EA PREREQUISITE 2: MINIMUM ENERGY PERFORMANCE

Project # 1000002482 Federal Center South ARRA Build

All fields and uploads are required unless otherwise noted.

THRESHOLD ATTEMPTED

Points Attempted: 0

ALL OPTIONS

TARGET FINDER

The following fields are required, but the values have no bearing on EA Prerequisite 2 compliance. Use the Target Energy Performance Results calculator on the ENERGY STAR website to generate the values. If using prescriptive compliance paths (Options 2 or 3), leave the Design energy consumption and cost values blank in the Target Finder website, and set the Design values equal to the Target values in this form.

	Design	Target
Energy performance rating:	100	100
CO_2-eq emissions:	430 metric tons/year	558 metric tons/year
CO_2-eq emissions reduction:	77 %	70 %

Upload EAp2-1. Provide the Target Finder Energy Performance Results for the project building (a screen capture or other documentation containing the same information).(Optional) Upload *Files: 1*

☐ The building is not able to get a Target Finder score because the tool does not support the primary building type of the project building.(Optional)

PREREQUISITE COMPLIANCE

Total gross square footage: 188,587 sf

Principal project building activity: Office: Government

Select a compliance path:

◉ **Option 1. Whole Building Energy Simulation.** The project team will document improvement in the proposed building performance rating as compared to the baseline building performance rating per ASHRAE/IESNA Standard 90.1-2007 or California Title 24-2005 Part 6.

○ **Option 2. Prescriptive Compliance Path: ASHRAE Advanced Energy Design Guide.** The project team will document compliance with the ASHRAE Advanced Energy Design Guide.

○ **Option 3. Prescriptive Compliance Path: Advanced Buildings Core Performance Guide.** The project team will document compliance with the Advanced Buildings™ Core Performance™ Guide.

OPTION 1. WHOLE BUILDING ENERGY SIMULATION

Complete the following sections:

Section 1.1A - General Information
Section 1.1B - Mandatory Requirements
Section 1.2 - Space Summary
Section 1.3 - Advisory Messages
Section 1.4 - Comparison of Proposed Design Versus Baseline Design Energy Model Inputs
Section 1.5 - Energy Type Summary
Section 1.6 - On-Site Renewable Energy (if applicable)
Section 1.7 - Exceptional Calculation Measure Summary (if applicable)
Section 1.8 - Performance Rating Method Compliance Report
Section 1.9A - Total Building Performance Summary
Section 1.9B - Reports & Metrics

SECTION 1.1A - GENERAL INFORMATION

☒ **Compliant energy simulation software:** The energy simulation software used for this project has all capabilities described in EITHER section "G2 Simulation General Requirements" in Appendix G of ASHRAE 90.1-2007 OR the analogous section of the alternative qualifying energy code used.

☒ **Compliant energy modeling methodology:** Energy simulation runs for both the baseline and proposed building use the assumptions and modeling methodology described in EITHER ASHRAE 90.1-2007 Appendix G OR the analogous section of the alternative qualifying energy code used.

Simulation program: EDSL Thermal Analysis S

Principal heating source: Electricity

Energy code used: ASHRAE 90.1-2007

List the ASHRAE addenda used in the modeling assumptions, if any. (Optional)

Zip/Postal Code:	98134
Weather file:	Seattle - boeing field TMY3
Climate zone:	4C

List the climatic data from ASHRAE Standard 90.1-2007 Table D-1. Specify if another source is referenced for HDD & CDD data.

Heating Degree Days:	4,280
Cooling Degree Days:	2,421
HDD and CDD data source, if other than ASHRAE: (Optional)	

New construction gross square footage:	188,587
Existing, renovated gross square footage:	0
Existing, unrenovated gross square footage:	0
Total gross square footage:	188,587
New construction percent:	100 %
Existing renovation percent:	0 %
Existing unrenovated percent:	0 %
Gross square footage used in the energy model, if different than gross square footage above: (Optional)	0

SECTION 1.1B - MANDATORY REQUIREMENTS

For all elements included in the architect's scope of work for the project building, the project building design complies with all ASHRAE Standard 90.1-2007 mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4), and the information provided regarding the Proposed Case energy model in Section 1.4 is consistent with the Building Design.

