Glazing and Energy Analysis Report

Relating to Visual Light Transmittance (VLT) and Leadership in Energy and Environmental Design (LEED) requirements of the Mauka Area Rules

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Exhibit A

Table of Contents

Appendices

Abbreviations and Definitions

For the purposes of this report, abbreviations and definitions are as follows:

ASHRAE - American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ANSI/ASHRAE/IES Standard 90.1-2007 | Energy Standard for Buildings Except Low-Rise Residential Buildings

Baseline - The building design with the minimum acceptable energy efficiency. Guidelines are provided in ASHRAE 90.1.

Glazing - An assembly of glass that serves as the exterior window.

IECC - International Energy Conservation Code
IECC 2006 | Chapter 5 – Commercial Energy Efficiency

LEED - Leadership in Energy and Environmental Design
LEED 2009 for New Construction | Energy and Atmosphere | Prerequisite 2 – Minimum Energy Performance

MAR - Mauka Area Rules
HAR §15-217
Located under: Hawaii Administrative Rules | Department of Business, Economic Development and Tourism | Hawaii Community Development Authority

ROH - Revised Ordinances of Honolulu | Chapter 32 – Building Energy Conservation Code

SHGC - Solar Heat Gain Coefficient
Number between 0 and 1 describing how much heat the glazing assembly absorbs from the sun. Lower values indicate less heat absorption from the sun, which is generally favorable in Hawaii.

U-value - An insulative property of an assembly, such as a glass window. Lower values indicate less heat absorption between the exterior and the building envelope, which is favorable.

VLT - Visible Light Transmittance
Percentage of visible light allowed through a glazing assembly.

I. Executive Summary

Concerns have been expressed that the requirements in the Mauka Area Rules (MAR) contained in the Hawaii Administrative Rules (HAR) are so stringent that it inadvertently prohibits certain types of building designs. The requirements in question are visible light transmittance (VLT) minimums and LEED energy efficiency minimums. The concern being that the combination of requirements restricts the types of allowable glazing products to the extent that there may be no readily available glazing product meeting both requirements for an all glass building.

An updated building energy model simulation for the Symphony Honolulu project conducted using the actual glazing selection for the project shows a 13.0% improvement in building energy performance, which is 3.0% higher than the LEED minimum. The glazing in the Symphony Honolulu project meets the LEED requirements, but does not meet the VLT requirement of the MAR; however, energy modeling of other glazing options has shown it possible to meet both the 50% VLT required by the MAR and the 10% improvement over baseline energy performance required by LEED. Several glazing options were explored that meet the VLT requirements of the MAR and exceed the baseline energy performance by 10.3% to 10.7%. Based on these results, we believe that the VLT requirement of the MAR does not excessively limit building design. Creative building designs like a high-rise tower with all-glass exteriors are still possible.

There are some potential disadvantages caused by requiring high VLT values. Glazing with high VLT does not always provide low external reflectance, which is the presumed intent of the VLT requirement. One concern is that high VLT glazing may reduce the privacy of the residential units. Another concern is that higher VLT glazing typically results in lower energy efficiency in a building. If sustainability and environmental consideration are priorities, lower energy consumption by a building may be more desirable than its transparency. This means that lower VLT values may be more desirable.

Through a study of applicable codes, glazing options, and calculations, this report addressed the apparent conflict between the MAR VLT requirement and the LEED energy efficiency requirements. The study shows that the Symphony Honolulu building could have been designed to comply with both requirements, but at the cost of lower energy efficiency. A lower VLT value generally relates

to higher efficiency, more privacy for residents, and does not restrict low external reflectance. A high VLT does not necessarily relate to a low external reflectance.

If sustainability is a priority, lowering energy consumption to gain transparency of the glazing may not be desirable. Current glazing technology is very advanced, offering dynamic glazing that adjusts depending the level of sunlight present in the environment. Given these considerations, we recommend that the HCDA consider revising the VLT requirement in the MAR and addressing the reflectance issue directly.

II. Introduction

The primary concern addressed in this report is whether the Visible Light Transmittance (VLT) requirement of the Mauka Area Rules (MAR) in combination with the energy efficiency requirements of Leadership in Energy and Environmental Design (LEED) criteria, creates an unnecessarily difficult set of design constraints that have no real purpose. This report summarizes and presents a study of the MAR and other rules and codes governing the Mauka Area of the Kakaako Community Development District (KCDD) and analyzes the effects VLT on the energy efficiency of a building.

The Symphony Honolulu project ("Project") has been analyzed to determine if there is a conflict between the VLT and LEED requirements of the MAR. The Project is a residential high-rise project located on the corner of Kapiolani Boulevard and Ward Avenue. The Project is under the jurisdiction of the Hawaii Community Development Authority (HCDA) and the design of the Project must comply with all applicable provisions of the MAR, except where variances are approved.

The Project incorporates a window-wall design, which creates the look of an all glass building exterior. With this design, glass performance becomes a key factor in the overall building energy performance. Although the proposed glass selection for this building design does allow the building to meet the LEED energy efficiency goals, it does not comply with the VLT requirements of the MAR. The lower VLT glazing product increases efficiency by allowing less light to be transmitted through the glass. In other words, lower VLT means less light is transmitted through the glass, potentially increasing energy efficiency. Likewise, higher VLT means more light is transmitted through the glass, potentially decreasing energy efficiency.

The MAR, contained in the Hawaii Administrative Rules (HAR) §15-217, has specific glazing requirements. Section 15-217-55 (k)(2) states that "[w]indow glazing shall be transparent with clear or limited UV tint so as to provide views out of and into the building." Discussion with HCDA planning staff indicates that an additional intent of the VLT requirement was to minimize external reflection on outdoor public spaces, streets, and neighboring buildings in the district and also to minimize heat island effects.

III. Applicable Code Requirements

This section provides a description of the applicable codes and ordinances and the minimum requirements the Project must meet. The MAR provide planning, zoning, and design criteria for the Mauka area of the KCDD. MAR section 3(e) states that "[e]xcept as otherwise specifically stated in this chapter, all other rules, laws, and ordinances shall continue to remain applicable to the developments and properties within the Mauka area." The intent was that relevant provisions of the Revised Ordinances of Honolulu (ROH) also apply to projects within the KCDD, except where specifically exempted or superseded by the MAR.

The MAR has glazing requirements, including Visible Light Transmittance (VLT) minimums and LEED minimums for new construction. The three applicable requirements of the MAR are listed in three sections. MAR section 55(k)(2) states, "[VLT] level of windows on the ground floor shall be seventy per cent or greater and on all other floors the [VLT] level shall be fifty per cent or greater." MAR section 59(c)(1) states, "[A] project shall qualify for the applicable base LEED rating system at the appropriate certification level (e.g., new construction shall qualify for LEED for new construction." MAR section 55(m)(4) states, "At least seventy per cent of a retail thoroughfare front element shall be transparent glazing, with at least seventy per cent of the glazing to allow views into the store rather than being shallow window box displays."

Chapter 32 of the ROH states that all residential and commercial buildings must comply with the International Energy Conservation Code (IECC) as amended. The ROH and IECC classify this building as commercial (IECC Ch.2 and ROH Section 16.1.1(21)); therefore, the Project must comply with the IECC commercial requirements.

Chapter 5 of the IECC provides two compliance paths for energy consumption of commercial buildings. Based on IECC section 501.1, the designer can choose between the requirements of American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) 90.1 or IECC Chapter 5. LEED baseline requirements are not fulfilled by the use of IECC chapter 5; therefore, the designer must comply with ASHRAE 90.1.

ASHRAE 90.1 describes the minimum requirement for energy efficiency in a new building. The methodology for determining baseline building energy usage is described in sections 5 through 9. Because this building has an all glass exterior, the following are the applicable fenestration requirements for determining baseline energy use:

1. Maximum U-value of 1.2
2. Maximum Solar Heat Gain Coefficient (SHGC) of 0.25
3. Maximum Glass Area of 40%

These requirements are not mandatory design criteria for the building; they are prescriptive provisions to determine baseline energy use. The designer is free to use any materials to design the building as long as the design exceeds the baseline building model energy efficiency determined by the prescriptive provisions. ASHRAE 90.1 Section 11 describes an alternate method to the prescriptive provisions that "may be employed for evaluating the compliance of all proposed designs except designs with no mechanical system" (ASHRAE 90.1 11.1.1). A building simulation program must be used to perform an energy usage calculation to show that the proposed building performs better than or equal to the baseline building design.

The LEED requirement pertaining to the energy efficiency of this building is Energy & Atmosphere (EA) Prerequisite 2, Option 1, which states, "Demonstrate a 10% improvement in the proposed building performance rating . . . compared with the baseline building performance rating." The designer must "[c]alculate the baseline building performance rating according to the building performance rating method in Appendix G of [ASHRAE] Standard 90.1-2007 . . . using a computer simulation model for the whole building project." Simply put, the proposed building design needs energy performance that is 10% better than the baseline building performance.

