



LEED 2009 for New Construction and Major Renovations

EA PREREQUISITE 2: MINIMUM ENERGY PERFORMANCE

Project # 1000010801 Wayne Aspinall Federal Building

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:	142 metric tons/year	142 metric tons/year
CO ₂ -eq emissions reduction:	79 %	79 %

Upload EA p2-1. 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: 41,562 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:

Trace

Principal heating source:

Electricity

Energy code used:

ASHRAE 90.1-2007

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

None

Zip/Postal Code:

Weather file:

Climate zone:

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:

Cooling Degree Days:

HDD and CDD data source, if other than ASHRAE: (Optional)

New construction gross square footage:

Existing, renovated gross square footage:

Existing, unrenovated gross square footage:

Total gross square footage:

New construction percent: %

Existing renovation percent: %

Existing unrenovated percent: %

Gross square footage used in the energy model, if different than gross square footage above: (Optional)

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: Elicia Gibbon;Architect; December 1, 2011

Signatory	
Initial here:	EKG

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: Timothy Baker;HVAC Engineer; December 1, 2011

Signatory	
Initial here:	TJB

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: Robert Smolinski;MEP Engineer; December 1, 2011

Signatory	
Initial here:	RJS

Upload the following [Interactive Compliance Forms](#): (Optional)

- Upload EA2-2. Building Envelope Compliance Documentation
- Upload EA2-3. HVAC Compliance Documentation
- Upload EA2-4. Lighting Compliance Documentation
- Upload EA2-5. Service Water Heating Compliance Documentation

SECTION 1.2 - SPACE SUMMARY

Table EA2-1. Space Usage Type

Space Name / Description	Space Usage Type	Space Size	Regularly Occupied GSF	Unconditioned GSF	Typical Hours in Operation (per week)
Conference Room	Conference Room	5,372	5,372	0	65
Office Open	Office Open	7,324	7,324	0	65
Office Private	Office Private	2,830	2,830	0	65
Lobby/Reception	Lobby/Reception	2,996	2,996	0	65
Corridor	Corridor	7,333	0	0	65
Utility Room	Utility Room	2,489	0	0	65
Restroom	Restroom	1,840	0	0	65

Space Name / Description	Space Usage Type	Space Size	Regularly Occupied GSF	Unconditioned GSF	Typical Hours in Operation (per week)
Storage	Storage	2,876	0	0	65
Unconditioned	Unconditioned	8,502	0	8,502	65
Total		41,562	18,522	8,502	
Percentage of total (%)			44.56	20.46	

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	0	0
Number of hours cooling loads not met ¹	0	0
Total	0	0
Difference ² (Proposed design minus baseline design)		0
Number of warning messages	0	0
Number of error messages	0	0
Number of defaults overridden	0	0
Unmet load hours compliance	Y	

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

²Unmet 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."

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 propagated 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	DOE EIA	Colorado State Average	0.07	0.07	kWh	kW
Natural Gas			0	0		
			0	0		

¹Describe 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, available on EIA's website (www.eia.gov). If project uses backup energy for on-site renewable energy, please specify the rate of backup source energy.

²List 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.

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)

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
			Energy Use	Demand					
Interior Lighting	<input type="checkbox"/>	Electricity	Energy Use	kWh	60,205	60,205	60,205	60,205	60,205
			Demand	kW	24	24	24	24	24
Exterior Lighting	<input type="checkbox"/>	Electricity	Energy Use	kWh	2,277.6	2,277.6	2,277.6	2,277.6	2,277.6
			Demand	kW	0.48	0.48	0.48	0.48	0.48
Space Heating	<input type="checkbox"/>	Electricity	Energy Use	kWh	188,936	192,992	200,504	202,046	196,119.5
			Demand	kW	207	209	203	206	206.25
Space Cooling	<input type="checkbox"/>	Electricity	Energy Use	kWh	81,794	88,798	84,241	88,699	85,883
			Demand	kW	66	70	72	69	69.25
Pumps	<input type="checkbox"/>	Electricity	Energy Use	kWh	0	0	0	0	0
			Demand	kW	0	0	0	0	0
Heat Rejection	<input type="checkbox"/>	Electricity	Energy Use	kWh	6,292	6,832	6,457	6,767	6,587
			Demand	kW	8	8	8	8	8
Fans-Interior	<input type="checkbox"/>	Electricity	Energy Use	kWh	51,281	54,291	53,250	52,732	52,888.5
			Demand	kW	51	50	53	47	50.25
Fans - Parking Garage	<input checked="" type="checkbox"/>		Energy Use						
			Demand						
Service Water Heating	<input type="checkbox"/>	Electricity	Energy Use	kWh	4,732	4,732	4,732	4,732	4,732
			Demand	kW	13	13	13	13	13
Receptacle Equipment	<input checked="" type="checkbox"/>	Electricity	Energy Use	kWh	39,563	39,563	39,563	39,563	39,563
			Demand	kW	13	13	13	13	13
Interior Lighting - Process	<input checked="" type="checkbox"/>		Energy Use						
			Demand						
Refrigeration Equipment	<input checked="" type="checkbox"/>		Energy Use						
			Demand						
Cooking	<input checked="" type="checkbox"/>		Energy Use						
			Demand						