Signatory: Heather Karch;Architect; July 18, 2011

REQUIRED SIGNATORY
Initial here: HTK
ARCHITECT

For all elements included in the mechanical engineer's scope of work for the project building, the project building design complies with all ASHRAE Standard 90.1-2007 mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4), and the information provided regarding the Proposed Case energy model in Section 1.4 is consistent with the Building Design.

Signatory: Benjamin Gozart;MEP Engineer; July 20, 2011

REQUIRED SIGNATORY
Initial here: BFG
MECHANICAL ENGINEER

For all elements included in the electrical engineer's scope of work for the project building, the project building design complies with all ASHRAE Standard 90.1-2007 mandatory provisions (Sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4), and the information provided regarding the Proposed Case energy model in Section 1.4 is consistent with the Building Design.

Signatory: Benjamin Gozart;MEP Engineer; July 20, 2011

REQUIRED SIGNATORY
Initial here: BFG
ELECTRICAL ENGINEER

Upload the following Interactive Compliance Forms: (Optional)

- ☐ **Upload EAp2-2.** Building Envelope Compliance Documentation
- ☐ **Upload EAp2-3.** HVAC Compliance Documentation
- ☐ **Upload EAp2-4.** Lighting Compliance Documentation
- ☐ **Upload EAp2-5.** Service Water Heating Compliance Documentation

SECTION 1.2 - SPACE SUMMARY

Table EAp2-1. Space Usage Type

Space Name / Description	Space Usage Type	Space Size	Regularly Occupied GSF	Unconditioned GSF	Typical Hours in Operation (per week)
Oxbow	Office	135,062	135,062	0	60
Commons	conference room and br	42,064	0	0	50
	Total	177,126	135,062	0	
	Percentage of total (%)		76.25	0	

Add Row Delete Row

SECTION 1.3 - ADVISORY MESSAGES

Complete Table EAp2-2 based on information from the energy simulation output files.

Table EAp2-2. Advisory Messages

	Baseline Design (0° Rotation)	Proposed Design
Number of hours heating loads not met[1]	63	65
Number of hours cooling loads not met[1]	6	7
Total	69	72
Difference[2] (Proposed design minus baseline design)		3
Number of warning messages	0	0
Number of error messages	0	0
Number of defaults overridden	0	0
Unmet load hours compliance	Y	

[1] *Baseline design and proposed design unmet load hours each may not exceed 300*

[2] *Unmet load hours for the proposed design may not exceed the baseline design by more than 50 hours.*

SECTION 1.4 - COMPARISON OF PROPOSED DESIGN VERSUS BASELINE DESIGN ENERGY MODEL INPUTS

Download, complete, and upload "EAp2 Section 1.4 table.xls" (found under "Credit Resources") to document the Baseline and Proposed design energy model inputs for the project.

Documentation should be sufficient to justify the energy and cost savings numbers reported in the Performance Rating Table.

Upload EAp2-7. Provide the completed EAp2 Section 1.4 Tables available under "Credit Resources."

Upload *Files: 1*

SECTION 1.5 - ENERGY TYPE SUMMARY

List the energy types used by the project (i.e. electricity, natural gas, purchased chilled water or steam, etc.) for the Baseline and Proposed designs.

If revising the values in Table EAp2-3, reselect energy type in all affected rows in Table EAp2-4 and Table EAp2-5 to ensure that the revised values from Table EAp2-3 are propogated and that Table EAp2-4 and Table EAp2-5 calculations are refreshed.

