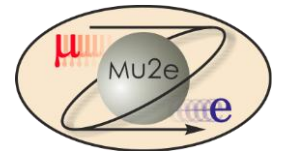




Mu2e CD-2 – Conventional Construction- High Performance & Sustainability / Guiding Principle



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10/22/2014

High Performance & Sustainability /Guiding Principle (GP)

- Requirement – DOE order 436.1 *EO 13423, Section 2(f), and EO 13514 Section 2(g), Federal agencies are required to ensure that new construction and major renovation of agency buildings comply with the Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings set forth in the Federal Leadership in High Performance and Sustainable Buildings Memorandum of Understanding*
- Mu2e project is committed to comply with sustainability requirements. Early in the project lifecycle we looked at.
 - GP & LEED checklists:
 - other guides (ASHRAE AEDG-advanced energy design guide)
 - Previous proj (cmtf 2010, DOE workshop Apr 2011, OTE)
- LEED-NC is not appropriate for Mu2e (*DocDB# 2081, LEED Analysis Memo dated Aug 04 2011 documented the reasoning*).
- The identification and incorporation of GP elements that are lifecycle efficient into the design represents the project's commitment to incorporating sustainability.

High Performance & Sustainability /Guiding Principle (GP)

- About 60% of GP items are already met, either already in place by current policies and procedures or are life cycle efficient. The remaining 20 of the 35 GP items are addressed by the project.
- Final GP report, and various backup documentation are submitted (posted under Doc# 2081)
- A number of the GP items are included in the design specifications. (Division 1 Spec and technical spec) and few are calculation documentation
- Two major GP items:
 - Commissioning (Cx):.:
 - Building energy efficiency:

High Performance & Sustainability /Guiding Principle (GP)

- Commissioning (Cx):
 - This is included in the current project and contract has been issued for a 3rd party Cx agent (Primera Engrs). This Cx agent have successfully commissioned two recent project onsite. (Fundamental commissioning)
 - Due to the nature of the project schedule once the CF bldg project is completed, spaces will remain open to each other for few years. Cx will try to simulate final condition as best as possible. A re commissioning (off project) is plan later when the final experiment equipment are installed and spaces between are closed and sealed.
 - Scope
 - Review of Owners Project Requirement & Basis of Design
 - Maintain and Update the Commissioning Plan
 - CF Mech systems, lighting control and BAS will be commissioned
 - ✓ Review startup procedure & witness random sampling
 - ✓ Prepare functional test procedure
 - ✓ Review test and balance report (TAB)
 - ✓ Perform FPT (functional performance test)
 - Document and maintain issue log
 - Perform retesting
 - Submit final Cx report

High Performance & Sustainability /Guiding Principle (GP)

- Energy efficiency:
 - Although the CF project (bldg) is not expected to meet the min requirement of “30% better than Ashrae 90.1 baseline” because of large process load, the project committed to doing the building energy model, incorporating the reasonable energy efficiency measures and just quantify where we’re at compared to Ashrae90 appendix-G baseline.
 - Various elements that contributed (Use of CUB chilled water, envelope, lighting, variable fan speed- Single zone VAV)
- The project did due diligence to comply with the sustainability requirement and provide an energy efficient building design using the GP guidance, where it is applicable

High Performance & Sustainability /Guiding Principle (GP)

Back up slides

GP checklist (prior to design)

Item	Guiding Principle Items	Simplified Description (refer to Guiding Principle Document for full description)
1	<i>Integrated Design</i>	<i>Maintain an integrated design team through all stages of the project.</i>
2		<i>Comply with OMBA-11, Section 7, Exhibit 300</i>
3		<i>Establish goals for siting, energy, water materials and indoor environmental quality.</i>
4		<i>Consider all stages of the project, including deconstruction</i>
5	Commissioning	Employ commissioning tailored to building, including commissioning requirements in construction documents, a comm plan, verification and a final report
6	Energy Efficiency	Reduce energy use by at least 30% relative to ASHRAE 90.1 - 2007 (if life cycle cost effective)
7		Use energy Star and FEMP-designated products where available
8	<i>Renewable Energy</i>	<i>Meet at least 30% of hot water demand using solar water heaters, where life cycle cost effective.</i>
9		<i>Implement renewable energy generation projects on site, where life cycle cost effective.</i>
10	Measurement and Verification	Install building level electricity meters in new major construction and renovation projects to optimize performance.
11		Install equivalent metering for natural gas
12	<i>Benchmarking</i>	<i>Compare energy target with performance after the first year. Confirm energy use is within 10% of the goal.</i>
13	Indoor Water	Use 20% less potable water than the indoor water use baseline calculated for the building
14		Installation of water meters
15		<i>Reuse of harvested rainwater, treated wastewater, etc. should be considered.</i>
16		<i>When potable water is used to impact efficiency, use LCC effective conservation measures</i>

