct Systems

Properties

Duct Systems (1)

Mechanical

System Name: Mechanical Supply Air V...
Static Pressure: 3.000" H₂O

3140 SCX MEP_2012-09-18 - System Browser

Systems	Flow	Size
Mechanical (45 systems)		
Exhaust Air		
Return Air		
Supply Air		
Air Handling Units: Arid Energy Labs 7000 CFM	5336 CFM	30"
Mechanical Supply Air FCU-01	115 CFM	
Mechanical Supply Air FCU-02	536 CFM	
Mechanical Supply Air SF-01	2000 CFM	
Mechanical Supply Air SG-1 1st Floor Clean Workshop 102	200 CFM	
Mechanical Supply Air SG-1 1st Floor Mens 181	180 CFM	
Mechanical Supply Air SG-1 1st Floor Womens 180	200 CFM	
Mechanical Supply Air SG-1 2nd Floor Dressing Female 209	210 CFM	
Mechanical Supply Air SG-1 2nd Floor Dressing Male 210	200 CFM	
Mechanical Supply Air SG-1 2nd Floor Womens 280	220 CFM	
Mechanical Supply Air SG-1 2nd FloorWorkshop and Stor 213	110 CFM	
Mechanical Supply Air SG-1 2nd FloorRepair Store Equip 214	500 CFM	
Mechanical Supply Air SG-1 Mens 2nd Floor281	240 CFM	
Mechanical Supply Air VAV-001	190 CFM	
Mechanical Supply Air VAV-002	175 CFM	
Mechanical Supply Air VAV-003	530 CFM	
Mechanical Supply Air VAV-004	170 CFM	
Mechanical Supply Air VAV-005	160 CFM	
Mechanical Supply Air VAV-006	100 CFM	
Mechanical Supply Air VAV-011	290 CFM	
Mechanical Supply Air VAV-012	570 CFM	
Mechanical Supply Air VAV-021	330 CFM	
Mechanical Supply Air VAV-020	220 CFM	
Mechanical Supply Air VAV-022	60 CFM	
Supply Air Ventilation Registers Rectangular: SA REG 1...	60 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 1...	40 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 2...	180 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 2...	70 CFM	6"
Variable Air Volume Terminal Units: CAV Relief & Dis...	70 CFM	10"
Mechanical Supply Air VAV-004	560 CFM	
Mechanical Supply Air VAV-005	710 CFM	
Mechanical Supply Air VAV-006	140 CFM	
Mechanical Supply Air VAV-007	160 CFM	
Mechanical Supply Air VAV-008	420 CFM	

3140 SCX MEP_2012-09-18 - 3D View: 3D with Building Ghosted

Modify | Duct Systems

Properties

Duct Systems (1)