Table1: Code and Ordinance Requirements				
Requirement	VLT	U-factor	SHGC	Minimum Energy Savings
ROH	n/a	1.2 max OR Comply with ASHRAE	0.40 max OR Comply with ASHRAE	n/a
MAR	**50% min[1] / 70% min[2]**	n/a	n/a	Comply with LEED
LEED	n/a	Comply with ASHRAE	Comply with ASHRAE	**10% over baseline[3]**
ASHRAE	n/a	1.2 max OR **Perform Calculation**	0.25 max OR **Perform Calculation**	**Provides baseline details**
IECC	n/a	Superseded by ROH	Superseded by ROH	n/a

Bold is the limiting factor. Where options are presented, underlined is the chosen option.

[1] Upper floors

[2] Ground floor

[3] Energy savings is calculated per the following formula:

$$Percentage\ improvement = 100\ x \frac{(Baseline\ building\ performance - Proposed\ building\ performance)}{Baseline\ building\ performance}$$

IV. Energy Modeling

To meet the LEED Energy and Atmosphere Prerequisite 2, Option 1, computer simulation models must be generated for the baseline building and for the proposed building. The simulation of the proposed building model needs to demonstrate a 10% increase in energy performance over the baseline building model. The energy modeling analysis for this study was performed using Carrier Hourly Analysis Program 4.9 (HAP v4.9).

A baseline building energy model for the Project was established using the parameters required by ASHRAE 90.1. We reviewed the LEED building simulation performed by Notkin Hawaii, Inc., ("Notkin") mechanical engineering consultants for the Project. The energy modeling performed by Notkin is based on glazing that does not meet the MAR VLT requirements. Notkin's results show that there is a 10.3% increase in energy performance over the baseline and appears to be the basis of the claim that the VLT requirements and the energy requirements of the MAR cannot be met simultaneously. We found, however, that Notkin's energy modeling for the Project is inconsistent with the actual building design. For example, Notkin's model includes extra rooms, incorrect areas, and incorrect SHGCs, among other things. Some of the parameters Notkin used in their energy modeling were either incomplete or erroneous. We discussed these inconsistencies with Notkin and corrected these parameters before conducting our building energy simulation model for the Project.

We generated and analyzed a corrected building energy simulation model for the Project that uses the same building design used in the Notkin model. This design, due to the VLT of the glazing product, does not meet the MAR requirements. However, with the errors corrected, our results show that the glazing used in the Project contribute to an increase in energy efficiency of 13.0% over the baseline, which is more than sufficient to meet the LEED specification.

We conducted several additional building energy model simulations for the Project using glazing products that meet the VLT requirements of the MAR. The VLT for the glazing ranged from 51% to 58% and the energy efficiency over the baseline ranged from 10.3% to 10.7%. The results these building energy models are presented in the table below.

Table 2: Comparison of Alternative Glazing Selections							
	VLT	U-factor	SHGC	Baseline Energy Use [kWh/yr]	Proposed Energy Use [kWh/yr]	Energy Savings over Baseline	Yearly Energy Savings [$]
Code Requirement	50% min	-	-	-	-	-	-
ASHRAE 90.1 Baseline Calculation (Glazing on only 40% of wall area)	-	1.2	0.25	10,283,732	10,283,732	NA	NA
Viracon VRE1-30 (Glazing used in the Project)	28%	0.27	0.19	10,283,732	8,946,235	13.0%	$427,999
Viracon VRE1-63 (Double Coating)	53%	0.16	0.25	10,283,732	9,216,249	10.4%	$341,594
Guardian Industries Green SunGuard SNX 62/27 Coating / Clear	52%	0.27	0.25	10,283,732	9,225,118	10.3%	$338,756
Guardian Clear (SNX 62/27)/Clear (IS 20)/Clear	54%	0.21	0.24	10,283,732	9,186,876	10.7%	$350,994
JE Berkowitz Solarban 70XL	58%	0.21	0.25	10,283,732	9,220,357	10.3%	$340,280
PPG Solarban Atlantica 70XL	51%	0.27	0.24	10,283,732	9,192,177	10.6%	$349,297

Detailed results and calculations are attached in Appendix A.

V. Glazing Product Availability

According to a general review, several glazing products that meet applicable requirements are readily available. These products meet the VLT minimum required by the MAR and the energy performance minimum required by LEED. The products used in our building energy model simulations were Viracon VNE1-63, PPG Idealscapes Solarban 70 XL, Guardian Industries Ultrawhite (SunGuard SNX 62/27 Coating)/Clear, and JE Berkowitz Solarban 70XL. A list of glazing products that also meet the VLT and LEED requirement of the MAR is provided below.

Double Pane Glass Performance

Manufacturer	Model	VLT%	U-Factor	SHGC
Viracon	VNE1-63 (1-3/4" Triple Insulating (Double Coating))	53	0.16	0.25
Guardian Industries	Clear (SunGuard SNX 51/23 Coating)/Clear	51	0.27	0.23
Guardian Industries	Green (SunGuard SNX 62/27 Coating)/Clear	52	0.27	0.25
Guardian Industries	Green (SunGuard SNX 62/27 Coating)/Clear (SunGuard IS 20 Interior Surface LE)	51	0.26	0.24
Guardian Industries	Green (SunGuard SNX 62/27 Coating)/Clear (SunGuard Neutral 78/65 Coating)	51	0.26	0.25
Guardian Industries	Green SNX 62/27 #2 (Green Outboard and Clear Inboard)	52	0.27	0.25
Guardian Industries	Green SNX 62/27 #2/SunGuard IS 20 #4 (Green Outboard and Clear Inboard)	51	0.21	0.23
Guardian Industries	Light Blue SNX 51/23 #2 (Clear Outboard and Inboard)	51	0.27	0.23
Guardian Industries	Light Blue SNX 51/23 #2 (Ultra White Outboard and Inboard)	52	0.27	0.23
Guardian Industries	TwilightGreen (SunGuard SN 68 Coating)/Clear (SunGuard IS 20 Interior Surface LE)	50	0.22	0.25
Guardian Industries	UltraWhite (SunGuard SNX 51/23 Coating)/Clear	51	0.27	0.23
Guardian Industries	UltraWhite (SunGuard SNX 51/23 Coating)/Clear (SunGuard IS 20 Interior Surface LE)	50	0.21	0.22
Guardian Industries	UltraWhite (SunGuard SNX 51/23 Coating)/Clear (SunGuard IS 20 Interior Surface LE)	50	0.26	0.23
Guardian Industries	UltraWhite (SunGuard SNX 51/23 Coating)/Clear (SunGuard Neutral 78/65 Coating)	50	0.26	0.23
PPG IdeaScapes	Solarban 70XL on Atlantica	51	0.27	0.24

Triple Pane Glass Performance

Manufacturer	Model	VLT%	U-Factor	SHGC
Viracon	VNE1-63 (Double Coating)	53	0.16	0.25
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear (SunGuard IS 20 Interior Surface LE Coating)/Clear	54	0.21	0.24
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear (SunGuard IS 20 Interior Surface LE Coating)/Clear	54	0.18	0.23
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear (SunGuard Neutral 78/65 Coating)/Clear	54	0.21	0.24
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear (SunGuard Neutral 78/65 Coating)/Clear	54	0.17	0.24
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear/Clear	55	0.21	0.24
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear/Clear (SunGuard IS 20 Interior Surface LE Coating)	54	0.18	0.24
Guardian SunGuard Indu	Clear (SunGuard SNX 62/27 Coating)/Clear/Clear (SunGuard Neutral 78/65 Coating)	54	0.17	0.24
Guardian SunGuard Indu	UltraWhite (SunGuard SNX 62/27 Coating)/Clear/Clear	56	0.21	0.24
J.E. Berkowitz, LP	Solarban 70XL (#2)/Clear/Clear	58	0.21	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 400 on Clear (4)/Sungate 500 on Clear (5)	56	0.14	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 500 on Clear (4)/Sungate 500 on Clear (5)	54	0.15	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 500 on Clear (4)/Sungate 500 on Clear (6)	54	0.13	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Solarban 60 on Clear (5)	50	0.13	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Solarban 60 on Clear (5)	50	0.13	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Sungate 400 on Clear (5)	54	0.14	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Sungate 500 on Clear (5)	52	0.14	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Sungate 600 on Clear (5)	50	0.14	0.25
PPG IdeaScapes	Solarban 72 on Starphire (2)/Sungate 600 on Clear (4)/Sungate 600 on Clear (6)	50	0.13	0.24
PPG IdeaScapes	Solarban 72 on Starphire/Sungate 600 on Clear (3)/Sungate 500 on Clear (5)	52	0.16	0.25

These glazing products meet applicable code minimums for the upper floors.

The calculations show that multiple options are available to meet the MAR; however, this was at a cost to the overall energy efficiency of the building. These energy efficiency reductions are typical of the products fitting the design criteria. If energy efficiency is a priority, a reduction of the VLT requirement should be considered.