Table EAp2-3. Energy Type Summary

Energy Type	Utility Company Name	Utility Rate and Description of rate structure[1]	Baseline Virtual Rate[2] ($ per unit energy)	Proposed Virtual Rate[2] ($ per unit energy)	Units of Energy	Units of Demand
Electricity	Seattle City Light	DOE EIA	0.0721	0.0721	kWh	kW
Natural Gas	Puget Sound Energy	DOE EIA	0.0347	0.0347	kWh	kW
			0	0		

[1]Describe the rate structure and list the local utility rate/s for the energy type. Per ASHRAE 90.1-2007 G2.4, project teams are allowed to use the state average energy prices published by DOE's EIA for commercial building customers, readily available on EIA's website (www.eia.doe.gov). If project uses backup energy for on-site renewable energy, please specify the rate of backup source energy.

[2]List the virtual energy rate from the baseline and proposed design energy model results or from manual calculations. This rate is defined as defined as the total annual charge divided by the metered energy from the plant for each resource. Provide a narrative explaining demand reduction if the Proposed and Baseline rates vary significantly.

Add Row | Delete Row

If the Proposed and Baseline rates vary significantly, describe the building input parameters (e.g. demand reduction measures) leading to the variation in energy rates, and provide detailed information regarding the utility rate structure including all demand and energy charges, and the seasonal and time-of-use structure of the utility tariff. (Required when Proposed & Baseline Rates vary by more than 10%)

Upload EAp2-8. Provide any documentation to support the proposed/baseline rate variance narrative. (Optional)

Upload *Files: 0*

SECTION 1.6 - PERFORMANCE RATING METHOD COMPLIANCE REPORT

In Table EAp2-4, list each energy end use for the project (including all end uses reflected in the baseline and proposed designs). Then check whether the end-use is a process load, select the energy type, and list the energy consumption and peak demand for each end-use for all four Baseline Design orientations.

Fill out the Proposed Design energy consumption and peak demand for each end use in Table. Performance Rating - Performance Rating Method Compliance.

Table EAp2-4. Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand		Baseline (0° rotation)	Baseline (90° rotation)	Baseline (180° rotation)	Baseline (270° rotation)	Baseline Building Results
Interior Lighting		Electricity	Energy Use	kWh	477,080	477,080	477,080	477,080	477,080
			Demand	kW	171.2	171.2	171.2	171.2	171.2
Exterior Lighting		Electricity	Energy Use	kWh	23,076	23,076	23,076	23,076	23,076
			Demand	kW	6.3	6.3	6.3	6.3	6.3
Space Heating		Electricity	Energy Use	kWh	337,751	337,495	340,882	339,648	338,944
			Demand	kW	1,069.12	1,068.37	1,068.32	1,064.99	1,067.7
Space Cooling		Electricity	Energy Use	kWh	106,064	107,366	105,237	107,253	106,480
			Demand	kW	1,042.74	999.81	1,025.02	1,034.36	1,025.48
Pumps		Electricity	Energy Use	kWh	94,358	93,183	93,155	95,254	93,987.5
			Demand	kW	48.02	47.09	47.37	48.27	47.69
Heat Rejection		Electricity	Energy Use	kWh	33,371	32,957	32,987	33,624	33,234.75
			Demand	kW	25.83	25.32	25.48	25.96	25.65
Fans-Interior		Electricity	Energy Use	kWh	261,306	267,342	253,882	259,282	260,453
			Demand	kW	148.38	149.42	150.96	153.11	150.47
Fans - Parking Garage	X		Energy Use						
			Demand						
Service Water Heating		Electricity	Energy Use	kWh	59,946	59,946	59,946	59,946	59,946
			Demand	kW	29	29	29	29	29
Receptacle Equipment	X	Electricity	Energy Use	kWh	294,975	294,975	294,975	294,975	294,975
			Demand	kW	101.3	101.3	101.3	101.3	101.3
Interior Lighting - Process	X		Energy Use						
			Demand						
Refrigeration Equipment	X		Energy Use						
			Demand						
Cooking	X		Energy Use						
			Demand						
Industrial Process	X		Energy Use						
			Demand						
Elevators and Escalators	X	Electricity	Energy Use	kWh	57,165	57,165	57,165	57,165	57,165
			Demand	kW	96.9	96.9	96.9	96.9	96.9
heating/cooling unitary systems		Electricity	Energy Use	kWh	138,031	138,031	138,031	138,031	138,031
			Demand	kW	15.76	15.76	15.76	15.76	15.76
			Energy Use						
			Demand						