Industrial Process	✘		Energy Use						
			Demand						
Elevators and Escalators	✘	Electricity	Energy Use	kWh	2,600	2,600	2,600	2,600	2,600
			Demand	kW	25	25	25	25	25
	■		Energy Use						
			Demand						
Baseline Energy Totals			Total Energy Use (mBtu/yr)		1493.37	1543.22	1548.47	1568.23	1538.32
					Annual Process Energy (mBtu/yr)			143.86	
					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.

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 baseline electricity use is relatively high, due to use of ASHRAE baseline system type 6, which requires electric resistance for heating. This project is targeting site net zero energy performance. As part of the overall approach, process energy is lower than for a traditional building. This is achieved through plug load occupancy control and monitoring, mandated use of Energy Star equipment, and preferred use of laptops and cloud computing.

Upload EA2-9. Provide any documentation to support the process energy noncompliance narrative. (Optional)

Files: 1

Table EA2-5. 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	60205	Electricity	Energy Use	kWh	25,903	56.98
		Demand	kW	24		Demand	kW	15	
Exterior Lighting		Energy Use	kWh	2277.6	Electricity	Energy Use	kWh	1,423.5	37.5
		Demand	kW	0.48		Demand	kW	0.3	
Space Heating		Energy Use	kWh	196119.5	Electricity	Energy Use	kWh	12,422	93.67
		Demand	kW	206.25		Demand	kW	16	

Space Cooling		Energy Use	kWh	85883	Electricity	Energy Use	kWh	27,206	68.32
		Demand	kW	69.25		Demand	kW	40	
Pumps		Energy Use	kWh	0	Electricity	Energy Use	kWh	21,795	0
		Demand	kW	0		Demand	kW	6	
Heat Rejection		Energy Use	kWh	6587	Electricity	Energy Use	kWh	325	95.07
		Demand	kW	8		Demand	kW	0.3	
Fans-Interior		Energy Use	kWh	52888.5	Electricity	Energy Use	kWh	27,242	48.49
		Demand	kW	50.25		Demand	kW	14	
Fans - Parking Garage	X	Energy Use				Energy Use		0	0
		Demand				Demand		0	
Service Water Heating		Energy Use	kWh	4732	Electricity	Energy Use	kWh	4,732	0
		Demand	kW	13		Demand	kW	13	
Receptacle Equipment	X	Energy Use	kWh	39563	Electricity	Energy Use	kWh	39,563	0
		Demand	kW	13		Demand	kW	13	
Interior Lighting - Process	X	Energy Use				Energy Use		0	0
		Demand				Demand		0	
Refrigeration Equipment	X	Energy Use				Energy Use		0	0
		Demand				Demand		0	
Cooking	X	Energy Use				Energy Use		0	0
		Demand				Demand		0	
Industrial Process	X	Energy Use				Energy Use		0	0
		Demand				Demand		0	
Elevators and Escalators	X	Energy Use	kWh	2600	Electricity	Energy Use	kWh	2,600	0
		Demand	kW	25		Demand	kW	25	
		Energy Use				Energy Use		0	0
		Demand				Demand		0	
Baseline Total Energy Use				1538.32	Proposed Total Energy Use		556.88	MBtu/yr	
Baseline Process Energy				143.86	Proposed Process Energy		143.86	MBtu/yr	

Table EA2-6. Section 1.6 Energy Use Summary & Energy Savings

Energy Type	Units	Baseline Design	Proposed Design
Electricity	kWh	450,855.6	163,211.5
Natural Gas		0	0
		0	0
Totals	MMBtu	1,538.32	556.88

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.

There are different methods for including renewable energy use data in calculations for EA Prerequisite 2/Credit 1. Please note that the same method has to be used for all the measures in this section.