VI. Energy Efficiency

As can be seen from the data, the high VLT requirement negatively affects energy efficiency, and increases electricity usage. Increasing VLT typically increases SHGC, which increases the amount of solar heat that enters the building envelope. This in turn increases the air conditioning load, which then uses more energy to maintain the same level of occupant comfort. By contrast, lower values for VLT and SHGC reduce air-conditioning load and reduce energy usage. Reducing the VLT requirement would therefore facilitate reduced energy usage. At the current cost of electricity, for every 1% increase in energy efficiency there is an approximate annual savings of $33,000. Additionally, a high VLT requirement may not be optimal for achieving low external reflectivity. Higher values of VLT do not necessarily provide low external reflectance. There are products that have low VLT and low external reflectance. There are also products that have high VLT and high external reflectance.

VII. Conclusion

There have been concerns that the VLT requirements of the MAR are overly stringent to the point where there may be no glazing products readily available that can meet both the VLT requirement and the energy performance required by LEED. It has been a concern that the MAR's restriction on the VLT of the glass may preclude the design of an all glass building exterior and limit future building design in KCDD to older looking concrete and steel buildings. The building energy model simulations show that it is possible to meet both the MAR VLT requirement and the LEED energy efficiency requirement, even with a design including an all-glass building exterior. The design can be constructed while still adhering to the requirements of Section 15-217-55(k)(2), 15-217-55(m)(4), and 15-217-59.

In general, higher VLT values result in poorer energy performance. The increased light transmittance introduces additional solar heat into the building, resulting in higher air-conditioning load. Higher air-conditioning load increases the energy required to maintain occupant comfort. Based on current energy rates, every 1% increase in energy efficiency saves approximately $33,000

annually on electrical energy costs. Lower values of VLT can result in higher energy efficiency, which ultimately leads to lower electrical energy costs.

It would be worthwhile for the HCDA to reconsider the current VLT requirement in a manner that better balances VLT requirements with higher energy efficiency. It is our understanding that the high VLT requirement was made to address reflectivity of the building and the heat island effect. High VLT does not, however, guarantee that these effects would be minimized and is not the ideal regulating parameter. Another unintentional affect of the high VLT glass requirement is the reduced privacy in residential buildings due to increased visibility from the exterior. From sustainability and environmental perspectives, energy efficiency should be a higher priority than the transparency of the exterior glass. There has been tremendous improvement in glazing technology in recent years. Today, dynamic glazing that adjusts parameters such as VLT and exterior reflectance depending on the level of sunlight in the environment is now readily available. Given these considerations, it is our recommendation that the HCDA consider revising the VLT requirement in the MAR.

Appendix A. Detailed Calculations

Calculations were performed to determine energy savings over the baseline design. Several glazing products were analyzed. The detailed calculations are in the following pages. An energy analysis program, Carrier Hourly Analysis Program 4.9 (HAP version 4.9), was used.

Annual Cost Summary

Symphony - Viracon VRE 1-30 28% VLT
Douglas Engineering Pacific, Inc.

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Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	136,800
Cooling	832,957	844,223	837,158	851,319	675,639
Heating	279,829	281,926	282,270	279,578	261,906
Pumps	0	0	0	0	108,098
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,182,444**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,862,788**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.317
Cooling	1.931	1.957	1.940	1.973	1.566
Heating	0.649	0.654	0.654	0.648	0.607
Pumps	0.000	0.000	0.000	0.000	0.251
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.741**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.636**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	4.8
Cooling	25.4	25.6	25.5	25.8	23.6
Heating	8.5	8.5	8.6	8.5	9.1
Pumps	0.0	0.0	0.0	0.0	3.8
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**41.3**
Lights	13.8	13.7	13.8	13.7	15.8
Electric Equipment	3.2	3.2	3.2	3.1	3.6
Misc. Electric	34.2	34.0	34.3	34.0	39.2
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**58.7**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

LEED 2009 EA Credit 1 Summary Report

Symphony - Viracon VRE 1-30 28% VLT
Douglas Engineering Pacific, Inc.

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General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,832	364	+3468

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

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07/14/2015
05:42PM

			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	818,458	7 %
		Demand kW	131.8		Demand kW	122.6	7 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,111,372	20 %
		Demand kW	635.6		Demand kW	500.6	21 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	337,814	n/a
		Demand kW	0.0		Demand kW	38.6	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	427,508	72 %
		Demand kW	196.1		Demand kW	49.2	75 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

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07/14/2015
05:42PM

		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		30,524,548	13 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	8,946,235 kWh	2,862,795	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**30,524,548 kBTU**	**2,862,795**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**30,524,548 kBTU**	**2,862,795**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**13.0 %**	**13.0 %**	**70.75**	**81.33**

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Symphony - Viracon VRE 1-30 28% VLT
Douglas Engineering Pacific, Inc.

07/14/2015
05:42PM

LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	10%	2 pt
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Annual Cost Summary

Symphony - Viracon VRE1-63 53% VLT
Douglas Engineering Pacific, Inc.

07/15/2015
06:51PM

Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	157,443
Cooling	832,957	844,223	837,158	851,319	739,759
Heating	279,829	281,926	282,270	279,578	262,393
Pumps	0	0	0	0	109,249
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,268,843**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,949,187**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.365
Cooling	1.931	1.957	1.940	1.973	1.715
Heating	0.649	0.654	0.654	0.648	0.608
Pumps	0.000	0.000	0.000	0.000	0.253
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.941**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.836**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	5.3
Cooling	25.4	25.6	25.5	25.8	25.1
Heating	8.5	8.5	8.6	8.5	8.9
Pumps	0.0	0.0	0.0	0.0	3.7
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**43.0**
Lights	13.8	13.7	13.8	13.7	15.4
Electric Equipment	3.2	3.2	3.2	3.1	3.5
Misc. Electric	34.2	34.0	34.3	34.0	38.1
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**57.0**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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Symphony - Viracon VRE1-63 53% VLT 07/15/2015
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General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,900	364	+3536

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

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Symphony - Viracon VRE1-63 53% VLT
Douglas Engineering Pacific, Inc.

07/15/2015
06:51PM

			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	819,977	7 %
		Demand kW	131.8		Demand kW	123.6	6 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,311,747	12 %
		Demand kW	635.6		Demand kW	531.8	16 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	341,409	n/a
		Demand kW	0.0		Demand kW	39.0	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	492,034	68 %
		Demand kW	196.1		Demand kW	56.6	71 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

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Symphony - Viracon VRE1-63 53% VLT
Douglas Engineering Pacific, Inc.

07/15/2015
06:51PM

		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		31,445,840	10 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	9,216,249 kWh	2,949,200	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**31,445,840 kBTU**	**2,949,200**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**31,445,840 kBTU**	**2,949,200**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**10.4 %**	**10.4 %**	**72.89**	**81.33**

LEED 2009 EA Credit 1 Summary Report

Symphony - Viracon VRE1-63 53% VLT
Douglas Engineering Pacific, Inc.

07/15/2015
06:51PM

LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	**10%**	**2 pt**
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Annual Cost Summary

Symphony - Guardian Green SNX 62-27 52% VLT
Douglas Engineering Pacific, Inc.

07/14/2015
06:01PM

Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	158,886
Cooling	832,957	844,223	837,158	851,319	741,135
Heating	279,829	281,926	282,270	279,578	262,340
Pumps	0	0	0	0	109,326
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,271,687**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,952,031**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.368
Cooling	1.931	1.957	1.940	1.973	1.718
Heating	0.649	0.654	0.654	0.648	0.608
Pumps	0.000	0.000	0.000	0.000	0.253
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.948**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.842**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	5.4
Cooling	25.4	25.6	25.5	25.8	25.1
Heating	8.5	8.5	8.6	8.5	8.9
Pumps	0.0	0.0	0.0	0.0	3.7
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**43.1**
Lights	13.8	13.7	13.8	13.7	15.3
Electric Equipment	3.2	3.2	3.2	3.1	3.5
Misc. Electric	34.2	34.0	34.3	34.0	38.1
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**56.9**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,904	364	+3540

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

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			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	819,812	7 %
		Demand kW	131.8		Demand kW	125.3	5 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,316,047	12 %
		Demand kW	635.6		Demand kW	542.3	15 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	341,654	n/a
		Demand kW	0.0		Demand kW	39.0	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	496,521	67 %
		Demand kW	196.1		Demand kW	57.1	71 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

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		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		31,476,099	10 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	9,225,118 kWh	2,952,038	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**31,476,099 kBTU**	**2,952,038**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**31,476,099 kBTU**	**2,952,038**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**10.3 %**	**10.3 %**	**72.96**	**81.33**

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LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	**10%**	**2 pt**
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Annual Cost Summary

Symphony - Guardian Clear (SNX 62 27) 54% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:01PM

Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	155,335
Cooling	832,957	844,223	837,158	851,319	732,635
Heating	279,829	281,926	282,270	279,578	262,366
Pumps	0	0	0	0	109,124
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,259,459**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,939,803**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.360
Cooling	1.931	1.957	1.940	1.973	1.698
Heating	0.649	0.654	0.654	0.648	0.608
Pumps	0.000	0.000	0.000	0.000	0.253
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.919**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.814**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	5.3
Cooling	25.4	25.6	25.5	25.8	24.9
Heating	8.5	8.5	8.6	8.5	8.9
Pumps	0.0	0.0	0.0	0.0	3.7
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**42.8**
Lights	13.8	13.7	13.8	13.7	15.4
Electric Equipment	3.2	3.2	3.2	3.1	3.5
Misc. Electric	34.2	34.0	34.3	34.0	38.2
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**57.2**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

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General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,890	364	+3526

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

LEED 2009 EA Credit 1 Summary Report

Symphony - Guardian Clear (SNX 62 27) 54% VLT 07/15/2015
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			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	819,892	7 %
		Demand kW	131.8		Demand kW	125.1	5 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,289,483	13 %
		Demand kW	635.6		Demand kW	529.6	17 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	341,023	n/a
		Demand kW	0.0		Demand kW	38.9	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	485,396	68 %
		Demand kW	196.1		Demand kW	55.9	72 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

LEED 2009 EA Credit 1 Summary Report

Symphony - Guardian Clear (SNX 62 27) 54% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:01PM

		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		31,345,621	11 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	9,186,876 kWh	2,939,800	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**31,345,621 kBTU**	**2,939,800**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**31,345,621 kBTU**	**2,939,800**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**10.7 %**	**10.7 %**	**72.65**	**81.33**

LEED 2009 EA Credit 1 Summary Report

Symphony - Guardian Clear (SNX 62 27) 54% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:01PM

LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	**10%**	**2 pt**
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Annual Cost Summary

Symphony - JE Berkowitz Solarban 70XL 58% VLT
Douglas Engineering Pacific, Inc.

07/15/2015
07:10PM

Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	158,091
Cooling	832,957	844,223	837,158	851,319	740,401
Heating	279,829	281,926	282,270	279,578	262,321
Pumps	0	0	0	0	109,349
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,270,163**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,950,506**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.366
Cooling	1.931	1.957	1.940	1.973	1.716
Heating	0.649	0.654	0.654	0.648	0.608
Pumps	0.000	0.000	0.000	0.000	0.254
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.944**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.839**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	5.4
Cooling	25.4	25.6	25.5	25.8	25.1
Heating	8.5	8.5	8.6	8.5	8.9
Pumps	0.0	0.0	0.0	0.0	3.7
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**43.0**
Lights	13.8	13.7	13.8	13.7	15.3
Electric Equipment	3.2	3.2	3.2	3.1	3.5
Misc. Electric	34.2	34.0	34.3	34.0	38.1
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**57.0**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

LEED 2009 EA Credit 1 Summary Report

Symphony - JE Berkowitz Solarban 70XL 58% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:10PM

General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,904	364	+3540

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

LEED 2009 EA Credit 1 Summary Report

Symphony - JE Berkowitz Solarban 70XL 58% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:10PM

			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	819,754	7 %
		Demand kW	131.8		Demand kW	123.3	6 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,313,753	12 %
		Demand kW	635.6		Demand kW	531.0	16 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	341,728	n/a
		Demand kW	0.0		Demand kW	39.0	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	494,039	68 %
		Demand kW	196.1		Demand kW	56.9	71 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

LEED 2009 EA Credit 1 Summary Report

Symphony - JE Berkowitz Solarban 70XL 58% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:10PM

		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		31,459,855	10 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	9,220,357 kWh	2,950,514	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**31,459,855 kBTU**	**2,950,514**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**31,459,855 kBTU**	**2,950,514**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**10.3 %**	**10.3 %**	**72.92**	**81.33**

LEED 2009 EA Credit 1 Summary Report

Symphony - JE Berkowitz Solarban 70XL 58% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:10PM

LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	**10%**	**2 pt**
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Annual Cost Summary

Symphony - PPG Solarban 70XL Atlantica 51% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:18PM

Table 1. Annual Costs

Component	[B090] Baseline Buildings ($)	[B180] Baseline Buildings ($)	[B270] Baseline Buildings ($)	Baseline Buildings ($)	Proposed Building ($)
Air System Fans	489,125	493,278	477,201	492,955	156,134
Cooling	832,957	844,223	837,158	851,319	733,443
Heating	279,829	281,926	282,270	279,578	262,307
Pumps	0	0	0	0	109,270
Heat Rejection Fans	0	0	0	0	0
HVAC Sub-Total	**1,601,911**	**1,619,427**	**1,596,628**	**1,623,853**	**1,261,153**
Lights	452,820	452,820	452,820	452,820	452,820
Electric Equipment	104,080	104,080	104,080	104,080	104,080
Misc. Electric	1,123,444	1,123,444	1,123,444	1,123,444	1,123,444
Misc. Fuel Use	0	0	0	0	0
Non-HVAC Sub-Total	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**	**1,680,344**
Grand Total	**3,282,255**	**3,299,771**	**3,276,972**	**3,304,196**	**2,941,497**

Table 2. Annual Cost per Unit Floor Area

Component	[B090] Baseline Buildings ($/ft²)	[B180] Baseline Buildings ($/ft²)	[B270] Baseline Buildings ($/ft²)	Baseline Buildings ($/ft²)	Proposed Building ($/ft²)
Air System Fans	1.134	1.143	1.106	1.143	0.362
Cooling	1.931	1.957	1.940	1.973	1.700
Heating	0.649	0.654	0.654	0.648	0.608
Pumps	0.000	0.000	0.000	0.000	0.253
Heat Rejection Fans	0.000	0.000	0.000	0.000	0.000
HVAC Sub-Total	**3.713**	**3.754**	**3.701**	**3.764**	**2.923**
Lights	1.050	1.050	1.050	1.050	1.050
Electric Equipment	0.241	0.241	0.241	0.241	0.241
Misc. Electric	2.604	2.604	2.604	2.604	2.604
Misc. Fuel Use	0.000	0.000	0.000	0.000	0.000
Non-HVAC Sub-Total	**3.895**	**3.895**	**3.895**	**3.895**	**3.895**
Grand Total	**7.608**	**7.648**	**7.596**	**7.659**	**6.818**
Gross Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0
Conditioned Floor Area (ft²)	431434.0	431434.0	431434.0	431434.0	431434.0

Note: Values in this table are calculated using the Gross Floor Area.

Table 3. Component Cost as a Percentage of Total Cost

Component	[B090] Baseline Buildings (%)	[B180] Baseline Buildings (%)	[B270] Baseline Buildings (%)	Baseline Buildings (%)	Proposed Building (%)
Air System Fans	14.9	14.9	14.6	14.9	5.3
Cooling	25.4	25.6	25.5	25.8	24.9
Heating	8.5	8.5	8.6	8.5	8.9
Pumps	0.0	0.0	0.0	0.0	3.7
Heat Rejection Fans	0.0	0.0	0.0	0.0	0.0
HVAC Sub-Total	**48.8**	**49.1**	**48.7**	**49.1**	**42.9**
Lights	13.8	13.7	13.8	13.7	15.4
Electric Equipment	3.2	3.2	3.2	3.1	3.5
Misc. Electric	34.2	34.0	34.3	34.0	38.2
Misc. Fuel Use	0.0	0.0	0.0	0.0	0.0
Non-HVAC Sub-Total	**51.2**	**50.9**	**51.3**	**50.9**	**57.1**
Grand Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

LEED 2009 EA Credit 1 Summary Report

Symphony - PPG Solarban 70XL Atlantica 51% VLT 07/15/2015
Douglas Engineering Pacific, Inc. 07:18PM

General Information

Simulation Program Name and Version ..... **Hourly Analysis Program v4.90**
Simulation Weather File Name ..... **Honolulu, Hawaii (TM2)**

Building Designations

Proposed Building ..... **Proposed Building**
Baseline - 0 degrees ..... **Baseline Buildings**
Baseline - 90 degrees ..... **[B090] Baseline Buildings**
Baseline - 180 degrees ..... **[B180] Baseline Buildings**
Baseline - 270 degrees ..... **[B270] Baseline Buildings**

Floor Areas and Window-to-Wall Ratios

	Proposed Design	Baseline
Total Conditioned Floor Area (ft²)	431,434	431,434
Total Floor Area (ft²)	431,434	431,434
Window to Wall Ratio	95 %	43 %
Gross Wall Area (ft²)	171,273	171,273
Vertical Window Area (ft²)	162,786	73,194

Advisory Messages

	Proposed Building	Baseline Building (0 deg. rotation)	Difference
Number of hours heating loads not met	0	0	0
Number of hours cooling loads not met	3,889	364	+3525

Energy Type Summary

Energy Type	Utility Rate Description	Units of Energy	Units of Demand
Electric	HECO	kWh	kW