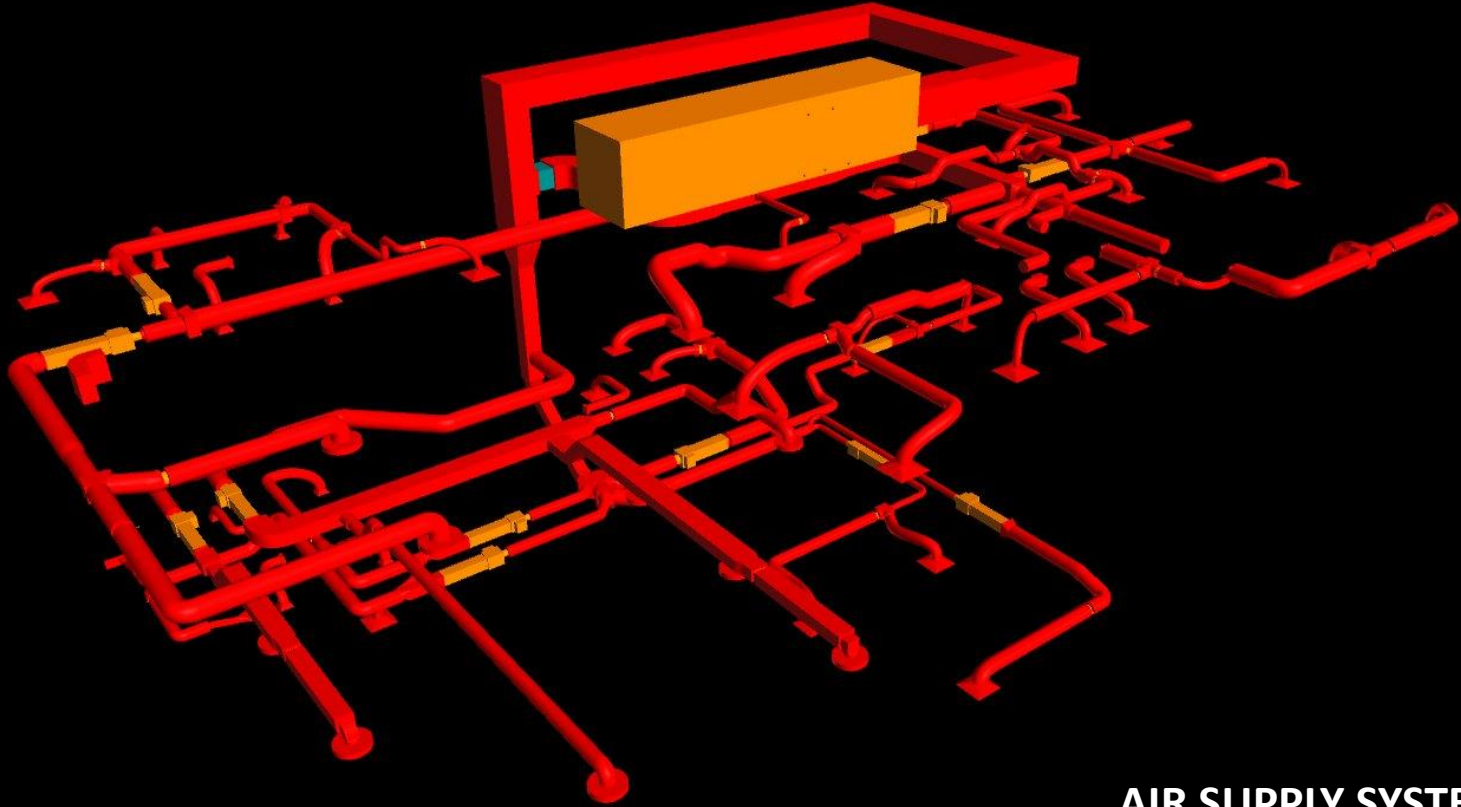
Mechanical

System Name: Mechanical Supply Air V...
Static Pressure: 3.000" H₂O

3140 SCX MEP_2012-09-18 - System Browser

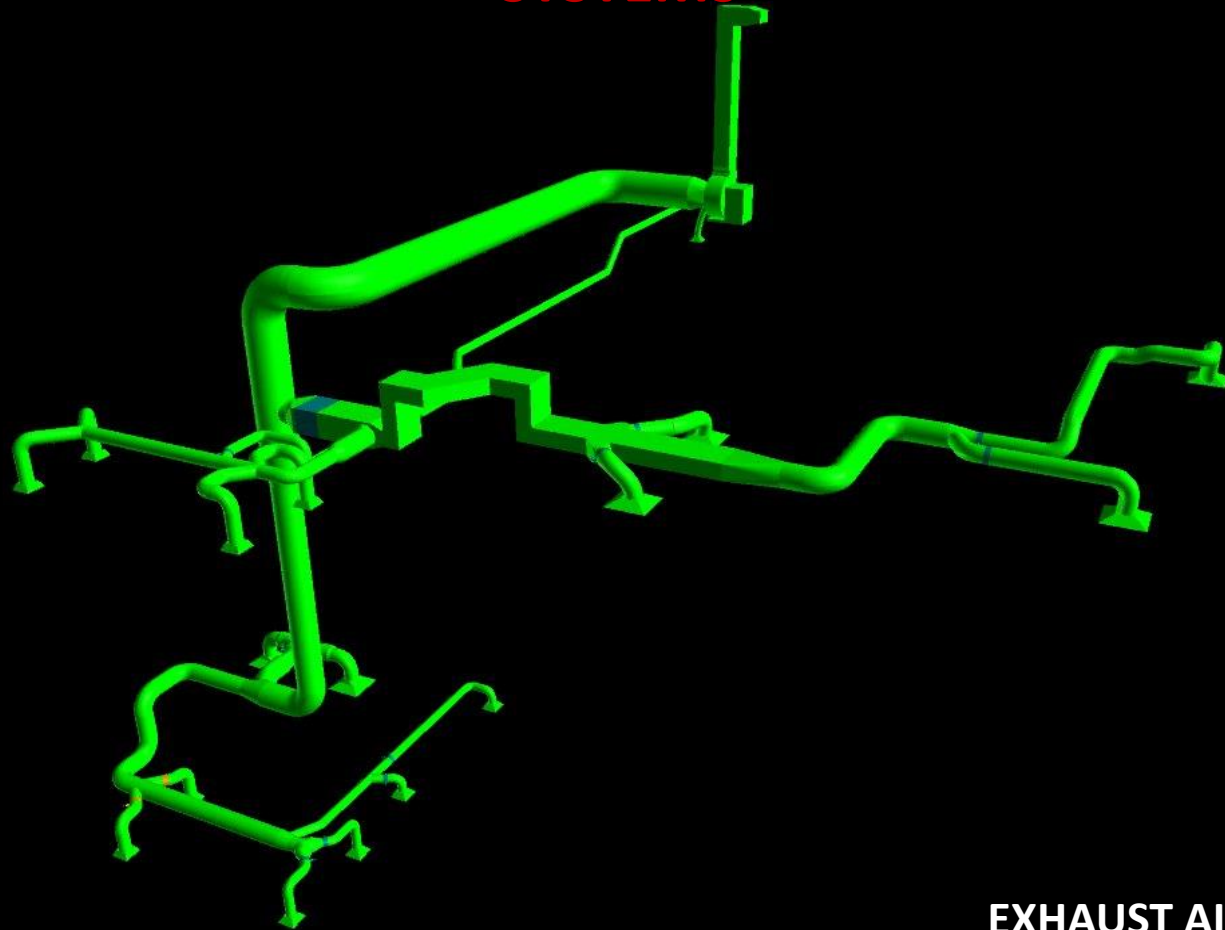
Systems	Flow	Size
Mechanical (45 systems)		
Exhaust Air		
Return Air		
Supply Air		
Air Handling Units: Arid Energy Labs 7000 CFM	5336 CFM	30"
Mechanical Supply Air FCU-01	115 CFM	
Mechanical Supply Air FCU-02	536 CFM	
Mechanical Supply Air SF-01	2000 CFM	
Mechanical Supply Air SG-1 1st Floor Clean Workshop 102	200 CFM	
Mechanical Supply Air SG-1 1st Floor Mens 181	180 CFM	
Mechanical Supply Air SG-1 1st Floor Womens 180	200 CFM	
Mechanical Supply Air SG-1 2nd Floor Dressing Female 209	210 CFM	
Mechanical Supply Air SG-1 2nd Floor Dressing Male 210	200 CFM	
Mechanical Supply Air SG-1 2nd Floor Womens 280	220 CFM	
Mechanical Supply Air SG-1 2nd FloorWorkshop and Stor 213	110 CFM	
Mechanical Supply Air SG-1 2nd FloorRepair Store Equip 214	500 CFM	
Mechanical Supply Air SG-1 Mens 2nd Floor281	240 CFM	
Mechanical Supply Air VAV-001	190 CFM	
Mechanical Supply Air VAV-002	175 CFM	
Mechanical Supply Air VAV-003	530 CFM	
Mechanical Supply Air VAV-004	170 CFM	
Mechanical Supply Air VAV-005	160 CFM	
Mechanical Supply Air VAV-006	100 CFM	
Mechanical Supply Air VAV-011	290 CFM	
Mechanical Supply Air VAV-012	570 CFM	
Mechanical Supply Air VAV-021	330 CFM	
Mechanical Supply Air VAV-020	220 CFM	
Mechanical Supply Air VAV-022	60 CFM	
Supply Air Ventilation Registers Rectangular: SA REG 1...	60 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 1...	40 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 2...	180 CFM	6"
Supply Air Ventilation Registers Rectangular: SA REG 2...	70 CFM	6"
Variable Air Volume Terminal Units: CAV Relief & Dis...	70 CFM	10"
Mechanical Supply Air VAV-004	560 CFM	
Mechanical Supply Air VAV-005	710 CFM	
Mechanical Supply Air VAV-006	140 CFM	
Mechanical Supply Air VAV-007	160 CFM	
Mechanical Supply Air VAV-008	420 CFM	

