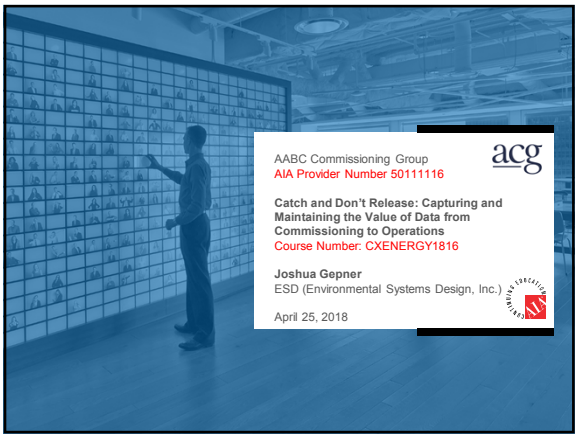

AABC Commissioning Group
AIA Provider Number 50111116

Catch and Don't Release: Capturing and Maintaining the Value of Data from Commissioning to Operations
Course Number: CXENERGY1816

Joshua Gepner
ESD (Environmental Systems Design, Inc.)

April 25, 2018

Credit(s) earned on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Copyright Materials

Course Description

Through digital technology, efficiencies can easily be gained by utilizing enhanced documentation management and data-transfer protocols within the construction industry. This is especially true in the commissioning sector. This presentation will explain how to set up successful documentation and data collection strategies during the commissioning process, how accurate commissioning records provide the knowledge base needed for maintaining a building, as well as strategies for providing commissioning data for use during operations and occupancy.

Learning Objectives

At the end of the this course, participants will be able to:

1. Learn to establish lines of communication with stakeholders so the data produced by the commissioning process creates value for the end user.
2. Understand the variables required to properly lay out and implement a documentation and data collection strategy to successfully roll out to stakeholders.
3. Know the documentation strategies that should be utilized throughout the commissioning process.
4. Identify common problems with transitioning data from commissioning to operations and occupancy.

Presenter Overview

Joshua J. Gepner
Vice President, Operations Director Commissioning

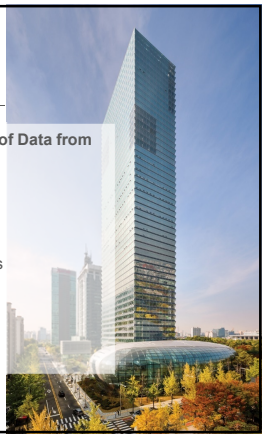
Education
Boston University, Boston, Massachusetts, Bachelor of Science, Electrical Engineering, 2003

State Licenses
PE (Professional Engineer) – Illinois

Registrations / Accreditations
QCxP (Qualified Commissioning Process Provider) – University of Wisconsin
LEED AP O+M (LEED Accredited Professional Building Operations and Maintenance)

Joshua Gepner joined ESD (Environmental Systems Design, Inc.) in 2009 bringing over seven years of design engineering, consulting engineering and commissioning expertise to the company. He is knowledgeable in commercial, residential, and industrial electrical design as well as LEED and Building Energy Code standards. Josh has over nine years of commissioning experience, specializing in mission critical facilities commissioning specifically for data centers and other critical facilities. He is currently the Operations Director for the Commissioning team at ESD.

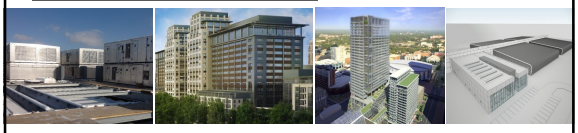
Agenda



Capturing and Maintaining the Value of Data from Commissioning to Operations

- Goals
  - Input From Stakeholders
- During Commissioning
  - Record Keeping Process
    - Documentation Strategies
    - Advantages – Online Cx
- After Turnover
  - Data Transfer
- The Future
- Questions

Goal of Commissioning



Definition of Commissioning

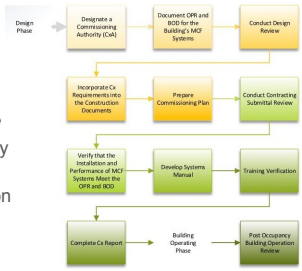
Commissioning is a programmed series of design and construction **documentation** and testing activities that are performed specifically to ensure that the finished facility operates as intended (defined by The Building Commissioning Handbook)

Primary Goal of Commissioning

Provide functional buildings and systems that meet both the design intent and the owner's operational needs