Save Form

Baseline Energy Totals	Total Energy Use (mBtu/yr)	6425.22	6443.96	6402.33	6432.76	6426.07
		Annual Process Energy (mBtu/yr)				1201.5
		Process Energy Modeling Compliance[1]				N

1. Annual process energy costs must be at least 25% of the total energy costs for the proposed design. This form determines compliance using cost calculations from Section 1.9. Process Energy Costs should be modeled to accurately reflect the proposed building. Process Energy must be the same in the baseline and proposed cases, unless an exceptional calculation is used. Process energy costs must be at least 25% of the total baseline energy costs. Any exceptions must be supported by a narrative and/or other supporting documentation.

Add Row Delete Row

Note: Compliance is determined correctly after Section 1.9A is complete. If the project does not comply, explain any exceptions in the narrative below.

Explain any exceptions, special circumstances or modeling difficulties that occurred relating to the process energy noncompliance.

The contract for this project includes retention associated with energy performance whereby, if the targeted energy usage isn't achieved during the operation of the building, a portion of the contract payment will not be released. As such it was imperative for the design team to confirm the operating profiles and plug loads of the client as these would significantly and directly impact the operating energy of the building.

Initial assumptions regarding the operating profiles and plug loads were made during the concept design phase for the owners review and comment. During design development, a plug load study of the current USACE operation in Seattle was conducted to confirm the final profiles and plug loads that were used for this energy study. Attached here and to the original submission is a memo written to the builder for comment by the owner. The owner reviewed these assumptions without comment and confirmed that these are realistic profiles and plug loads to use in the proposed design. These plug loads fall out below the 25% benchmark that LEED assumes.

Upload EAp2-9. Provide any documentation to support the process energy noncompliance narrative. (Optional) Upload *Files: 1*

Table EAp2-5. Performance Rating - Performance Rating Method Compliance

End Use	Process	Baseline Building Units		Baseline Building Results	Proposed Design Energy Type	Units of Annual Energy & Peak Demand		Proposed Building Results	Percent Savings
Interior Lighting		Energy Use	kWh	477080		Energy Use	kWh	312,965	
		Demand	kW	171.2	Electricity	Demand	kW	107.7	34.4
Exterior Lighting		Energy Use	kWh	23076		Energy Use	kWh	20,882	
		Demand	kW	6.3	Electricity	Demand	kW	5.7	9.51
Space Heating		Energy Use	kWh	338944		Energy Use	kWh	97,185	
		Demand	kW	1067.7	Electricity	Demand	kW	1,083.5	71.33
Space Cooling		Energy Use	kWh	106480		Energy Use	kWh	58,101	
		Demand	kW	1025.48	Electricity	Demand	kW	1,098	45.43
Pumps		Energy Use	kWh	93987.5		Energy Use	kWh	28,140	
		Demand	kW	47.69	Electricity	Demand	kW	52.4	70.06
Heat Rejection		Energy Use	kWh	33234.75		Energy Use	kWh	20,446	
		Demand	kW	25.65	Electricity	Demand	kW	17.2	38.48