SYSTEMS



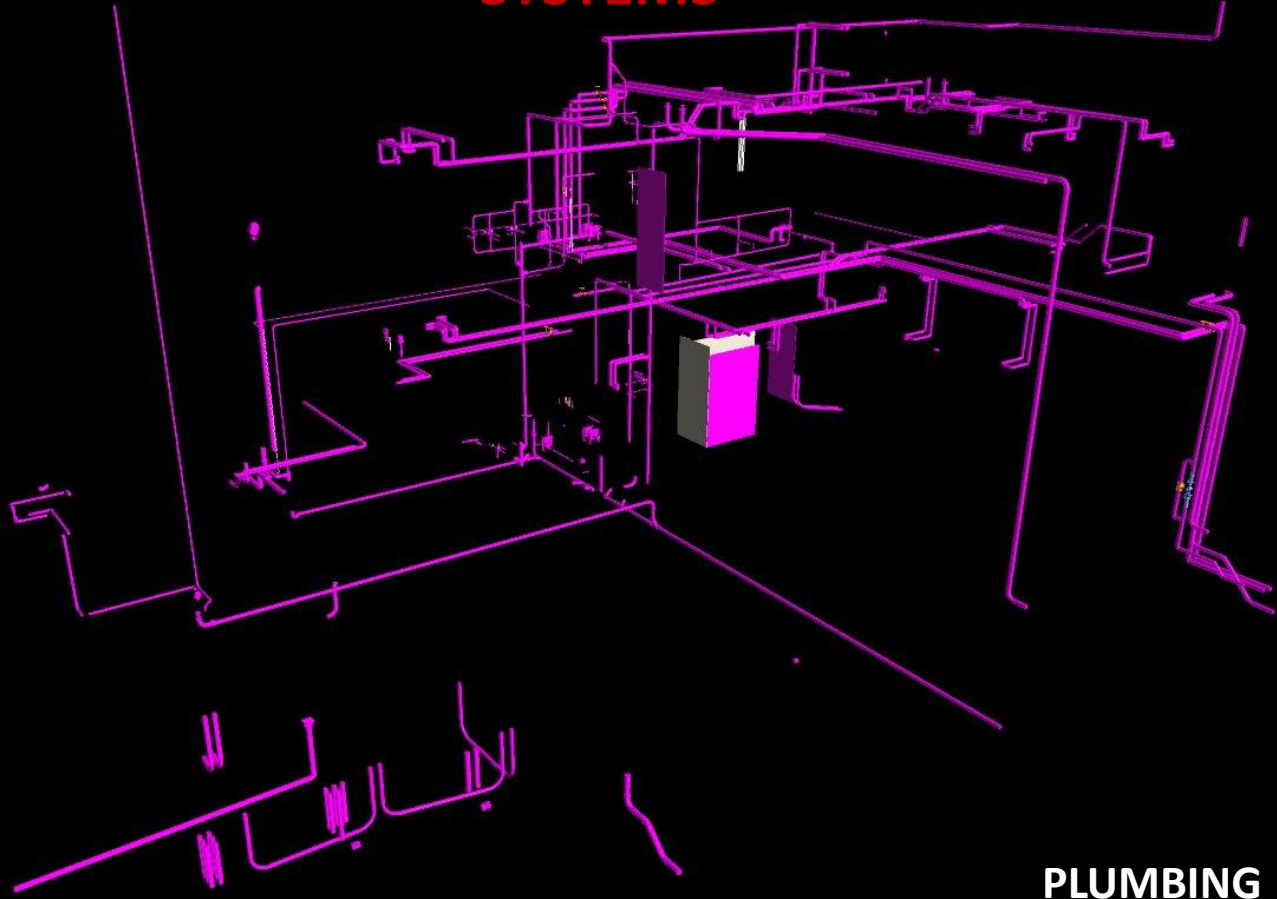
AIR SUPPLY SYSTEM

SYSTEMS

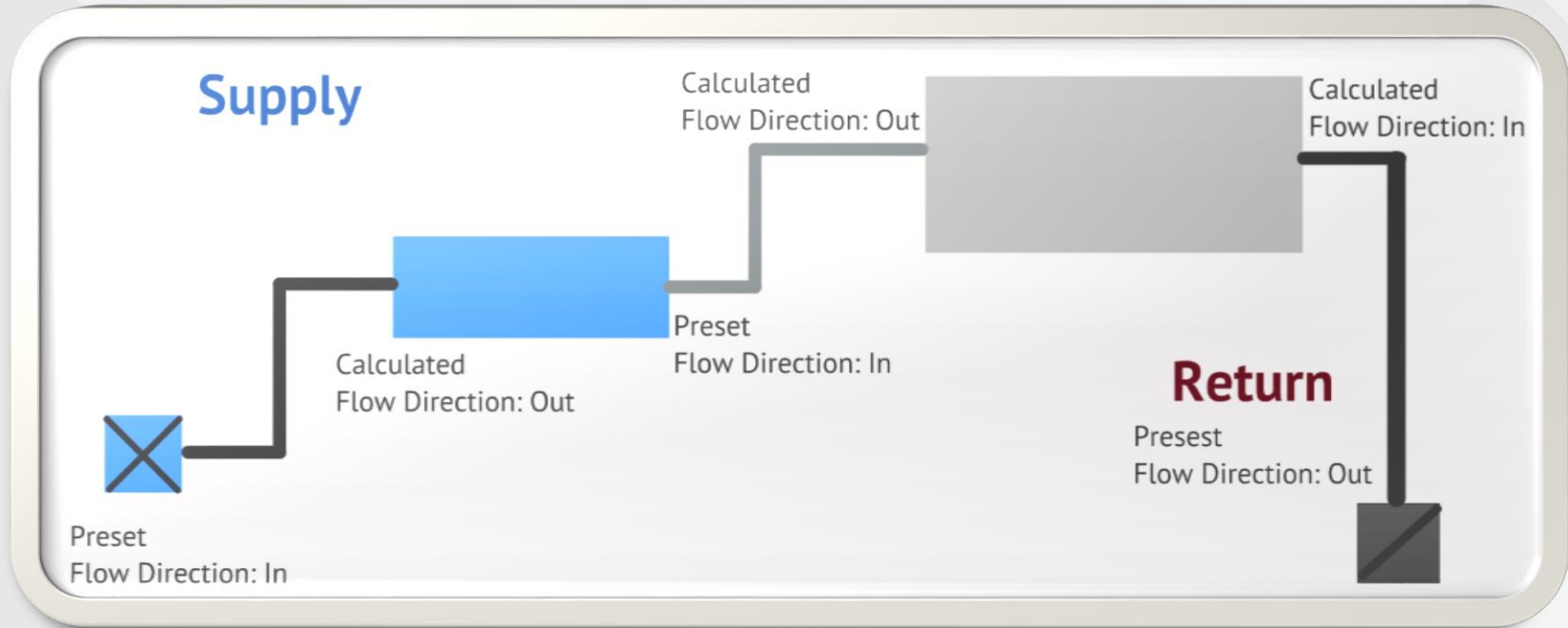


EXHAUST AIR SYSTEM

SYSTEMS



PLUMBING



4 Zones



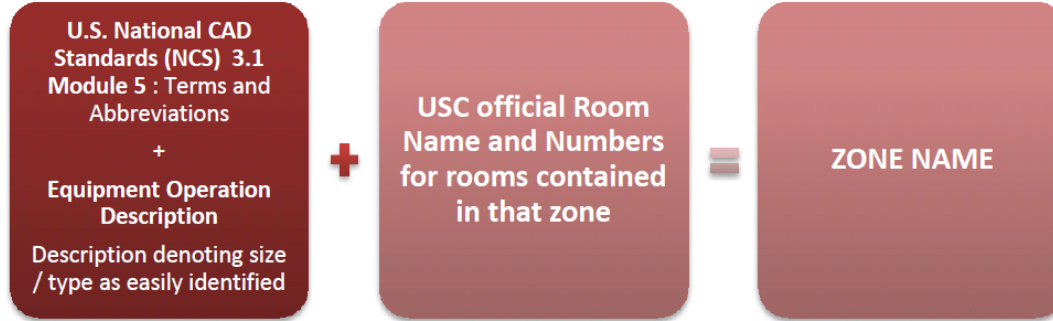
SCX HVAC Zones

- | | | |
|--|---|--|
| FCU D1 Electrical Room 185 | VAV D05 106 Operations | VAV D25 Makeup/Hair 212 |
| FCU D2 Electrical Room 184 | VAV D06 Operations Manager 106 A, Manager 107 A | VAV D26 Wardrobe 211, Office 214A |
| SF D1 Set Stor 104, Set Shop 105 | VAV D11 Mezzanine M100 | VAV D27 Dressing Rooms 209,210 |
| VAV D01 Lobby 100 | VAV D12 Equipment Storage Volume 107-2, Check In-Check Out Station 107B | VAV D28 Conference Room 207 |
| VAV D02 Corridor 100C-1, Restrooms 180,181 | VAV D21 Repair/Stor Equipment 214 | VAV D29 Manager Rooms 204,205,206 |
| VAV D03 Clean Workshop 102 | VAV D23 Restrooms 280, 282 | VAV D210 Corridor 200C-1, Staff Worker 213, Assembly 208 |
| VAV D04 Corridor 100C-3, File Room 103 | VAV D24 Teaming Preview 201 | |

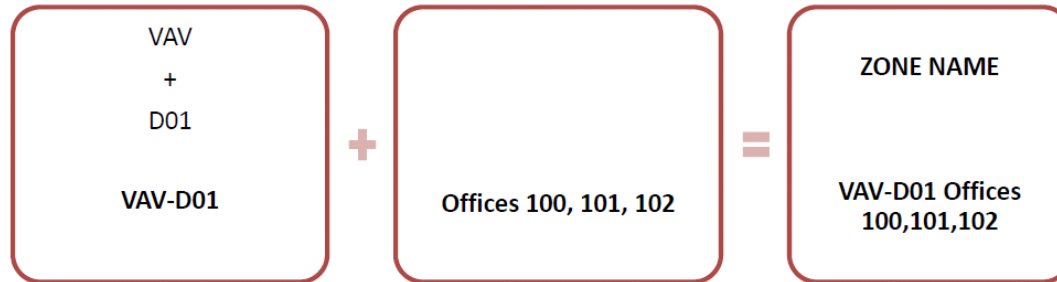


Zones need to be defined and named correctly in the software.

Zones: Nomenclature Requirements



For example: The HVAC Zone associated with VAV Box D01 serving Offices 100,101,102 = **VAV-D01 Offices 100,101,102**