Item	Guiding Principle Items	Simplified Description (refer to Guiding Principle Document for full description)
17	<i>Outdoor Water</i>	<i>Use water efficient landscaping practices to reduce consumption by minimum of 50% over conventional usage.</i>
18		<i>Install water meters for places with significant outdoor water use</i>
19		<i>Employ strategies to reduce storm water run-off per EISA section 438.</i>
20	<i>Process Water</i>	<i>When potable water is used to improve a building's energy efficiency</i>
21	Water Efficient products	Specify EPA's Water Sense or other such products where available
22		<i>Choose Water Sense certified irrigation contractors</i>
23	Ventilation and Thermal Control	Meet ASHRAE Standard 55-2004 Thermal Environmental Conditions for Human Occupancy
24		Meet ASHRAE Standard 62.1-2007 Ventilation for Acceptable Indoor Air Quality
25	<i>Moisture Control</i>	<i>Establish and implement a moisture control strategy to prevent damage, minimize mold contamination and reduce health risks.</i>
26	Daylighting	Achieve a minimum daylighting factor of 2% in 75% of all space occupied for critical visual tasks.
27		Provide individual lighting controls & glare control
28	Low-emitting materials	Specify materials that have low pollutant emissions
29	Air Quality during Construction	Follow SMACNA Indoor Air Quality Guidelines 2007. Continue after construction for 72 hours.
30	<i>Environmental Tobacco Smoke Control</i>	<i>Prohibit smoking within 25 feet of all entrances, windows and ventilation intakes</i>
31	Recycled Content	Specify products meeting or exceeding EPA's recycled content recommendations.
32	Biobased Content	Specify products with highest content level per USDA recommendations
33	Environmentally Preferable Products	Use products that have less impact on human health and the environment over their lifecycle
34	Waste and Materials Management	Incorporate adequate space, equipment and transport accommodations for recycling in the building design. Recycle at least 50% of C&D waste during construction
35	Ozone Depleting Compounds	Eliminate the use of ozone-depleting compounds during and after construction

Commissioning

Mu2e Commissioning* Plan		E.Huedem 8/26/2013			
		Own er or	Cx A (TBD)	CxPM (Cont ontr	Subc ontr
MISC TESTS					
Provide notification (duct leak test)				X	
Witness duct test	X	optnl	X	X	
Provide notification (pipe flush & cleaning)			X		
Witness pipe flush & cleaning	X	optnl	X	X	
Provide notification (pipe pressure test)			X		
Witness pipe pressure test	X	X	X	X	
Submit all misc Test reports to Cx & Owner			X	X	
Submit electrical Test reports			X	X	
CPI (Contractor Pre-Inspection Checklist)					
Verify proper installation of Equip/Syst to be Cx	X	X	X	X	
Review, Coordinate, Confirm, Schedule CPI work with Cx Team			X	X	
Witness CPI	some	some	X	X	
Log & correct deficiencies			X	X	
Sign CPI to confirm completion			X	X	
START-UP					
Provide notification (Mfr check-test-start) / Schedule start-up [4 wks prior]			X	X	
Submit Pre-start check sheets to CxA (prior to startup)			X	X	
Startup & Initial check-out lead by				X	
Witness Mfr check-test-startup	X	X (a)	X	X	
Submit signed copy of completed start-up form / Install chklist to CxA/Owner			X	X	
CONTROLS POINT-to-POINT PreFunctional Test					
Test Control system point-to-point and selective functional test			X	X	
TAB (testing and balancing)					
Submit TAB Plan outline to CxA & Controls sub [8 wks prior]			X	X	
Actual TAB work				X	
Submit TAB report			X	X	
FPT (Functional Performance Test)					
Provide notification (FPT- functional test)			X	X	
Review, Coordinate, Confirm, Schedule FPT work with Cx Team			X	X	
Witness FPT (functional test)	some	X	X	X	
Verify proper operation & controls	X	X	X	X	
Actual work				X	
List deficiencies in troubleshooting log			X		
Correct deficiencies			X	X	
Sign FPT & controls verification for each system			X	X	
O&M MANUALS					
Provide IOM to CxA for equip/syst being Cx			X	X	
Review IOM	optnl	optnl			
TRAINING					
Provide list of trainig sessions, plan & agenda, for each equip/syst to be Cx [2 wks prior]			X	X	
Provide notification (Owner Training Session)			X		
Attend Training Session	X	optnl			
Submit completed sign-in sheet from training session to CxA			X	X	
WARRANTY PERIOD / POST Cx					
Coordinate any activities during warranty period			X		
Correct incompte & non-confirming/deficient items				X	
Any retest witness by	X	X	X		
Final Summary Report to Owner			X		