Energy Units:
1 kBTU = 1,000 BTU
1 kWh = 3.412 kBTU

Demand Units:
1 MBH = 1,000 BTU/h
1 kW = 3.412 MBH

Baseline Performance - Performance Rating Method Compliance

End Use	Process	Baseline Design Energy Type	Units of Annual Energy & Peak Demand	Baseline (0 deg rotation)	Baseline (90 deg rotation)	Baseline (180 deg rotation)	Baseline (270 deg rotation)	Baseline Design
Interior Lighting	No	Electric	Energy kWh	1,415,052	1,415,052	1,415,052	1,415,052	1,415,052
			Demand kW	345.6	345.6	345.6	345.6	345.6
Space Heating	No	Electric	Energy kWh	873,682	874,467	881,018	882,095	877,815
			Demand kW	131.3	130.7	132.0	133.1	131.8
Space Cooling	No	Electric	Energy kWh	2,660,373	2,602,988	2,638,196	2,616,117	2,629,419
			Demand kW	646.8	628.2	635.6	631.8	635.6
Pumps	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Heat Rejection	No	Electric	Energy kWh	0	0	0	0	0
			Demand kW	0.0	0.0	0.0	0.0	0.0
Fans - Interior	No	Electric	Energy kWh	1,540,485	1,528,578	1,541,374	1,491,227	1,525,416
			Demand kW	199.1	196.2	197.3	192.0	196.1
Receptacle Equipment	Yes	Electric	Energy kWh	325,252	325,252	325,252	325,252	325,252
			Demand kW	42.1	42.1	42.1	42.1	42.1
Exterior Lighting	No	Electric	Energy kWh	224,694	224,694	224,694	224,694	224,694

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Symphony - PPG Solarban 70XL Atlantica 51% VLT 07/15/2015
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			Demand kW	51.3	51.3	51.3	51.3	51.3
General EF	No	Electric	Energy kWh	6,745	6,745	6,745	6,745	6,745
			Demand kW	0.8	0.8	0.8	0.8	0.8
Elevators	Yes	Electric	Energy kWh	340,764	340,764	340,764	340,764	340,764
			Demand kW	38.9	38.9	38.9	38.9	38.9
Parking Lighting and Pool	No	Electric	Energy kWh	982,872	982,872	982,872	982,872	982,872
			Demand kW	112.2	112.2	112.2	112.2	112.2
Water Heating	No	Electric	Energy kWh	1,296,188	1,296,188	1,296,188	1,296,188	1,296,188
			Demand kW	3,551.2	3,551.2	3,551.2	3,551.2	3,551.2
Booster Pumps	No	Electric	Energy kWh	144,500	144,500	144,500	144,500	144,500
			Demand kW	33.6	33.6	33.6	33.6	33.6
Garage Fans	No	Electric	Energy kWh	43,800	43,800	43,800	43,800	43,800
			Demand kW	5.0	5.0	5.0	5.0	5.0
Laundry	Yes	Electric	Energy kWh	238,199	238,199	238,199	238,199	238,199
			Demand kW	652.6	652.6	652.6	652.6	652.6
Resident Toilet Light and Exh	No	Electric	Energy kWh	233,016	233,016	233,016	233,016	233,016
			Demand kW	26.6	26.6	26.6	26.6	26.6
Baseline Energy Totals	Total Annual Energy Use kBTU			35,231,021	34,997,277	35,183,415	34,940,658	35,088,094
	Annual Process Energy kBTU							3,085,181
	Process Energy Modeling Compliance							N

(1) 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 doucmentation.
(2) In this project Process Energy is 9% of total baseline energy cost.

Baseline Energy Costs

Energy Type	Baseline Cost (0 deg rotation) ($)	Baseline Cost (90 deg rotation) ($)	Baseline Cost (180 deg rotation) ($)	Baseline Cost (270 deg rotation) ($)	Baseline Building Performance ($)
Electric	3,304,199	3,282,277	3,299,734	3,276,967	3,290,794
Total Baseline Costs	**3,304,199**	**3,282,277**	**3,299,734**	**3,276,967**	**3,290,794**

Performance Rating Table - Performance Rating Method Compliance

End Use	Process ?	Baseline Building Units	Baseline Building Results	Proposed Design Energy Type	Proposed Design Units	Proposed Building Results	Percent Savings
Interior Lighting	No	Energy kWh	1,415,052	Electric	Energy kWh	1,415,052	0 %
		Demand kW	345.6		Demand kW	345.6	0 %
Space Heating	No	Energy kWh	877,815	Electric	Energy kWh	819,710	7 %
		Demand kW	131.8		Demand kW	124.7	5 %
Space Cooling	No	Energy kWh	2,629,419	Electric	Energy kWh	2,292,007	13 %
		Demand kW	635.6		Demand kW	534.5	16 %
Pumps	No	Energy kWh	0	Electric	Energy kWh	341,477	n/a
		Demand kW	0.0		Demand kW	39.0	n/a
Heat Rejection	No	Energy kWh	0	Electric	Energy kWh	0	n/a
		Demand kW	0.0		Demand kW	0.0	n/a
Fans - Interior	No	Energy kWh	1,525,416	Electric	Energy kWh	487,900	68 %
		Demand kW	196.1		Demand kW	56.1	71 %
Receptacle Equipment	Yes	Energy kWh	325,252	Electric	Energy kWh	325,252	0 %
		Demand kW	42.1		Demand kW	42.1	0 %
Exterior Lighting	No	Energy kWh	224,694	Electric	Energy kWh	224,694	0 %

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		Demand kW	51.3		Demand kW	51.3	0 %
General EF	No	Energy kWh	6,745	Electric	Energy kWh	6,745	0 %
		Demand kW	0.8		Demand kW	0.8	0 %
Elevators	Yes	Energy kWh	340,764	Electric	Energy kWh	340,764	0 %
		Demand kW	38.9		Demand kW	38.9	0 %
Parking Lighting and Pool	No	Energy kWh	982,872	Electric	Energy kWh	982,872	0 %
		Demand kW	112.2		Demand kW	112.2	0 %
Water Heating	No	Energy kWh	1,296,188	Electric	Energy kWh	1,296,188	0 %
		Demand kW	3,551.2		Demand kW	3,551.2	0 %
Booster Pumps	No	Energy kWh	144,500	Electric	Energy kWh	144,500	0 %
		Demand kW	33.6		Demand kW	33.6	0 %
Garage Fans	No	Energy kWh	43,800	Electric	Energy kWh	43,800	0 %
		Demand kW	5.0		Demand kW	5.0	0 %
Laundry	Yes	Energy kWh	238,199	Electric	Energy kWh	238,199	0 %
		Demand kW	652.6		Demand kW	652.6	0 %
Resident Toilet Light and Exh	No	Energy kWh	233,016	Electric	Energy kWh	233,016	0 %
		Demand kW	26.6		Demand kW	26.6	0 %
Energy Totals	Baseline Total Energy Use (kBTU)		35,088,094	Proposed Total Energy Use (kBTU)		31,363,706	11 %
	Baseline Annual Process Energy (kBTU)		3,085,181	Proposed Annual Process Energy (kBTU)		3,085,181	0 %

Energy Cost and Consumption by Energy Type - Performance Rating Method Compliance

	Proposed Design		Baseline Design	
Energy Type	**Energy Use**	**Cost ($)**	**Energy Use**	**Cost ($)**
Electric	9,192,177 kWh	2,941,497	10,283,732 kWh	3,290,794
Subtotal (Model Outputs)	**31,363,706 kBTU**	**2,941,497**	**35,088,094 kBTU**	**3,290,794**
	Energy Generated	**Renewable Energy Cost Savings ($)**		
Total On Site Renewable Energy				
	Energy Savings	**Cost Savings ($)**		
Exceptional Calculation Totals				
	Energy Use	**Cost ($)**		
Net Proposed Design Total	**31,363,706 kBTU**	**2,941,497**		
	Percent Savings		**Energy Use Intensity**	
	Energy	**Cost**	**Proposed Design (kBTU/ft²)**	**Baseline Design (kBTU/ft²)**
Summary Data	**10.6 %**	**10.6 %**	**72.70**	**81.33**

LEED 2009 EA Credit 1 Summary Report

Symphony - PPG Solarban 70XL Atlantica 51% VLT 07/15/2015
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LEED 2009 EA Credit 1 Points Reference Table

New Construction % Cost Savings	Existing Building Renovations % Cost Savings	LEED 2009 Points Awarded
12%	8%	1 pt
14%	**10%**	**2 pt**
16%	12%	3 pts
18%	14%	4 pts
20%	16%	5 pts
22%	18%	6 pts
24%	20%	7 pts
26%	22%	8 pts
28%	24%	9 pts
30%	26%	10 pts
32%	28%	11 pts
34%	30%	12 pts
36%	32%	13 pts
38%	34%	14 pts
40%	36%	15 pts
42%	38%	16 pts
44%	40%	17 pts
46%	42%	18 pts
48%	44%	19 pts