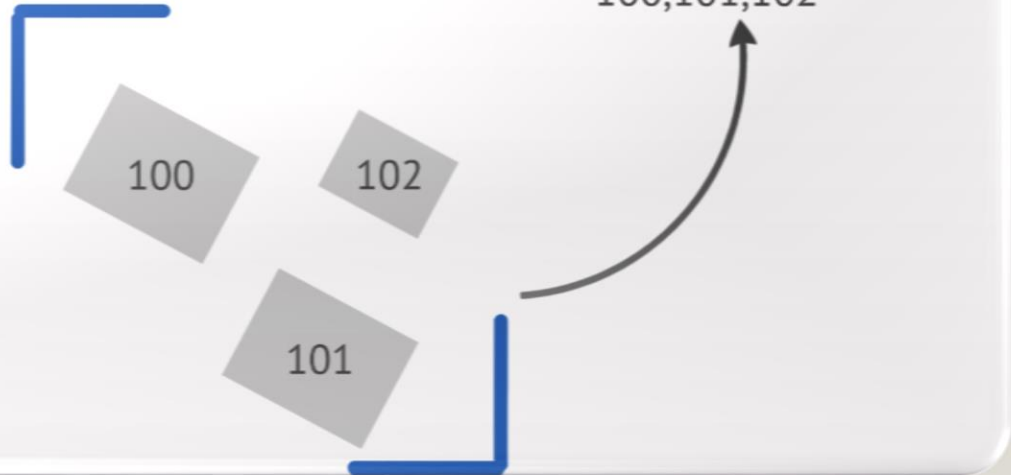


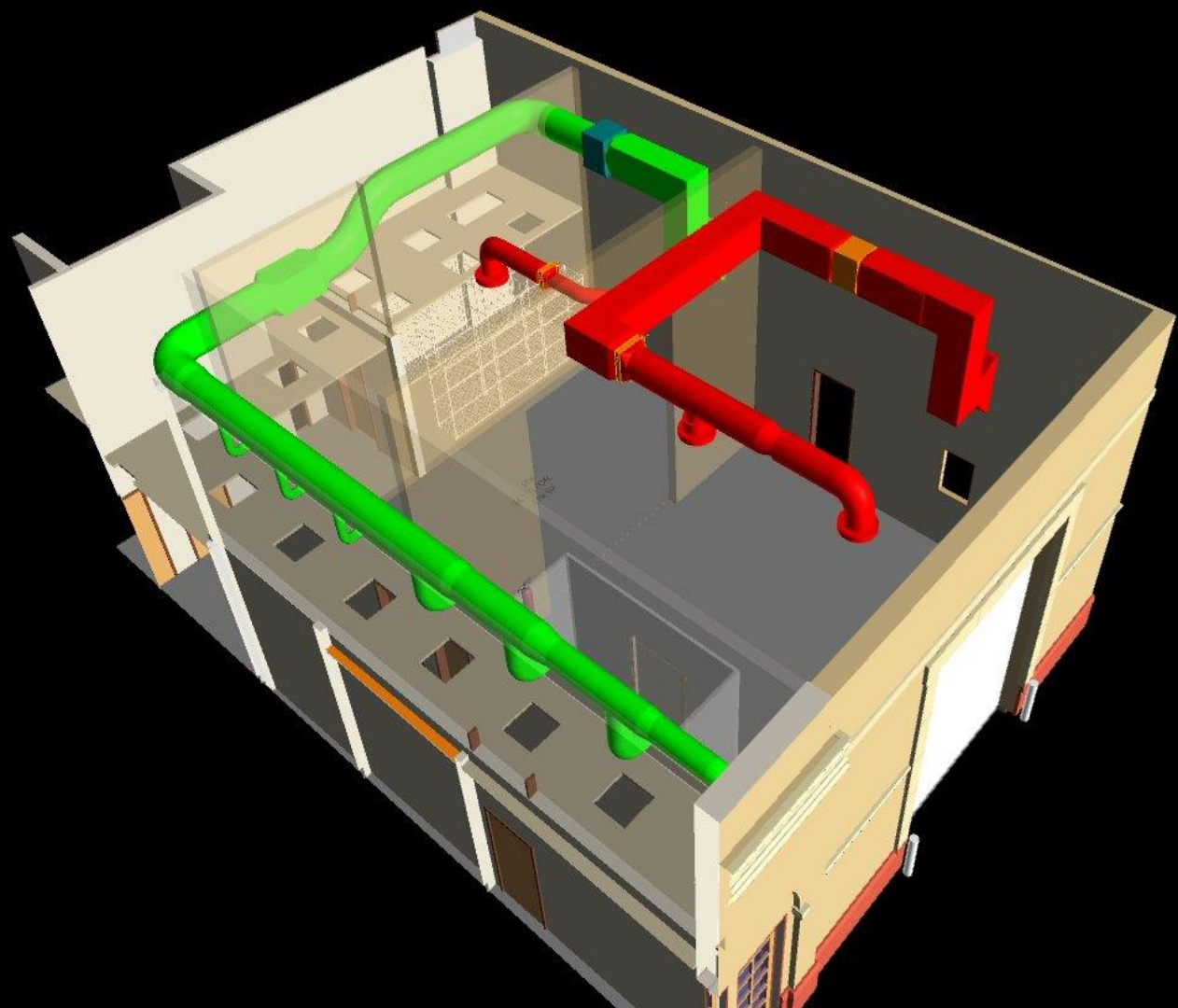
SPACES

Spaces should be named according to the official USC room numbers as provided by Space Management.

Need:

- 1) Spaces to be inserted
- 2) Spaces to be attached to zones
- 3) Zones to be named correctly





VAV-D01 Offices 100, 101, 102

example: HVAC Zone associated with VAV Box D01 serving Offices 100,101,102

National CAD Standard

NCS 3.1 Module 5
abbreviation for Air
Handling Unit is "VAV"

+

Description denoting
'size/type as easily
identified "D01"

VAV-D01

+

**USC Official Room Names
and Numbers for Rooms
contained in that Zone**

Office "100", "101", "102"

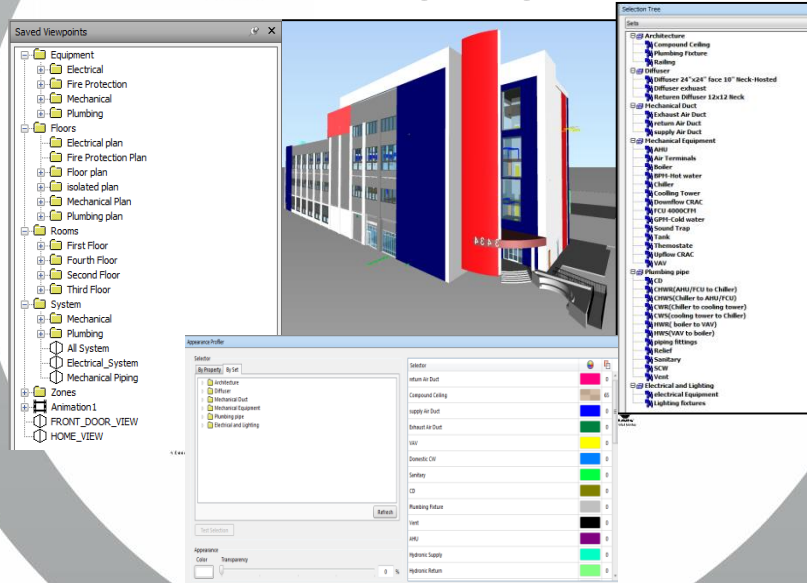
Office 100, 101, 102

=

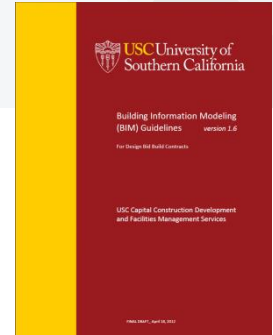
ZONE NAME

**VAV-D01 Offices
100, 101, 102**

5 Model Viewer



1



APPENDIX H: ECODOMUS

The following describes the process used for implementing EcoDomus on USC projects.

1. Configure COBie QC template

USC will set up the Data Acquisition Template in EcoDomus PM, to provide a baseline that all COBie2 requirements can be measured against in the automated QC process. OmniClass based rules are set for the attributes, naming conventions, and documentation, allowing for easy integration of the data with other data sets with the same classification system.

Step 1: Preparing ARCH Revit Model for Synchronization with EcoDomus PM





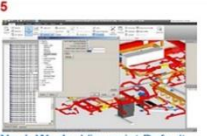

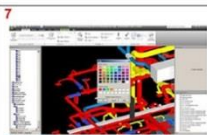

Step 2: Preparing MEP Revit Model for Synchronization with EcoDomus PM

Step 3: Preparing the NavisWorks Models for Uploading into EcoDomus

Step 4: Uploading the NavisWorks Model to EcoDomus

Step 5: Uploading the Data from Revit Model into EcoDomus using BIM CONNECTOR

Step 3: Preparing the NavisWorks Models for Upload to EcoDomus