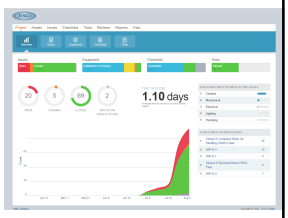
Changing Goals and Demands

- Faster, Stronger, Better
- Cheaper
- Expectations
  - *Current Information*
  - *Anywhere, Any Time*
- Cloud-Based Technology Advancements
- Documentation Retention



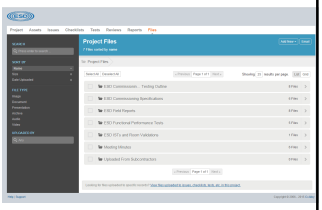
Primary Goals

- Improved Delivery
- Higher Quality Product
- Documentation Management
- Process Management
- Increased Collaboration
- Visibility and Transparency
- Analytics



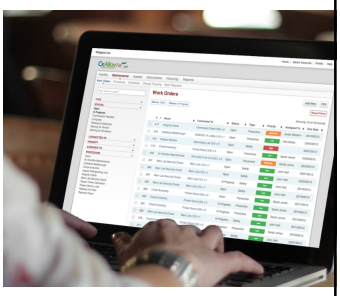
Secondary Goals

- Supports Market Trends
- Differentiation
- Record Keeping
- Data Capture
- Improved Closeout
- Owner Usability
  - Documentation Format



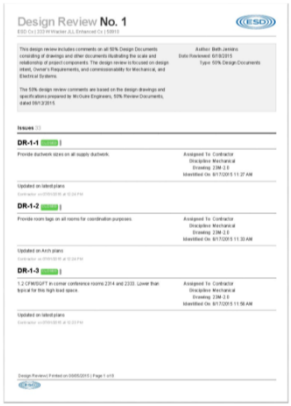
Input From Stakeholders Drives Value Proposition

- Process Aligned with End User Objectives
- What do They Want to See?
- What Systems are Needed to Capture Data?
- What will They Use for Their PM Plan or CMMS Systems?



Record Keeping

- **Context**
  - What Was Happening?
- **Considerations**
  - Complexity
  - Success Criteria
  - Specifications
    - Requested Capabilities
  - Submittals
    - Equipment Capabilities

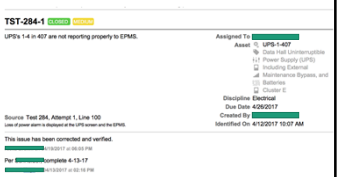

Design Review **No. 1**

Context

- **Option 1**
  - Pump was Broken.
    - Pump Fixed.
- **Option 2**
  - When called to run as the lead pump, Pump (P-2) was unable to generate the specified GPM. This issue was not seen with Pump (P-1) set as the lead pump
    - After trouble shooting, the mechanical contractor noticed that the impeller within the pump was not properly aligned. The lead/lag functionality was retested after the correction and both pumps were able to generate and maintain the specified GPM.

Content From Team

- Internal Training
- Professionalism
- Review Past Issues
- Assume the Reader has no Context


TST-284-1 CLOSED MEDIUM

UPS's 1-4 in 407 are not reporting properly to EPMS.

Assigned To
Asset UPS-1-407
Data Hall Uninterruptible
(UPS) Power Supply (UPS)
including External
Maintenance Bypass, and
Batteries
Cluster E

Discipline Electrical
Due Date 4/26/2017
Created By
Identified On 4/12/2017 10:07 AM

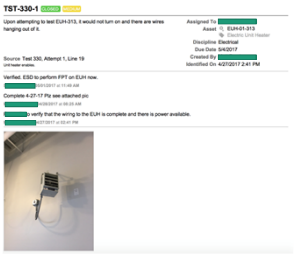
Source Test 284, Attempt 1, Line 100
Loss of power alarm is displayed at the UPS screen and the EPMS.

This issue has been corrected and verified.

Per complete 4-13-17

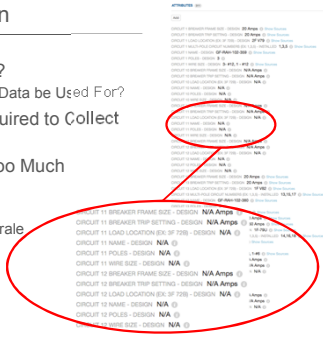
Responses From Team and Stakeholders

- Concise, Clear, Timely Responses
- Establish Champions
- What Not to Do
- Drag Them To the Finish!