Appendix B. Detailed Code Descriptions

"ROH"

Revised Ordinances of Honolulu | Chapter 32 – Building Energy Conservation Code

ROH Chapter 32 adopts IECC as amended. The requirements amend the IECC requirements and take precedence over the default IECC values. This chapter sets forth requirements for glazed fenestration. "Glazed fenestration" refers to glass windows and walls. The requirements are a maximum U-factor and a maximum solar heat gain coefficient (SHGC). The maximum U-factor is 1.2. The maximum SHGC is 0.40. (Table 402.1.1)

"MAR"

Hawaii Administrative Rules | Department of Business and Economic Development | Hawaii Community Development Authority | Mauka Area Rules

The Mauka Area Rules set forth requirements for glazed fenestration. The requirement is a minimum Visible Light Transmission (VLT) value for glazed fenestrations. The minimum VLT is 70% at ground floor and 50% on all other floors. (§15-217-55-k-2)

The Mauka Area Rules set forth requirements for energy conservation. A new building shall qualify for LEED for new construction. See LEED 2009 for details. (§15-217-59-c-1)

"LEED"

LEED 2009 for New Construction | Energy and Atmosphere | Prerequisite 2 Minimum Energy Performance

LEED 2009 sets forth requirements for performance with regards to electrical efficiency. The requirement is a 10% improvement in performance over a baseline model. The method of comparison and the baseline model is described in ASHRAE 90.1, Appendix G.

"IECC"

International Energy Conservation Code 2006 | Chapter 5 – Commercial Energy Efficiency

ASHRAE 90.1 sets forth requirements for energy efficiency. The code provides a default method and an alternative method.

Under the default method, there are strict requirements for glazing. The modified requirements in ROH take precedence. The requirements are a maximum U-factor and a maximum solar heat gain coefficient (SHGC). The maximum U-factor is 1.2. The maximum SHGC is 0.40. (ROH Table 402.1.1)

This project does not comply under the prescriptive method, so the alternative method must be used.

The alternative method is compliance with ASHRAE 90.1. (Section 501.1)

“ASHRAE”

ANSI/ASHRAE/IES Standard 90.1-2010 | Energy Standard for Buildings Except Low-Rise Residential Buildings

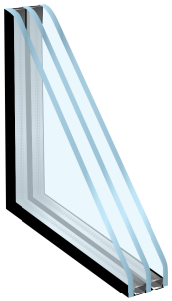
ASHRAE 90.1 sets forth requirements for energy efficiency. The code provides a prescriptive method and an Energy Cost Budget Method.

Under the prescriptive method, there are strict requirements for glazing. The requirements are a maximum U-factor and a maximum SHGC. The maximum U-factor is 1.2. The maximum SHGC is 0.25. (Table 5.5-1) This value is more stringent than the ROH. When a project is required to be compliant with multiple codes and the codes do not explicitly nullify portions of each other, as is the case for this project, the more stringent code takes precedence. This project does not comply under the prescriptive method, so the alternative method must be used.

Under the Energy Cost Budget Method, the project must be simulated for energy usage. ASHRAE 90.1 Appendix G provides a method to analyze performance of a building. Under this method, the calculation for the proposed building is compared with the calculation for the baseline model. The baseline model specifications are described in ASHRAE 90.1 Appendix G. The percentage improvement of the proposed building must be at least 10%. This is the method used in this report.

Appendix C. Datasheets

TRIPLE INSULATING SINGLE COATED LOW-E



The performance data applies to triple insulating glass units with three plies (clear lites) of 1/4" (6mm) glass and two 1/2" (13.2mm) airspaces or argon spaces. The coating is applied to the second (#2) surface.

The solar and optical data presented in this guide is center-of-glass data based on the National Fenestration Rating Council measurement standards. They were calculated using Lawrence Berkeley National Laboratory's (LBNL) WINDOW 5.2/6.3 software. In some cases performance data changed in comparison to previous versions of LBNL's WINDOW program.

▸ Contact Viracon at 800.533.2080 to obtain performance data on products not listed here.

Product	Transmittance			Reflectance			AIR U-Value						ARGON U-Value					
	Visible	Solar	U-V	Exterior	Interior	Solar	Winter	Summer	Shading Coefficient	Relative Heat Gain	SHGC	LSG	Winter	Summer	Shading Coefficient	Relative Heat Gain	SHGC	LSG
VE 1-85	68%	38%	21%	17%	18%	23%	.22	.23	.57	117	.49	1.39	.20	.19	.57	116	.49	1.39
VE 1-2M	63%	28%	8%	15%	17%	32%	.21	.21	.40	82	.34	1.85	.19	.17	.39	81	.34	1.85
VE 1-52	44%	26%	17%	18%	17%	21%	.23	.23	.41	85	.36	1.22	.20	.20	.41	84	.35	1.26
VE 1-48	42%	25%	15%	19%	17%	23%	.22	.23	.39	81	.34	1.24	.20	.19	.39	80	.33	1.27
VE 1-42	33%	20%	13%	20%	19%	21%	.22	.23	.32	68	.28	1.18	.20	.19	.32	67	.28	1.18
VE 1-55	42%	23%	11%	13%	21%	22%	.22	.23	.36	75	.31	1.35	.20	.19	.36	74	.31	1.35
VE 1-40	33%	17%	8%	16%	23%	25%	.22	.23	.28	60	.25	1.32	.20	.19	.28	59	.24	1.38
VRE 1-59	47%	24%	14%	33%	23%	39%	.22	.22	.35	73	.30	1.57	.19	.18	.35	73	.30	1.57
VRE 1-54	42%	21%	13%	34%	21%	38%	.22	.22	.32	67	.28	1.50	.19	.18	.32	66	.27	1.56
VRE 1-46	38%	20%	12%	36%	20%	40%	.22	.21	.30	62	.26	1.46	.19	.18	.30	62	.26	1.46
VRE 1-38	32%	16%	10%	45%	25%	47%	.22	.21	.24	51	.21	1.52	.19	.17	.24	50	.21	1.52
VRE 1-30	25%	12%	8%	48%	20%	47%	.22	.21	.20	43	.17	1.47	.19	.18	.20	42	.17	1.47
VNE 1-63	55%	21%	4%	13%	16%	38%	.21	.21	.30	63	.26	2.12	.18	.17	.30	62	.26	2.12
VUE 1-50	43%	17%	4%	13%	17%	27%	.21	.21	.26	55	.23	1.87	.18	.17	.26	54	.22	1.95

TRIPLE INSULATING DOUBLE COATED LOW-E (AIR FILLED)

The performance data applies to triple insulating glass units with three plies (clear lites unless otherwise specified) of 1/4" (6mm) glass and two 1/2" (13.2mm) airspaces or argon spaces. The coating is applied to the second (#2) surface. If double coated, a VE-85 coating is applied to the fourth (#4) surface.

The solar and optical data presented in this guide is center-of-glass data based on the National Fenestration Rating Council measurement standards. They were calculated using Lawrence Berkeley National Laboratory's (LBNL) WINDOW 5.2/6.3 software. In some cases performance data changed in comparison to previous versions of LBNL's WINDOW program.

Product	Transmittance			Reflectance			U-Value						
	Visible	Solar	U-V	Exterior	Interior	Solar	Winter	Summer	Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
VE 1-85	65%	33%	12%	16%	16%	23%	.17	.17	.51	104	.44	1.48	0.9
VE 1-2M	60%	26%	5%	14%	16%	32%	.16	.16	.37	77	.32	1.88	0.8
VE 1-52	43%	23%	10%	17%	15%	21%	.17	.17	.36	75	.31	1.39	0.9
VE 1-48	40%	21%	9%	18%	15%	23%	.17	.17	.34	71	.30	1.33	0.9
VE 1-42	32%	17%	8%	20%	17%	22%	.17	.17	.28	59	.25	1.28	0.9
VRE 1-59	45%	21%	8%	32%	21%	39%	.16	.16	.32	67	.28	1.61	0.8
VRE 1-54	41%	19%	8%	33%	19%	38%	.16	.17	.29	61	.25	1.64	0.8
VRE 1-46	37%	18%	7%	35%	18%	40%	.16	.16	.27	57	.24	1.54	0.8
VRE 1-38	31%	14%	6%	45%	23%	47%	.16	.16	.22	47	.19	1.63	0.8
VRE 1-30	24%	11%	5%	48%	18%	47%	.16	.16	.18	39	.16	1.50	0.8
VNE 1-63	53%	20%	2%	12%	15%	38%	.16	.16	.28	59	.25	2.12	0.8
VUE 1-50	42%	16%	3%	12%	15%	27%	.16	.16	.25	51	.21	2.00	0.8

TRIPLE INSULATING DOUBLE COATED LOW-E (ARGON FILLED)