Fans-Interior		Energy Use	kWh	260453		Energy Use	kWh	64,595	
		Demand	kW	150.47	Electricity	Demand	kW	79.1	75.2
Fans - Parking Garage	X	Energy Use				Energy Use		0	
		Demand				Demand		0	0
Service Water Heating		Energy Use	kWh	59946		Energy Use	kWh	10,292	
		Demand	kW	29	Electricity	Demand	kW	16.5	82.83
Receptacle Equipment	X	Energy Use	kWh	294975		Energy Use	kWh	294,975	
		Demand	kW	101.3	Electricity	Demand	kW	101.3	0
Interior Lighting - Process	X	Energy Use				Energy Use		0	
		Demand				Demand		0	0
Refrigeration Equipment	X	Energy Use				Energy Use		0	
		Demand				Demand		0	0
Cooking	X	Energy Use				Energy Use		0	
		Demand				Demand		0	0
Industrial Process	X	Energy Use				Energy Use		0	
		Demand				Demand		0	0
Elevators and Escalators	X	Energy Use	kWh	57165		Energy Use	kWh	57,165	
		Demand	kW	96.9	Electricity	Demand	kW	96.9	0
heating/ cooling unitary systems		Energy Use	kWh	138031		Energy Use	kWh	155,089	
		Demand	kW	15.76	Electricity	Demand	kW	17.7	-12.36
		Energy Use				Energy Use		0	
		Demand				Demand		0	0
Baseline Total Energy Use				6426.07	Proposed Total Energy Use		3820.88	MBtu/yr	
Baseline Process Energy				1201.5	Proposed Process Energy		1201.5	MBtu/yr	

Table EAp2-6. Section 1.6 Energy Use Summary & Energy Savings

Energy Type	Units	Baseline Design	Proposed Design
Electricity	kWh	1,883,372.25	1,119,835
Natural Gas	kWh	0	0
		0	0
Totals	MMBtu	6,426.07	3,820.88

SECTION 1.7 - EXCEPTIONAL CALCULATION MEASURE SUMMARY

Select one of the following

- ○ The energy analysis includes exceptional calculation method(s) (ASHRAE 90.1-2007, G2.5).
- ◉ The energy analysis does not include exceptional calculation methods.

SECTION 1.8 - ON-SITE RENEWABLE ENERGY

Select one of the following

- ○ The project uses on-site renewable energy produced on-site.
- ◉ The project does not use on-site renewable energy.

SECTION 1.9A - TOTAL BUILDING PERFORMANCE SUMMARY

Table EAp2-10. Energy Use Summary: Total Building Energy Use Performance

Energy Type	Units	Baseline Case		Proposed Case			
Section 1.6 Energy Use		Process	Section 1.6 Energy Use	Section 1.6 Energy Use	Section 1.7 Energy Savings	Section 1.8 Ren Energy Savings	Total Energy Use
Electricity	kWh	352,140	1,883,372.2	1,119,835	0	0	1,119,835
Natural Gas	kWh	0	0	0	0	0	0
		0	0	0	0	0	0
Totals	MMBtu	1,201.5	6,426.07	3,820.88	0	0	3,820.88
						Energy use savings	40.54%

Table EAp2-11. Energy Cost Summary: Total Building Energy Cost Performance (Baseline Case)

Energy Type	Baseline Cost ($) (0° rotation)	Baseline Cost ($) (90° rotation)	Baseline Cost ($) (180° rotation)	Baseline Cost ($) (270° rotation)	Baseline Building Performance
Electricity	135,773.17	136,169.25	135,289.55	135,932.66	135,791.16
Natural gas	0	0	0	0	0
Totals	135,773.17	136,169.25	135,289.55	135,932.66	135,791.16

Table EAp2-12. Energy Cost Summary: Total Building Energy Cost Performance (Manual Cost Input)

Energy Type	Units	Baseline Case		Proposed Case			
Section 1.6 Energy Use		Process	Section 1.6 Energy Use	Section 1.6 Energy Use	Section 1.7 Energy Savings	Section 1.8 Ren Energy Savings	Total Energy Cost
Electricity	$	25,389	135,791.16	80,740	0	0	80,740
Natural Gas	$	0	0	0	0	0	0
	$	0		0	0	0	0
Totals	$	25,389	135,791.16	80,740	0	0	80,740
Baseline process energy costs as percent of total energy costs (%)			18.7	Energy cost savings			40.54%
EA Credit 1 points documented							15

Use the Automatic Cost Calculation path if the project uses automatic cost calculation under Section 1.7 or Section 1.8.