Realistic Implementation

- Too Much Data?
  - Ask What Will Data be Used For?
- Equipment Required to Collect Data
- Don't Bite Off Too Much
  - Takes Time
  - Takes Effort
  - Can Lower Morale
- Limitations
  - Personnel
  - Budgetary
  - Time



Case Study – Risk Mitigation

- **Something Went Wrong?**
  - Who Knew About it?
  - When Did They Know About it?
  - Was it Escalated Properly?
- **Potential Damages**
  - Time Loss
  - Reputation
  - Future Work

Case Study – Change Order Collection

- **Add Services**
  - Number of Issues
  - Complexity of Issues
  - Number of Retests
- **Potential Damages**
  - Financial Loss
  - Future Work

Case Study – Value Proposition

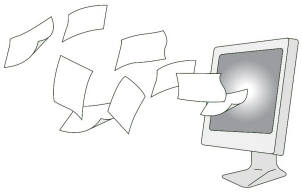
- **Look What We Did!**
  - Absorbed Effort
  - Out of Scope Effort
  - Problems Avoided
  - Does our Competition Do This for You?
- **Potential Damages**
  - Financial Loss
  - Reputation
  - Future Work

Advantages – Online Commissioning Tools

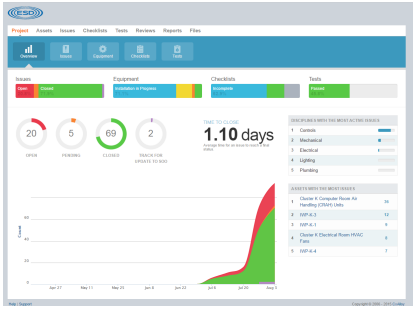
- Project Dashboard
- Field Observation Reports
- Design Reviews
- Checklists
- Tests
- Issues Tracking and Resolution
- Reports
- Online Storage of Cx Documents

Project Dashboard

- High Level Look-in for Project Stakeholders
- Graphical Representation of Project Progress
- Easy to Identify Hold-ups
- Digital Reporting
- Future High Level Review



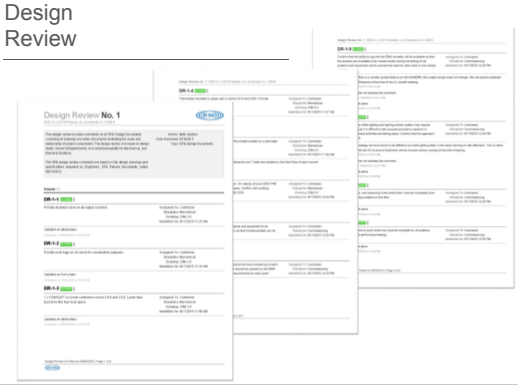
Project Dashboard



Design Review

- **Collaborative**
  - Real Time Progress
  - Cloud-Based
  - Multi-user Collaboration
- **Documented Decisions**
  - Transparency
  - Easily Delineated
  - Decision Records Visible

Design Review

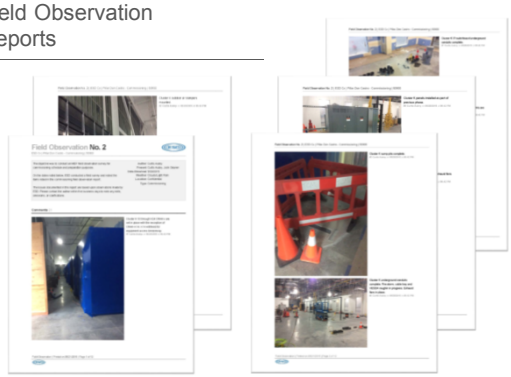


Field Observation Reports

Provide Progress Status Update

- Visual
- Time-stamped
- Multiple Platforms
  - *Computer*
  - *Tablet*
  - *Phone*
- Multi-user Input

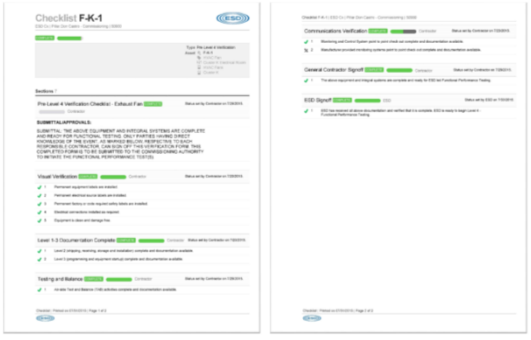
Field Observation Reports



Checklists

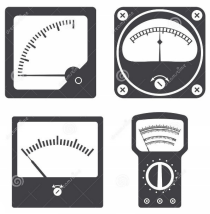
- Equipment Status Verification
- Settings Verification
- Photographs
- Maintain Control and Order
- Systems and Equipment on Visible Timeline