Energy Model result

Energy Cost Budget / PRM Summary

By Middough

Project Name: Mu2e	Date: October 10, 2013
City: Barrington, IL	Weather Data: Chicago Midway Airport, Illinois

Note: The percentage displayed for the "Proposed/ Base %" column of the base case is actually the percentage of the total energy consumption.

* Denotes the base alternative for the ECB study.

		* Ait-2 FNA1301 Baseline			Ait-1 FNA1301 Proposed		
		Energy 10 ⁶ Btu/yr	Proposed / Base %	Peak kBtuh	Energy 10 ⁶ Btu/yr	Proposed / Base %	Peak kBtuh
Lighting - Conditioned	Electricity	337.9	7	150	249.6	74	111
Space Heating	Electricity	132.3	3	401	133.3	101	185
	Gas	415.3	8	1,042	327.9	79	475
Space Cooling	Electricity	321.5	6	159	543.0	169	166
Pumps	Electricity	0.0	0	0	29.1	0	10
Heat Rejection	Electricity	35.5	1	15	0.9	3	2
Fans - Conditioned	Electricity	938.5	18	130	230.1	25	53
Receptacles - Conditioned	Electricity	2,828.4	55	644	2,828.4	100	644
Stand-alone Base Utilities	Electricity	160.9	3	38	57.1	35	13
Total Building Consumption		5,170.2			4,399.4		

		* Ait-2 FNA1301 Baseline	Ait-1 FNA1301 Proposed
Total	Number of hours heating load not met	179	0
	Number of hours cooling load not met	0	0

		* Ait-2 FNA1301 Baseline		Ait-1 FNA1301 Proposed	
		Energy 10 ⁶ Btu/yr	Cost/yr \$/yr	Energy 10 ⁶ Btu/yr	Cost/yr \$/yr
Electricity		4,754.9	60,742	4,071.5	52,012
Gas		415.3	1,989	327.9	1,571
Total		5,170	62,732	4,399	53,582

Energy Model Result

Some excerpt from GP report

- **Item 5 Commissioning**
 - Building commissioning is covered in the bid documents from an overview level through detailed commissioning checklists for each system used in the building.
- **Item 6 / 7 Energy Efficiency**
 - Building energy efficiency has been checked utilizing Trane Trace modeling software with input according to ASHRAE 90.1 – 2007, Appendix G. The current Trace output indicates a 15% savings relative to ASHRAE 90.1. A significant issue that is limiting the energy savings of this building is the high energy consumption of the experimental equipment
- **Item 10 / 11 Measurement and Verification**
 - Metering has been provided for natural gas, electricity and domestic water. Metering is being monitored by the building automation system.
- **Item 13 Indoor Water - Water Savings Calculations**
 - Plumbing fixtures have been selected to achieve 31.2% water savings following LEED Version 3 calculation methodology. Savings have exceeded the 20% goal
- **Item 14 Indoor Water - Measurement and Verification**
 - Domestic water meter is being provided and is monitored by the building automation system.
- **Item 21 / 22 Water Efficient Products**
 - Products and services that have earned the WaterSense label have been certified to be at least 20 percent more efficient without sacrificing performance.” Applicable products for the Mu2e project are toilets and faucets
- **Item 23 Ventilation and Thermal Control - ASHRAE 55-2004 Data**
 - Chart and Calc
- **Item 24 Ventilation and Thermal Control - ASHRAE 62-2007 Calculations**
 - Chart and Calc

FULL GP REPORT
Docdb 2081