☒ **Automatic Cost Calculation**: The project will generate the energy cost values using the virtual energy rate from Section 1.5: Energy Use Summary.

Table EAp2-13. Energy Cost Summary: Total Building Energy Cost Performance

Energy Type	Units	Baseline Case		Proposed Case			
Section 1.6 Energy Cost		Process	Section 1.6 Energy Cost	Section 1.6 Energy Cost	Section 1.7 Energy Savings	Section 1.8 Ren Energy Savings	Total Energy Cost
Electricity	$	25,389.29	135,791.14	80,740.1	0	0	80,740.1
Natural Gas	$	0	0	0	0	0	0
	$	0	0	0	0	0	0
Totals	$	25,389.29	135,791.14	80,740.1	0	0	80,740.1
Baseline process energy costs as percent of total energy costs (%)			18.7	Energy cost savings			40.54%
EA Credit 1 points documented							15

Section 1.9B - REPORTS AND METRICS

Table EAp2-14. Energy Use Intensity

	Baseline EUI	Proposed EUI
Electricity (kWh/sf)		
Interior Lighting	2.53	1.66
Space Heating	1.797	0.515

Save Form

Space Cooling	0.565	0.308
Fans - Interior	1.381	0.343
Service Water Heating	0.318	0.055
Receptacle Equipment	1.564	1.564
Miscellaneous	1.832	1.493
Total	9.987	5.938
Natural Gas (kBtu/sf)		
Space Heating	0	0
Service Water Heating	0	0
Total Energy Use Intensity (kBtu/sf)		
Total	34.075	20.261

Table EAp2-15. End Use Energy Percentage

	Baseline Case	Proposed Case	End Use Energy Savings (%)
Interior Lighting	25.333	27.955	21.489
Space Heating	17.994	8.673	31.665
Space Cooling	5.657	5.187	6.348
Fans - Interior	13.828	5.776	25.638
Service Water Heating	3.184	0.926	6.496
Receptacle Equipment	15.661	26.338	0
Miscellaneous	18.344	25.142	8.373

Input & Output Summaries from the Energy Model

Upload the summary report from the simulation program.

- **Upload EAp2-11.** If the project used DOE2, eQuest & Visual DOE, provide the Input summary and the BEPS, BEPU, & ES-D reports.
- **Upload EAp2-12.** If the project used EnergyPlus, provide the Input summary and the Annual Building Utility Performance Summary (ABUPS), System Summary, and the file that shows the annual energy cost by fuel source.
- **Upload EAp2-13.** If the project team used EnergyPro, provide the Input summary and the Title 24 reports: PERF-1, ECON-1, & UTIL-1.
- **Upload EAp2-14.** If the project team used HAP, provide the Input summary and the Annual Cost Summary, Unmet Load reports for all plants and systems (Building Zone Temperature Report), and Systems Energy Budget by Energy Source.

○ **Upload EAp2-15.** If the project team used Trace, provide the Input summary as well as the the Energy Consumption Summary, Energy Cost Budget/PRM Summary report, and Performance Rating Method Details.

◉ **Upload EAp2-16.** For all other modeling software, upload supporting documents of similar scope and detail (input and output summaries.) Upload *Files: 3*

ADDITIONAL DETAILS

☐ Special circumstances preclude documentation of prerequisite compliance with the submittal requirements outlined in this form.

☐ The project team is using an alternative compliance approach in lieu of standard submittal paths.

SUMMARY

EA Prerequisite 2: Minimum Energy Performance Compliance Documented: Y Check Compliance

Note: *Click "Check Compliance" to validate that the form meets the requirements. "Check Compliance" must be run after any changes are made to the form to ensure that "Compliance Documented" is accurate. Always press "Check Compliance" before saving the form.Fields are highlighted in red after "Check Compliance" is pressed are incomplete required fields. After entering information in those fields and pressing "Check Compliance" once more, the fields should return to their normal color*