 <p>1 NavisWorks Open MEP NWC</p>	 <p>2 NavisWorks Change Display Units Options> Interface> Display Units> Linear Units: Feet and Inches, Angular Units: Degrees, Decimal Places: 2, Fractional Display Precision: 1/4"</p>	 <p>3 NavisWorks Change Background Properties to "Graded" View > Background > Graded Hit "Ok"</p>
 <p>4 NavisWorks Turn off all Lines View> Click the "Lines" Button</p>	 <p>5 NavisWorks Viewpoint Default Options Options> Interface> Viewpoint Defaults> Check all 3 boxes, change Default Linear Speed to 6ft/sec</p>	 <p>6 NavisWorks Coloring Systems MEP.nwc Color MEP systems individually, isolate via the Selection Tree> System Type> either by Id, Name or System Classification</p>
 <p>7 NavisWorks Coloring VAV Boxes, Dampers, Filters Differently Select an shade close to each System's color</p>	 <p>8 NavisWorks Merge Arch.nwc file Merge the Arch NavisWorks NWC files into the current session</p>	<p>9 Make DWG's with only Room tags on. Merge into Navis Model and lift 1/4 inch above floor levels for Room ID. When creating views, using the Room Schedule can aid as a checkoff guide.</p>

6 Documents

Air Handling Equipment
FOR

USC
AHJ# PERFORMANCE DATA

Model	Flow	Pressure	Efficiency	...
0101	10	0.1	90	...
0102	15	0.15	88	...
0103	20	0.2	86	...
0104	25	0.25	84	...
0105	30	0.3	82	...
0106	35	0.35	80	...
0107	40	0.4	78	...
0108	45	0.45	76	...
0109	50	0.5	74	...
0110	55	0.55	72	...
0111	60	0.6	70	...
0112	65	0.65	68	...
0113	70	0.7	66	...
0114	75	0.75	64	...
0115	80	0.8	62	...
0116	85	0.85	60	...
0117	90	0.9	58	...
0118	95	0.95	56	...
0119	100	1.0	54	...
0120	105	1.05	52	...
0121	110	1.1	50	...
0122	115	1.15	48	...
0123	120	1.2	46	...
0124	125	1.25	44	...
0125	130	1.3	42	...
0126	135	1.35	40	...
0127	140	1.4	38	...
0128	145	1.45	36	...
0129	150	1.5	34	...
0130	155	1.55	32	...
0131	160	1.6	30	...
0132	165	1.65	28	...
0133	170	1.7	26	...
0134	175	1.75	24	...
0135	180	1.8	22	...
0136	185	1.85	20	...
0137	190	1.9	18	...
0138	195	1.95	16	...
0139	200	2.0	14	...
0140	205	2.05	12	...
0141	210	2.1	10	...
0142	215	2.15	8	...
0143	220	2.2	6	...
0144	225	2.25	4	...
0145	230	2.3	2	...
0146	235	2.35	0	...