Checklists



Functional Performance Tests

- Visual
- Time-stamped
- Issues Connected to Line Items within Test
  - *Simplifies Resolution*
  - *Simplifies Retesting*
  - *Remote Issue Closure*
- Files and Photos Can be Attached to Line Items or Tests



Functional Performance Tests

Functional Performance Tests

Issues Tracking and Resolution

- **Accountability**
  - Time Stamped
  - Assignable
  - Living Documentation
- **Collaborative**
  - Real Time Progress
  - Cloud-Based
  - Multi-user Collaboration
- **Reporting**
  - Construction Team can Export and Manage
  - Sortable

Module Capability Comparison

The Old Archaic Way – Spread Sheets and Word Documents

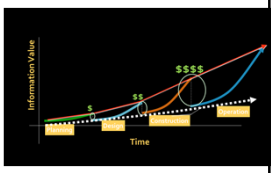
Module	Real Time	Time Stamped	Assign-able	Multi-User	Export-able	Sortable	Photos	Cloud-Based
Design Reviews		Manual	✓					Manual
Field Observation Reports		Manual	✓				Manual	Manual
Checklists		Manual	✓				Manual	Manual
Functional Performance Tests		Manual	✓				Manual	Manual
Issue Tracking and Resolution		Manual	✓			Manual		Manual

The New Cloud-Based Way – Using Online Commissioning Tools

Module	Real Time	Time Stamped	Assign-able	Multi-User	Export-able	Sortable	Photos	Cloud-Based
Design Reviews	✓	✓	✓	✓	✓	✓	✓	✓
Field Observation Reports	✓	✓	✓	✓	✓	✓	✓	✓
Checklists	✓	✓	✓	✓	✓	✓	✓	✓
Functional Performance Tests	✓	✓	✓	✓	✓	✓	✓	✓
Issue Tracking and Resolution	✓	✓	✓	✓	✓	✓	✓	✓

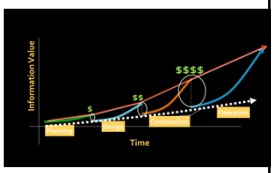
Data Transfer

- **Data is Captured, Lost, and Recaptured**
  - End of Project Crawl
  - Hand-Load Data
  - Recreate Equipment Lists
- **Data Loss has Real Impacts**
  - Warranty Terms Unknown
  - Unknown PM Requirements
  - Unknown System and Equipment Nameplate Data



Data Transfer - Solutions

- **Compatible Systems?**
  - Not Always Possible
  - High Cost, Locked In
  - Complex
- **Capture**
  - COBie
  - Excel Export
  - API
- **Capture as Created**
  - Don't Make Data Capture a Separate Activity



What is COBie

- “Construction Operations Building Information Exchange”
- Focuses on Maintaining Asset Data from Design, Through Construction, into Operations
- Asset Data Includes Equipment, Systems, and Locations (Rooms, Floors, Buildings) and Related Data
- COBie Allows for the Model Number Specified in Design to Get All the Way to the CMMS System Without Ever Retyping It

No, Really, What is it?

- It’s a Spreadsheet

Name	CreatedBy	CreatedOn	TypeName	Space	Description	Syst	ExtObject	ExtI	SerialNumber
ACCU-1	daniella.r.lowe@us	2011-09-14T17:02:00	Air Cooled Condensing Unit- Small	Site	Air Cooled Condensing Unit	Ch	Equipment	21	QPM890
ACCU-2	daniella.r.lowe@us	2011-09-14T17:02:00	Air Cooled Condensing Unit- Small	Site	Air Cooled Condensing Unit	Ch	Equipment	0Q0	QPM891
ACCU-3	daniella.r.lowe@us	2011-09-14T17:02:00	Air Cooled Condensing Unit- Small	Site	Air Cooled Condensing Unit	Ch	Equipment	13R	QPM892
Door 1AC6	daniella.r.lowe@us	2011-09-14T17:02:00	Door Type A	1AC1	M_Single-Flush:0915 x 2134mm	Ch	Equipment	1Sy	$TRD652B1
Door 1BC4	daniella.r.lowe@us	2011-09-14T17:02:00	Door Type B	1AC1	M_Single-Flush:0915 x 2134mm	Ch	Equipment	1Tq	$TRD654Z7
Door 1AC1	daniella.r.lowe@us	2011-09-14T17:02:00	Door Type H	1AC1	M_Curtain Wall Dbl Glass:M_C	Ch	Equipment	0uW	WS5009:ID1
Fire Extinguisher Cabi	daniella.r.lowe@us	2011-09-14T16:57:00	Fire Extinguisher Cabinet	1AC1	M_Fire Extinguisher Cabinet:30	Ch	Equipment	0Dh	2712R001
Door 1D40A	daniella.r.lowe@us	2011-09-14T17:02:00	Door Type A	1AC1	M_Single-Flush:0915 x 2134mm	Ch	Equipment	0Dh	$TRD653A6
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566A8
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566A9
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566B0
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566B1
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566B4
Supply Diffuser Sidewa	daniella.r.lowe@us	2011-09-14T17:02:00	Supply Diffuser Sidewall 800 mm	1AC1	M_Supply Diffuser - Sidewall:80	Ch	Equipment	3pL	4651566D2
Light Fixture SD-01	daniella.r.lowe@us	2011-09-14T17:02:00	Light Fixture SD	1AC1	M_Downlight - Recessed Can:2	Ch	Equipment	3pL	CPNG1189A2
Light Fixture SDB-01	daniella.r.lowe@us	2011-09-14T17:02:00	Light Fixture SDB	1AC1	M_Downlight - Recessed Can:2	Ch	Equipment	3pL	XVJH86921