Select one of the following:

- Automatic cost calculation:** The project team will base the Renewable Energy Cost on the "virtual" energy rate from the proposed design energy model results. (The calculated cost savings will automatically subtract from the proposed design energy model results when determining the Proposed Building Performance Rating.)
- Manual Cost Input:** the project team will analyze the Renewable Energy Cost for each on-site renewable source separately from the energy model based on local utility rate structures. Renewable Energy Costs are reported separately for each renewable source. (The calculated cost savings are automatically subtracted from the proposed design energy model results when determining the Proposed Building Performance Rating.) Use **Section 1.9A** Total Building Performance Summary - Manual Cost Input to input the cost values.
- Energy Model Includes Renewables:** On-site renewable energy is modeled directly in the energy model. Renewable Energy Cost is already credited in the proposed design energy model results (i.e. the energy model already reflects zero cost for on-site renewable energy, and this form will NOT subtract the Renewable Energy Cost a second time.)

Indicate the on-site renewable energy source(s) used, the backup energy type for each source (i.e. the fuel that is used when the renewable energy source is unavailable - ASHRAE 90.1-2007, Section G2.4), the rated capacity for the source, and the annual energy generated from each source.

Additionally, input the energy cost savings for each renewable energy source.

Table L-1. Renewable Energy Source Summary

Renewable Source	Renewable Energy Source Allocation	Renewable System Owner	Energy Type	Rated Capacity	Annual Energy Generated	Units	Annual Energy Cost (\$)
PV	On-Site only	Building Owner	Electricity	123.2	173,608	kWh	12,153

¹Per ASHRAE 90.1 G2.1 Exception, baseline performance shall be based on the energy source used as backup energy or on the use of electricity if no backup energy source has been specified.

Add Row

Delete Row

Table EA2-9. Section 1.8 Energy Use Summary & Energy Savings

Energy Type	Units	Baseline Case	Proposed Case
Electricity	kWh	0	173,608
Natural Gas		0	0
		0	0
Totals	MMBtu	0	592.35

SECTION 1.9A - TOTAL BUILDING PERFORMANCE SUMMARY

Table EA2-10. Energy Use Summary: Total Building Energy Use Performance

Energy Type	Units	Baseline Case		Proposed Case			Total Energy Use
		Process	Section 1.6 Energy Use	Section 1.6 Energy Use	Section 1.7 Energy Savings	Section 1.8 Ren Energy Savings	
Electricity	kWh	42,163	450,855.6	163,211.5	0	173,608	-10,396.5
Natural Gas		0	0	0	0	0	0
		0	0	0	0	0	0
Totals	MMBtu	143.86	1,538.32	556.88	0	592.35	-35.47
Energy use savings							102.31%

Table EA2-11. 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	30,629	31,651	31,759	32,164	31,550.75
Natural gas	0	0	0	0	0
Totals	30,629	31,651	31,759	32,164	31,550.75

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

Energy Type	Units	Baseline Case		Proposed Case			Total Energy Cost
		Process	Section 1.6 Energy Use	Section 1.6 Energy Use	Section 1.7 Energy Savings	Section 1.8 Ren Energy Savings	
Electricity	\$	2,951.4	31,550.75	11,422	0	12,153	-731
Natural Gas	\$	0	0	0	0	0	0
	\$	0		0	0	0	0
Totals	\$	2,951.4	31,550.75	11,422	0	12,153	-731
Baseline process energy costs as percent of total energy costs (%)			9.35	Energy cost savings			102.32%
EA Credit 1 points documented							19

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.

Section 1.9B - REPORTS AND METRICS

Table EAp2-14. Energy Use Intensity

	Baseline EUI	Proposed EUI
Electricity (kWh/sf)		
Interior Lighting	1.449	0.623
Space Heating	4.719	0.299
Space Cooling	2.066	0.655
Fans - Interior	1.273	0.655
Service Water Heating	0.114	0.114
Receptacle Equipment	0.952	0.952
Miscellaneous	0.275	0.629
Total	10.848	3.927
Natural Gas (kBtu/sf)		
Space Heating	0	0
Service Water Heating	0	0
Total Energy Use Intensity (kBtu/sf)		
Total	37.013	13.399

Table EAp2-15. End Use Energy Percentage

	Baseline Case	Proposed Case	End Use Energy Savings (%)
Interior Lighting	13.357	15.864	11.935
Space Heating	43.502	7.614	63.865
Space Cooling	19.045	16.679	20.388
Fans - Interior	11.735	16.679	8.93
Service Water Heating	1.051	2.903	0
Receptacle Equipment	8.776	24.242	0
Miscellaneous	2.535	16.017	-5.115

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: 9

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

Save Form