AIR MOVING EQUIPMENT DATA

SHEET NO: 1
JOB NAME: USC SCHOOL OF CHEMISTRY PART # 00001 ADDRESS: LOS ANGELES, CA

SYSTEM: DA/RA FAN NO: AHS 01 BLDG. NO: 0

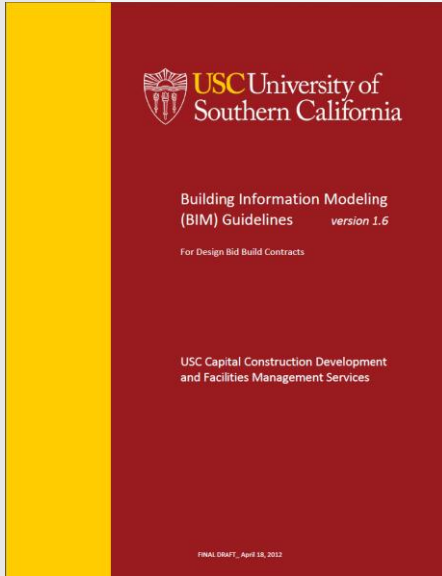
PARAMETER	UNIT	VALUE
FAN NO.		AHS-01
BUILDING LOCATION		W222
SPACE SERV'D	SQ. FT.	20,000
EQUIPMENT NO.		200001
MODEL NO.		05370-PAN-2
BRAND NO.		0500-1000-01

	SPECIFIED	ACTUAL	SPECIFIED	ACTUAL
Flow (CFM)	10100	10100	10100	10100
Pressure (in. WG)	1.0	1.0	1.0	1.0
Efficiency (%)	80	80	80	80
Motor Power (kW)	10.0	10.0	10.0	10.0
Motor Efficiency (%)	90	90	90	90
Motor Speed (RPM)	1800	1800	1800	1800
Motor Voltage (V)	480	480	480	480
Motor Current (A)	24	24	24	24
Motor Power Factor	0.9	0.9	0.9	0.9
Motor Service Factor	1.15	1.15	1.15	1.15
Motor Insulation Class	F	F	F	F
Motor Protection Class	IP54	IP54	IP54	IP54
Motor Frame	350	350	350	350
Motor Weight (kg)	150	150	150	150
Motor Dimensions (mm)	350x350x250	350x350x250	350x350x250	350x350x250
Motor Terminal Box	100	100	100	100
Motor Terminal Voltage	480	480	480	480
Motor Terminal Current	24	24	24	24
Motor Terminal Power	11.5	11.5	11.5	11.5
Motor Terminal Power Factor	0.9	0.9	0.9	0.9
Motor Terminal Service Factor	1.15	1.15	1.15	1.15
Motor Terminal Insulation Class	F	F	F	F
Motor Terminal Protection Class	IP54	IP54	IP54	IP54
Motor Terminal Frame	350	350	350	350
Motor Terminal Weight (kg)	150	150	150	150
Motor Terminal Dimensions (mm)	350x350x250	350x350x250	350x350x250	350x350x250

MAX-E2®

Labels: Stator Winding, Rotor Winding, Core Frame, Opposite Winding, Epoxy Fan, Stator Seal (O-ring) - 2/8" x 1/8"

REFERENCE:



3.2 MODEL AND DATA DELIVERY

Document – for those documents that are assignable to an associated BIM element or system (all fields, installed equipment documentation, Approval By=“Contractor Certified”, Stage=“As-Built”) All documents will be placed in the assigned location on **e-Builder**

(Page 7)



USC

rev. 11/9/2012

Required Documents List for COBie (Digital) Upload

This list outlines documents to be uploaded electronically onto USC's 3D FM BIM Portal, Ecodomus. This requirement does not in any way, explicitly or implied, exempt you from fulfilling your contractual obligations related to project close-out. The documents listed below do not substitute or represent the entire document set listed in USC's Close-Out Package and are specific only to the uploads onto USC's 3D FM BIM Portal, Ecodomus.

FORMAT

Document submittals are to be uploaded in a digital format and attached to the correct piece of equipment/component or facility following the proper USC Document Nomenclature. Documents are to be assembled in PDF format with a table of contents at the beginning of each document with bookmark links enabling navigation to each section.

When attaching documents specific to a piece of equipment or component, your PDF document is to be pertinent and specific to that particular equipment or component. Where generic information is included or multiple model numbers are referenced, highlight in the PDF document which specific information applies to the actual piece of equipment or component.

Where scanning of paper documents is required, configure the scanned file for minimum readable size and rotate all documents consistently. For detailed descriptions of these documents listed below, refer to the USC Closeout Design Guidelines included in your project contract requirements.

DOCUMENTS LIST FOR ALL APPLICABLE EQUIPMENT / COMPONENTS	ATTACH TO
Air and Hydronic Test and Balance Reports	Facility
Back Flow Prevention Device Certifications	Component
Commissioning Test Procedures	Component
Control Drawings	Facility
Electrical Acceptance Test Reports	Facility
Equipment Operating Permits	Component
Equipment Start Up Reports	Component
Final Submittals and Product Data (Actual Equipment Installed Only)	Type
Operations and Maintenance Manuals	Type
Panel Board Circuit Directories	Component
Performance Data, Ratings and Curves	Component
System Flow Diagrams	Facility
Valve Charts	Facility
Warranties (Equipment/Component Specific)	Type
Warranties (Systems/Discipline)	Facility

DOCUMENTS LIST FOR DOORS / WINDOWS / FIXED FURNITURE	ATTACH TO
Design Data (Approved Product Submittal)	Type
Maintenance Procedures	Type
Product Information	Type
Repair Materials and Sources	Type
Warranties (Equipment/Component Specific)	Type
Warranties (Systems/Discipline)	Facility



USC

rev. 11/9/2012

USC Document Nomenclature

Digital Documents submitted electronically to USC are to be named as follows:



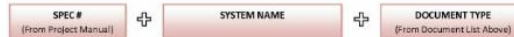
EXAMPLES

233600_AHU-C1_Commissioning Test Procedures
 233600_CRAC-C1_Equipment Start Up Report
 233600_AHU-C1_Performance Data, Ratings and Curves
 263213_GEN-1_Equipment Operating Permit
 262416_PB-L11A1_Panel Board Circuit Directory