No, Really, What is it?

- The Spreadsheet is Formatted According to a Standard

4.3 Switchgear

The following minimum set of information shall be provided in Construction Documents stage design deliverable schedule and reflected in the CD Stage COBie Deliverable.

Table 64 Mapping for Minimum Switchgear Type Schedule Headings

Design Schedule		COBie Mapping				
Heading	Unit	Sheet	Column	Attribute Name	Data Type	Attribute Reference
Name	Switchgear-TypeXX-Space#-01	Component	Name		ifcLabel	
Type	Switchgear-TypeXX	Component	TypeName		ifcText	
Location	(Space Name)	Component	SpaceName		ifcIdentifier	
Current	Amps	Attribute	-	Current	ifcElectricCurrentMeasure	Type/Component
Voltage	Volts	Attribute	-	Voltage	ifcElectricVoltageMeasure	Type/Component
Frequency	Hz	Attribute	-	Frequency	ifcFrequencyMeasure	Type/Component
Operating Weight	Kg	Attribute	-	OperatingWeight	ifcMassMeasure	Type/Component
Type of Support	-	Attribute	-	SupportType	ifcText	Type/Component
Horizontal Bus Current	Amps	Attribute	-	HorizontalBusCurrent	ifcElectricCurrentMeasure	Type/Component

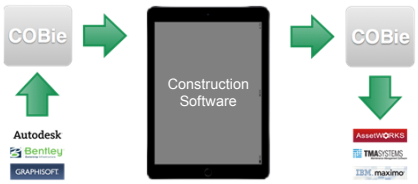
No, Really, What is it?

- Software Products Build in Import/Export Functionality Based on the Standard

Autodesk · EcoDomus · Bentley · TMA SYSTEMS · AssetWORKS · ARCHIBUS · FM:Systems · GRAPHISOFT · ONUMA · IBM maximo

COBie Lifecycle

- Used to Move Data from Design, Into Construction, then Into Operations



COBie Considerations

- COBie Requires Specific Organization
  - Space Names Must be Unique
  - Equipment Names Must be Unique
  - Assets Must be Tied to a Building
- Consider Less Rigid Approach
  - Does the Team Understand COBie?
  - Data Specialist
  - Will Capturing and "Forwarding" Data be Achieved Through Basic Exporting and Importing?

Excel Exports

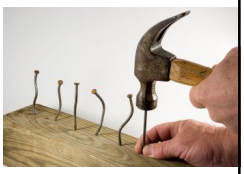
- Excel Export is Often Sufficient
- Due Diligence Still Required
  - Test Exporting and Importing Between Systems
  - Changes to the Process May Yield Better Results

API

- Application Programming Interface
  - Used by Programmers
- Two Software Products with API can Transfer Information Without Requiring Manual Export and Import
- Benefit from Network Effects
  - No Benefit if Only One Product Has an API
  - Possibilities to Grow Exponentially

Software Utilization Implementation

- Understand Capability and Limitations
- Establish Guidelines Early
- Train Users
- Communicate Benefits of Approach



Case Study – Proper Set Up is Key

- **Data Fields**
  - Carry Over
  - Results Oriented
  - Trial Run
  - Vendor Support
- **Potential Damages**
  - Time Loss
  - Value Loss

The Future

- Online Commissioning Tools
- API-Based Data Transfer
- Web-Based Manuals
- Maintenance Schedules Developed During Construction and Easily Transferred

Questions?

Thank You

This concludes The American Institute of Architects
Continuing Education Systems Course

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Operations Director Commissioning
Environmental Systems Design, Inc.
jgepner@esdglobal.com