Product	Transmittance			Reflectance			U-Value						
	Visible	Solar	U-V	Exterior	Interior	Solar	Winter	Summer	Shading Coefficient	Relative Heat Gain	SHGC	LSG	European U-Value
VE 1-85	65%	33%	12%	16%	16%	23%	.14	.14	.51	104	.44	1.48	0.7
VE 1-2M	60%	26%	5%	14%	16%	32%	.13	.13	.37	76	.32	1.88	0.7
VE 1-52	43%	23%	10%	17%	15%	21%	.14	.14	.36	74	.31	1.39	0.7
VE 1-48	40%	21%	9%	18%	15%	23%	.14	.14	.34	70	.29	1.38	0.7
VE 1-42	32%	17%	8%	20%	17%	22%	.14	.14	.28	58	.24	1.33	0.7
VRE 1-59	45%	21%	8%	32%	21%	39%	.13	.13	.32	66	.28	1.61	0.7
VRE 1-54	41%	19%	8%	33%	19%	38%	.13	.13	.29	60	.25	1.64	0.7
VRE 1-46	37%	18%	7%	35%	18%	40%	.13	.13	.27	56	.23	1.61	0.7
VRE 1-38	31%	14%	6%	45%	23%	47%	.13	.13	.22	46	.19	1.63	0.7
VRE 1-30	24%	11%	5%	48%	18%	47%	.13	.13	.18	38	.15	1.60	0.7
VNE 1-63	53%	20%	2%	12%	15%	38%	.13	.13	.28	58	.24	2.21	0.7
VUE 1-50	42%	16%	3%	12%	15%	27%	.13	.13	.24	50	.21	2.00	0.7

- My Settings
- Order a Sample
- SunGuard Website

- Performance Calculator
- My Project Center
- Building Energy Calculator
- Glass Visualizer

Performance Calculator

The Guardian Performance Calculator simplifies the calculation of glass make-ups through a simple point-and-click, Web-based interface. In addition, you can use the calculator to archive project data and generate client-ready reports. It is, quite simply, the most useful yet easy-to-use glass performance calculator in the business. Custom BIM content now available for download.

It is possible to create many different glazing types and glass make-ups using the Guardian Performance Calculator. Guardian makes no guarantee that any glazing modeled by this tool is available from Guardian or any other manufacturer. The user has the responsibility to check with the manufacturer regarding availability of any glass type or make-up.

1. Start from Scratch or Load an Existing Glass Type | Help?

Create a new Make-up

Monolithic	Double
Triple	Single Laminate
IG with laminated outboard	IG with laminated inboard

Open a Glass Type from My Project Center

2. Define and Analyze | Help?

Project Name: Unassigned (Create Project) (Assign To Project)

Glass Type: Untitled glass type 03 (edit)

- Copy This Make-up
- Import a Make-up from My Project Center

Make-up Name: Default Make-up 01 (edit) | Help?

outdoor side

Help?

Green (North America) 1/4" = 1 -

LITE 6mm — 2 - SunGuard® SNX 62/27

GAP 100% Air, 1/2" = 12.7 mm

LITE Clear (North America) 1/4" = 6mm — 3 - _____ 4 - _____

indoor side

TOTAL THICKNESS: 0.942 in / 23.927 mm

GLAZING SLOPE: 90° View Project Database

1. Summary Data
2. Thermal Stress Guide
3. Contact Us

Help? Customize Summary Data

Make-up Name	Outboard Substrate & Coating	Inboard Substrate & Coating	Transmittance Visible (τv %)	Transmittance Solar (τe %)	Reflectance Visible ρv % out	Reflectance Visible ρv % in	U-Value Winter Night	U-Value Summer Day	Solar Heat Gain Coefficient (SHGC)
Default Make-up 01	SunGuard® SNX 62/27 on Green (North America)	Clear (North America)	52	18	9	11	0.29	0.27	0.25

Calculation Standard: NFRC 2010

Request BIM | Generate Report

Loading...

- My Settings
- Order a Sample
- SunGuard Website

- Performance Calculator
- My Project Center
- Building Energy Calculator
- Glass Visualizer

Performance Calculator

The Guardian Performance Calculator simplifies the calculation of glass make-ups through a simple point-and-click, Web-based interface. In addition, you can use the calculator to archive project data and generate client-ready reports. It is, quite simply, the most useful yet easy-to-use glass performance calculator in the business. Custom BIM content now available for download.

It is possible to create many different glazing types and glass make-ups using the Guardian Performance Calculator. Guardian makes no guarantee that any glazing modeled by this tool is available from Guardian or any other manufacturer. The user has the responsibility to check with the manufacturer regarding availability of any glass type or make-up.

1. Start from Scratch or Load an Existing Glass Type | Help?

Create a new Make-up

Monolithic	Double
Triple	Single Laminate
IG with laminated outboard	IG with laminated inboard

Open a Glass Type from My Project Center

2. Define and Analyze | Help?

Project Name: Unassigned (Create Project) (Assign To Project)

Glass Type: Untitled glass type 02 (edit)

- Copy This Make-up
- Import a Make-up from My Project Center

Make-up Name: Default Make-up 01 (edit) | Help?

outdoor side

Help?

LITE Clear (North America) 1/4" = 6mm — 1 - ; 2 - SunGuard® SNX 62/27

GAP 100% Air, 1/2" = 12.7 mm

LITE Clear (North America) 1/4" = 6mm

GAP 100% Air, 1/2" = 12.7 mm

LITE Clear (North America) 1/4" = 6mm

3 - SunGuard® Neutral 78/65

4 - _____

5 - _____

6 - _____

indoor side

TOTAL THICKNESS: 1.663 in / 42.24 mm

GLAZING SLOPE: 90°

View Project Database

1. Summary Data
2. Thermal Stress Guide
3. Contact Us

Help?

Customize Summary Data

Make-up Name	Outboard Substrate & Coating	Inboard Substrate & Coating	Transmittance Visible (τv %)	Transmittance Solar (τe %)	Reflectance Visible ρv % out	Reflectance Visible ρv % in	U-Value Winter Night	U-Value Summer Day	Solar Heat Gain Coefficient (SHGC)
Default Make-up 01	SunGuard® SNX 62/27 on Clear (North America)	Clear (North America)	54	20	13	16	0.21	0.21	0.24

Calculation Standard: NFRC 2010

Request BIM | Generate Report

Loading...

Individual columns can be filtered; hover over the column header to access the drop down menu.
To print your view of the list, use your browser's print capability (File - Print). Recommended page orientation is landscape. Elect "shrink to fit" the printed page.

Actions 1 - 30 View: **Main Display**

Thickness (inches)↓	Glass Type	Product	Pattern	Color	Visible (VLT)	Solar Transmittance	UV	Vis. Exterior	Vis Interior	Solar Reflectance	Winter	Summer	Shading Coefficient	SHGC	LSG
1.7500	Triple-Glazed Insulating Glass	Clear / Clear / Clear			71 %	49 %	40 %	21 %	21 %	15 %	0.31	0.34	0.71	0.61	1.16
1.7500	Triple-Glazed Insulating Glass	Clear / Clear / Clear w/ Argon			71 %	49 %	40 %	21 %	21 %	15 %	0.28	0.32	0.71	0.61	1.16
1.7500	Triple-Glazed Insulating Glass	Starphire / Starphire / Starphire			78 %	72 %	39 %	21 %	21 %	19 %	0.31	0.34	0.86	0.75	1.04
1.7500	Triple-Glazed Insulating Glass	Starphire / Starphire / Starphire w/ Argon			78 %	72 %	39 %	21 %	21 %	19 %	0.28	0.32	0.86	0.75	1.04
1.7500	Triple-Glazed Insulating Glass	Solarban 60 (#2) / Clear / Clear			63 %	28 %	15 %	16 %	18 %	31 %	0.22	0.22	0.40	0.34	1.85
1.7500	Triple-Glazed Insulating Glass	Solarban 60 (#2) / Clear / Clear w/ Argon			63 %	28 %	15 %	16 %	18 %	31 %	0.18	0.18	0.40	0.34	1.85
1.7500	Triple-Glazed Insulating Glass	Solarban 60 (#2) / Starphire / Starphire			67 %	33 %	16 %	16 %	19 %	31 %	0.22	0.22	0.41	0.36	1.86
1.7500	Triple-Glazed Insulating Glass	Solarban 60 (#2) / Starphire / Starphire w/ Argon			67 %	33 %	16 %	16 %	19 %	31 %	0.18	0.18	0.40	0.35	1.91
1.7500	Triple-Glazed Insulating Glass	Solarban 70XL (#2) / Clear / Clear			58 %	22 %	4 %	16 %	19 %	54 %	0.21	0.21	0.29	0.25	2.32

Blue and Green Tinted Glasses

PPG IdeaScapes®
Glass • Coatings • Paint

Omni Dallas Convention Center Hotel
Location: *Dallas, TX*
Products: Pacifica®, Solarban® z50, Solarban® 70XL Glasses
Architect: *BOKA Powell Architects; 5GStudio*
Glazing Contractor: *Goldfinch Brothers, Inc.*
Glass Fabricator: *JE Berkowitz, LP*
Owner/Developer: *City of Dallas/Matthews Southwest*

Aesthetic Description

Architects have relied on blue and green tinted glasses for decades to give buildings a distinctive look and to reduce heat gain and glare. PPG offers a collection of blue and green tints that can be paired with its exceptional range of advanced low-e and reflective coatings to offer architects more performance and aesthetic options than ever.