EXAMPLES

233416_Fan Coil Units_Final Submittal and Product Data
 233600_Air Handling Units_Operations and Maintenance Manual
 262923_Variable Speed Drives_Warranty



EXAMPLES

230500_HVAC System_Air and Hydronic Test and Balance Report
 230500_HVAC System_Warranty
 230500_HVAC System_System Flow Diagrams
 230500_HVAC System_Control Drawings
 220523_Plumbing System_Valve Chart
 260500_Electrical System_Electrical Acceptance Test Reports

Documents library

revised

Name	Date modified	Type	Size
220523_Plumbing System_Valve Chart	11/1/2012 11:10 AM	PDF File	36 KB
230500_Building C_Air and Hydronic Test and Balance Report	7/1/2010 12:44 PM	PDF File	1,274 KB
230500_HVAC System_Control Diagrams	11/9/2009 9:21 AM	PDF File	902 KB
230500_HVAC System_Warranty	11/1/2012 9:34 AM	PDF File	76 KB
230600_AHU-C2_Final Submittal and Product Data	11/1/2012 8:00 PM	PDF File	6,436 KB
233416_FF-C1_Equipment Start Up Report	11/1/2012 3:29 PM	PDF File	28 KB
233416_FCU-C1_Equipment Start Up Report	11/1/2012 3:29 PM	PDF File	28 KB
233600_AHU-C1_Air Flow Diagram	11/1/2012 9:06 AM	PDF File	106 KB
233600_AHU-C1_Commissioning Test Procedures	6/7/2010 11:23 AM	PDF File	55 KB
233600_AHU-C1_Equipment Start Up Report	11/1/2012 5:05 PM	PDF File	32 KB
233600_AHU-C1_Final Submittal and Product Data	11/1/2012 3:55 PM	PDF File	6,435 KB
233600_AHU-C1_Operations and Maintenance Manual	11/1/2012 4:58 PM	PDF File	28,432 KB
233600_AHU-C1_Performance Data, Ratings and Curves	11/1/2012 9:04 AM	PDF File	58 KB
233600_AHU-C2_Equipment Start Up Report	11/1/2012 3:29 PM	PDF File	28 KB
233600_AHU-C2_Operations and Maintenance Manual	11/1/2012 4:58 PM	PDF File	28,432 KB
238123_CRAC-C1_Equipment Start Up Report	11/1/2012 3:29 PM	PDF File	28 KB
260500_Electrical System_Electrical Acceptance Test Reports	5/19/2010 8:50 AM	PDF File	565 KB
262416_PB-L11A1_Panel Board Circuit Directory	11/1/2012 10:44 AM	PDF File	941 KB
263213_GEN-1_Equipment Operating Permit	11/1/2012 9:19 AM	PDF File	123 KB

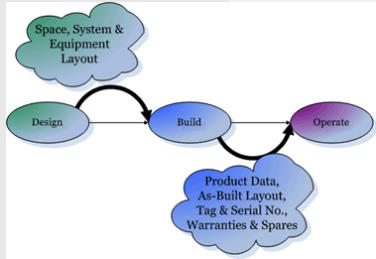
7 Print from Model





Designers

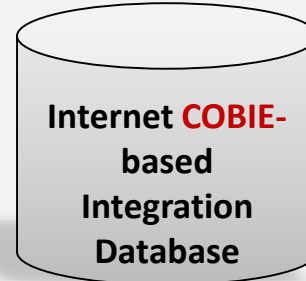
- ✓ Initialize Equipment List
- ✓ Enter Schedule Information
- ✓ Review Submittals



SpaceID	RoomID	SpaceFunction	SpaceReferenceID	ExternalRoomName	SpaceNumber	SpaceName
1						
44	Level 1 15 11 34 11	Office	SpaceDPick	1109	UA	
45	Level 1 15 41 99 09	Special Storage Space	SpaceDPick	1110	Storage	
46	Level 1 11 21 41	Interview Room	SpaceDPick	1111	Interview Room	
47	Level 1 81 21 99 09	Other Facility Equipment Service Space	SpaceDPick	1112	Elec.	
48	Level 1 15 11 34 11	Office	SpaceDPick	1113	Cashier Booth	
49	Level 1 11 21 41	Interview Room	SpaceDPick	1114	Interview Room	
50	Level 1 11 21 41	Interview Room	SpaceDPick	1115	Interview Room	
51	Level 1 15 11 34 11	Office	SpaceDPick	1116	Officer	
52	Level 1 15 11 34 11	Office	SpaceDPick	1117	UA	
53	Level 1 11 11 99 09	Other Gathering Space	SpaceDPick	1118	Interview Window	
54	Level 1 11 11 99 09	Other Gathering Space	SpaceDPick	1200	Screening	
55	Level 1 81 31 14	Queue Space	SpaceDPick	1201	Waiting Area, Queue Area, Writing Area	
56	Level 1 11 21 41	Interview Room	SpaceDPick	1202	Interview Room	
57	Level 1 11 21 41	Interview Room	SpaceDPick	1203	Interview Room	
58	Level 1 11 11 99 09	Other Gathering Space	SpaceDPick	1204	Writing Area	
59	Level 1 11 21 41	Interview Room	SpaceDPick	1205	Interview Room	
60	Level 1 81 31 11	Waiting Room	SpaceDPick	1206	Waiting Area	
61	Level 1 85 21 17 11	Maintenance Closet (incl Janitor's Closet)	SpaceDPick	1207	Janitor Closet/Storage	
62	Level 1 41 11 14 21	Restroom	SpaceDPick	1208	Restroom - Applicants (male)	
63	Level 1 41 11 14 21	Restroom	SpaceDPick	1209	Restroom - Applicants (female)	
64	Level 2 85 21 11	Stairway	SpaceDPick	2000A	Stair	

Contractors

- Upload Documents
- Maintain Equipment List
- Enter Equipment "Plate" Information
- Enter Testing Information
- Submittals