In addition to light-green ***Solexia®*** glass, which has been an industry mainstay since the 1930s, PPG's nature-inspired color palette includes aqua-blue ***Azuria®*** glass, emerald-green ***Atlantica®*** glass, sky-blue ***Solarblue®*** glass and rich-blue ***Pacifica®*** glass. Using these tints with reflective ***Solarcool®*** and subtly-reflective ***Vistacool®*** glass coatings further multiplies the color selection.

Performance Characteristics

Blue and green tinted glasses are available with ***Solarban®*** solar control, low-e glasses or combined in an insulating glass unit (IGU) with ***Sungate®*** passive low-e glasses to fulfill a wide range of performance demands, whether the goal is to maximize light transmittance, increase privacy or improve solar control performance.

Fabrication and Availability

PPG Certified Fabricator® Network

Blue and green tinted glasses, as well as ***Sungate®*** and ***Solarban®*** low-e glasses, provide maximum processing flexibility and can be laminated, tempered or heat-strengthened to satisfy increased strength or safety glazing requirements. PPG tinted glass and ***Sungate®*** glasses are available from hundreds of PPG-qualified glass fabricators in the U.S., Canada and throughout the world. Tinted glasses with ***Solarban®*** glasses are available through the ***PPG Certified Fabricator® Network***.

Additional Resources

ecological Solutions from PPG™

Ecological Solutions from PPG™ encompass a number of environmentally sustainable architectural glass products, including uncoated blue and green tinted glasses, as well as those with ***Solarcool®, Vistacool®, Solarban®*** and ***Sungate®*** glass coatings. For more information, or to obtain samples of any PPG glass product, call 888-PPG-IDEA (774-4332) or visit www.ppgideascapes.com.

PPG is the first U.S. float glass manufacturer to have its products recognized by the ***Cradle to Cradle Certified™*** program, and offers more C2C-certified architectural glasses than any other float glass manufacturer.

Glass Type (Coating if Any (Surface) Glass) Outdoor Lite: + Indoor Lite:	Transmittance[2]			Reflectance[2]		U-Value[3] NFRC (BTU/hr•ft²°F)		European U-Value[4] EN 673 (W/m²°C)	Shading Coefficient[5]	Solar Heat Gain Coefficient[6]	Light to Solar Gain (LSG)[7]
	Ultra-violet %	Visible %	Total Solar Energy %	Exterior Light %	Interior Light %	Winter Night-time	Summer Day-time				
Monolithic (6mm)											
PACIFICA	15	42	27	5	5	1.02	0.93	5.8	0.56	0.49	0.86
SOLARBLUE	31	56	47	6	6	1.02	0.93	5.8	0.71	0.61	0.92
AZURIA	42	68	32	7	7	1.02	0.93	5.8	0.59	0.52	1.31
SOLEXIA	31	77	47	8	8	1.02	0.93	5.8	0.71	0.62	1.24
ATLANTICA	16	67	34	7	7	1.02	0.93	5.8	0.61	0.53	1.26
Insulating Vision Unit Performance Comparisons 1-inch (25mm) units with 1/2-inch (13mm) airspace and two 1/4-inch (6mm) lites											
PACIFICA GLASS											
SOLARBAN 70XL (2) *PACIFICA* + Clear	2	32	12	6	12	0.28	0.26	1.5	0.22	0.19	1.68
SOLARBAN 67 (2) *PACIFICA* + Clear	3	26	11	8	15	0.29	0.27	1.6	0.21	0.19	1.37
SOLARBAN 60 (2) *PACIFICA* + Clear	5	34	15	6	10	0.29	0.27	1.6	0.26	0.22	1.55
SOLARBAN R100 (2) *PACIFICA* + Clear	3	20	9	11	13	0.29	0.27	1.6	0.19	0.16	1.25
PACIFICA + *SOLARBAN* 70XL (3)	2	31	12	6	10	0.28	0.26	1.5	0.26	0.22	1.41
PACIFICA + *SOLARBAN* 67 (3) Clear	3	26	11	7	18	0.29	0.27	1.6	0.27	0.23	1.13
PACIFICA + *SOLARBAN* 60 (3) Clear	5	34	15	6	9	0.29	0.27	1.6	0.29	0.25	1.36
SOLARBLUE GLASS											
SOLARBAN 70XL (2) *SOLARBLUE* + Clear	4	42	17	8	12	0.28	0.26	1.5	0.26	0.23	1.83
SOLARBAN 67 (2) *SOLARBLUE* + Clear	6	34	16	10	15	0.29	0.27	1.6	0.26	0.22	1.55
SOLARBAN 60 (2) *SOLARBLUE* + Clear	10	45	21	7	11	0.29	0.27	1.6	0.33	0.28	1.61
SOLARBAN R100 (2) *SOLARBLUE* + Clear	6	26	12	15	13	0.29	0.27	1.6	0.22	0.19	1.37
SOLARBLUE + *SOLARBAN* 70XL (3)	3	40	16	8	11	0.28	0.26	1.5	0.32	0.27	1.48
SOLARBLUE + *SOLARBAN* 67 (3) Clear	6	34	16	9	18	0.29	0.27	1.6	0.34	0.30	1.13
SOLARBLUE + *SOLARBAN* 60 (3) Clear	10	45	21	7	9	0.29	0.27	1.6	0.38	0.33	1.36
AZURIA GLASS											
SOLARBAN 70XL (2) *AZURIA* + Clear	5	52	18	9	12	0.28	0.26	1.5	0.29	0.25	2.08
SOLARBAN 67 (2) *AZURIA* + Clear	8	42	16	13	16	0.29	0.27	1.6	0.26	0.23	1.83
SOLARBAN 60 (2) *AZURIA* + Clear	13	54	21	8	11	0.29	0.27	1.6	0.32	0.28	1.93
SOLARBAN R100 (2) *AZURIA* + Clear	8	32	12	21	13	0.29	0.27	1.6	0.22	0.19	1.68
AZURIA + *SOLARBAN* 70XL (3)	4	49	17	9	11	0.28	0.26	1.5	0.33	0.29	1.69
AZURIA + *SOLARBAN* 67 (3) Clear	8	42	16	11	18	0.29	0.27	1.6	0.33	0.29	1.45
AZURIA + *SOLARBAN* 60 (3) Clear	13	54	21	9	10	0.29	0.27	1.6	0.36	0.31	1.74
SOLEXIA GLASS											
SOLARBAN 70XL (2) *SOLEXIA* + Clear	4	58	21	10	13	0.28	0.26	1.5	0.31	0.27	2.15
SOLARBAN 67 (2) *SOLEXIA* + Clear	6	47	19	16	16	0.29	0.27	1.6	0.29	0.25	1.88
SOLARBAN 60 (2) *SOLEXIA* + Clear	10	61	25	9	12	0.29	0.27	1.6	0.37	0.32	1.91
SOLARBAN R100 (2) *SOLEXIA* + Clear	6	36	15	25	13	0.29	0.27	1.6	0.24	0.21	1.71
SOLEXIA + *SOLARBAN* 70XL (3)	3	56	20	11	12	0.28	0.26	1.5	0.37	0.32	1.75
SOLEXIA + *SOLARBAN* 60 (3) Clear	10	61	25	10	10	0.29	0.27	1.6	0.42	0.37	1.65
ATLANTICA GLASS											
SOLARBAN 70XL (2) ATLANTICA + Clear	2	51	17	9	12	0.28	0.26	1.5	0.28	0.24	2.13
SOLARBAN 67 (2) *ATLANTICA* + Clear	3	41	15	13	16	0.29	0.27	1.6	0.26	0.22	1.86
SOLARBAN 60 (2) *ATLANTICA* + Clear	5	53	20	8	11	0.29	0.27	1.6	0.32	0.27	1.96
SOLARBAN R100 (2) *ATLANTICA* + Clear	3	32	12	20	13	0.29	0.27	1.6	0.22	0.19	1.68
ATLANTICA + *SOLARBAN* 70XL (3)	2	49	17	10	11	0.28	0.26	1.5	0.32	0.28	1.75
ATLANTICA + *SOLARBAN* 67 (3) Clear	3	41	15	11	18	0.29	0.27	1.6	0.33	0.29	1.41
ATLANTICA + *SOLARBAN* 60 (3) Clear	5	53	20	9	10	0.29	0.27	1.6	0.36	0.31	1.71

All performance data calculated using LBNL Window 6.3 software and represents center of glass performance data. European U-values are calculated using WinDat version 3.0.1 software. For detailed information on the methodologies used to calculate the aesthetic and performance values in this table, please visit www.ppgideascapes.com or request our Architectural Glass Catalog.

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