Data
Centric
BIM

USC

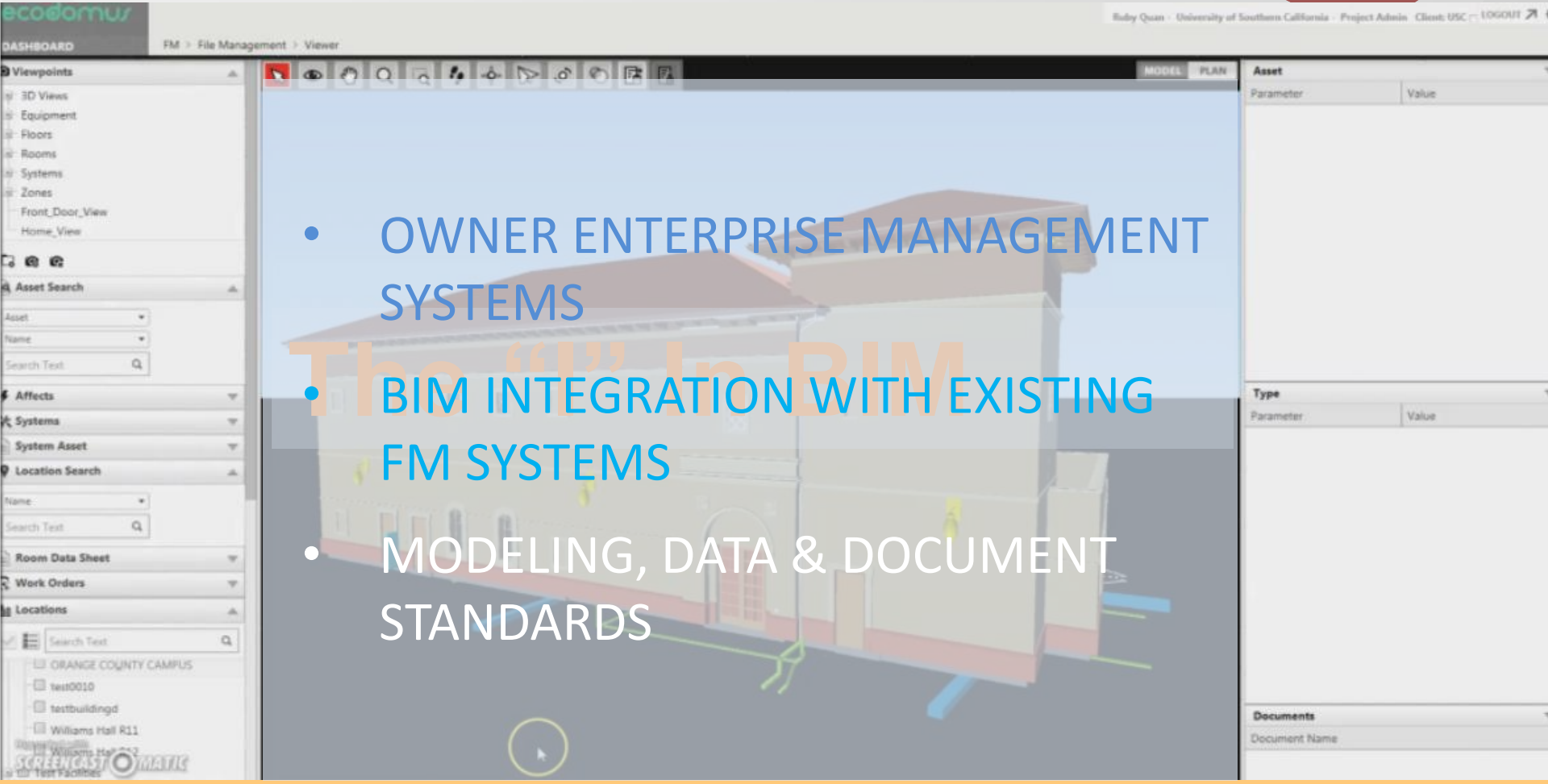
- ✓ Equipment Numbers
- ✓ Space Data
- ✓ Review for University Standards

Commissioning Agent

- Verify Document Completeness
- Review Reports
- Review Equipment List
- Track Training Requirements

***Gathering the right information, by the right people, at the right time**

Using the "I" In BIM: Asset Management



- OWNER ENTERPRISE MANAGEMENT SYSTEMS
- BIM INTEGRATION WITH EXISTING FM SYSTEMS
- MODELING, DATA & DOCUMENT STANDARDS

What Are The BIM Contract Deliverables?

*BIM Deliverables to FMS do not currently replace our paper and CAD deliverables.

- Revit Design Model
- Revit As-built (As Constructed) model from AE
- Native format CAD models from the GC and Subs
- COBie Data and Docs from GC

3.2 MODEL AND DATA DELIVERY

The final delivery of the BIM and associated data to USC will be in the form of:

- a. Fully coordinated architectural, structural, civil and MEP 3D models in Revit at 100% CD by the Design Team.
- b. All equipment schedules must be generated from the parameters of the objects.
- c. "As constructed" native format MEPF and structural models provided by the Design Team in accordance with the requirements as detailed in Appendix B.*
- d. Complete "as constructed" Revit models provided by the Design Team in accordance with the requirements as detailed in Appendix B.*
- e. The following COBIE 2.4 standard worksheets*, submitted by the General Contractor, shall emphasize on the MEPF systems, shall be provided (at minimum) to meet the following Management Goals:
 - Contact (all fields)
 - Facility (all fields)
 - Floor (all fields)

6. Design Phases

6.1 DELIVERABLE SCHEDULE AND MILESTONES (to be completed by the end of each phase)

Milestone	Deliverable
Contract Award	Final BIM Execution Plan
Schematic Design Phase	Architectural Model
	Civil Model
	COBie Design Data <ul style="list-style-type: none"> • Contact • Facility • Floor • Space • Zone
	Architectural Model
	Civil Model
	MEPF Model or Models
	Structural Model
	COBie Design Data <ul style="list-style-type: none"> • Contact • Facility • Floor • Space • Type • Component
	Architectural Model
	Civil Model
	MEPF Model or Models
	Structural Model
	COBie Design Data <ul style="list-style-type: none"> • Contact • Facility • Floor • Space • Zone • Type

2.6.12 Record Documents, Record Drawings and As-built Drawings. As further detailed in Exhibit 6, no later than thirty (30) calendar days after receipt of As-built Drawings from Contractor and as a condition precedent to final payment to Architect, Architect and its Consultants shall review for accuracy, correct where necessary, and forward to Owner Record Drawings produced by Architect from the redline As-built Drawings received from Contractor, including applicable addenda, bulletins, clarifications, submittal information, changes and selections made during construction. In addition, Architect shall provide to Owner, Record Construction Documents including all civil, architectural, structural, plumbing, mechanical, electrical, landscape, special systems, and updated specifications, which shall reflect Contractor's As-built Drawings and submittal information. As further detailed in Exhibit 6, the Record Documents, including the Project Manual, and all engineering calculations shall be provided by Architect to Owner in three (3) full size documents and three (3) electronic versions on disks in CAD and BIM format and shall be clearly identified near or in the title block on each sheet as "RECORD DRAWINGS". All CAD and BIM record documents shall be prepared in accordance with AIA layering system standards or BIM Drawing Standards as contained in Exhibit 5. The medium for transmittal of all AutoCAD files and BIM document files shall be as agreed by Owner. If any inconsistencies or ambiguities arise between this provision and Exhibits 5 and 6, such inconsistencies shall be resolved by Architect complying with the more stringent requirements. Owner recognizes that the CAD and BIM documents may be subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error or human alteration. Accordingly, the CAD and BIM record documents are provided to Owner for informational purposes only and not as an end product. Owner agrees to waive any claims by Owner against Architect resulting from the unauthorized alteration, misuse or reuse of the CAD and BIM record documents.

Thank You!

- Questions?

