Nova Group

Inspired Solutions by Nova Group

MERP Level 2 Energy Audit

Prepared For

Department of Buildings & General Services - State of Vermont
133 State Street
Montpelier, VT 05633

Brandon - Brandon Highway Garage
356 Champlain Street
Brandon, VT 05733

Nova Group Carbon Neutral Report

novagroupgbc.com/carbonneutral

August 13, 2024

Department of Buildings & General Services - State of Vermont
133 State Street
Montpelier, VT 05633

Re: MERP Level 2 Energy Audit
Brandon - Brandon Highway Garage
356 Champlain Street
Brandon, VT 05733
Nova Project No.: SE24-3894

Nova Group, GBC has completed a MERP Level 2 Energy Audit in accordance with the State of Vermont ACT 172 at Brandon - Brandon Highway Garage located at 356 Champlain Street in Brandon, VT. Nova Group, GBC visited the site on May 22, 2024.

The assessment was performed at the Client's request using methods and procedures consistent with and using methods and MERP Level 2 Energy Audit procedures as outlined in Nova Group, GBC Proposal.

This report has been prepared for and is exclusively for the use and benefit of the Client identified on the cover page of this report. The purpose for which this report shall be used shall be limited to the use as stated in the contract between the client and Nova Group, GBC.

This report, or any of the information contained therein, is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of Nova Group, GBC. Any reuse or distribution without such consent shall be at the client's or recipient's sole risk, without liability to Nova Group, GBC.

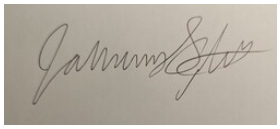
Estimated installation costs are based on Nova Group, GBC experience on similar projects and industry standard cost estimating tools including *RS Means*. Since actual installed costs may vary widely for particular installation based on labor & material rates at time of installation, Nova Group, GBC does not guarantee installed cost estimates and shall in no event be liable should actual installed costs vary from the estimated costs herein. We strongly encourage the owner to confirm these cost estimates independently. Nova Group, GBC does not guarantee the costs savings estimated in this report. Nova Group, GBC shall in no event be liable should the actual energy savings vary from the savings estimated herein.

Nova Group, GBC certifies that Nova Group, GBC has no undisclosed interest in the subject property and that Nova Group, GBC employment and compensation are not contingent upon the findings or estimated costs to remedy any deficiencies due to deferred maintenance and any noted component or system replacements.

Respectfully submitted,

NOVA GROUP, GBC

Reviewed by:



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1.0 EXECUTIVE SUMMARY

1.1 General Description

1.1.1 Purpose

The purpose of this MERP Level 2 Energy Audit is to provide the State of Vermont - Building and General Services and Brandon - Brandon Highway Garage with energy efficiency opportunities at the facility and specific recommendations for Energy and Conservation Measures (ECM's). Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Utility grants towards energy conservation, or as a basis for replacement of equipment or systems.

1.1.2 Scope of Work

1.1.2.1 Energy Audit Scope of Work

The purpose of this Energy Assessment is to provide the State of Vermont - Building and General Services and Brandon - Brandon Highway Garage with a baseline of energy usage, the relative energy efficiency of the facility, and specific recommendations for Energy Conservation Measures. Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Federal and Utility grants towards energy conservation, as well as support performance contracting, justify a municipal bond-funded improvement program, or as a basis for replacement of equipment or systems.

The energy assessment consisted of an onsite visual assessment to determine current conditions, itemize the energy consuming equipment (i.e. Boilers, Make-Up Air Units, DWH equipment); review lighting systems both exterior and interior; and review efficiency of all such equipment. The study also included interviews and consultation with operational and maintenance personnel. The following is a summary of the tasks and reporting that make up the Energy Assessment portion of the report.

The following is a summary of the tasks and reporting that make up the Energy Assessment portion of the report.

Energy and Water Using Equipment

Nova Group, GBC has surveyed the tenant spaces, common areas, offices, maintenance facilities and mechanical rooms to document utility-related equipment, including heating systems, cooling systems, air handling systems and lighting systems.

Building Envelope

Nova Group, GBC has reviewed the characteristics and conditions of the building envelope, checking insulation values and conditions where accessible. This review also includes an inspection of the condition of walls, windows, doors, roof areas, insulation and special use areas.

Recommendations for Energy Savings Opportunities

Based on the information gathered during the on-site assessment, the utility rates, as well as recent consumption data and engineering analysis, Nova Group, GBC has identified opportunities to save energy and provide probable construction costs, projected energy/utility savings and provide a simple payback analysis.

Energy Assessment Process

- Interviewing staff and review plans and past upgrades
- Performing an energy assessment for each use type. Performing a preliminary evaluation of the utility system
- Making preliminary recommendations for system energy improvements and measures
- Estimating initial cost

Reporting

The Nova Group, GBC Energy Assessment Report includes:

- A comprehensive study identifying all applicable Energy Conservation Measures (ECMs) and priorities, based on initial cost.

1.2 Findings

1.2.1 Energy Conservation Measure Sorting

Simple Payback Period – The number of years required for the cumulative value of energy cost savings less future non-fuel costs to equal the investment costs of the building energy system, without consideration of discount rates. ECMs with a payback period greater than the Expected Useful Life (EUL) of the project are not typically recommended for loan-funded energy projects, as the cost of the project will not be recovered during the lifespan of the equipment; however they will be considered for energy projects funded by the MERP Implementation Grant. These ECMs are recommended for implementation during future system replacement. At that time, replacement may be evaluated based on the premium cost of installing energy efficient equipment. The ECMs presented in the table below are presented in order of priority of payback, however ECM's involving resilience components will be prioritized accordingly.

$$\textit{Simple Payback} = \frac{\textit{Initial Cost}}{\textit{Annual Savings}}$$

Interactive Energy Conservation Measures - This analysis excludes the interactive effects of Energy Conservation Measures. Due to the significant interactive effects between the ECMs that include the replacement or modification of the Heating Ventilation and Air Conditioning Systems and the other recommended ECM's, the HVAC ECMs are presented independently of the ECMs that do not include the replacement or modification of HVAC equipment. Furthermore, a 10% discount in energy savings was applied to account for the interactive effects amongst the ECMs. In addition to the consideration of the interactive effects, Nova Group, GBC has applied a 15% contingency to the implementation costs to account for potential cost overruns during the implementation of the ECMs.

Interactive Energy Conservation Measures - The change in resultant energy saving estimates due to implementing multiple Energy Conservation Measure's that have indirect impacts on one another.

1.2.2 Assumptions

Nova Group, GBC has made the following assumptions in calculation of the Energy Conservation Measures.

- Building operating hours are assumed to be 40 hours per week.
- The facility occupancy is four (4) people.
- Annual Heating Equipment Operating Hours are derived from actual consumption and equipment input rates to be 4,719 hours/year.

- Annual Cooling Equipment Operating Hours are derived from actual consumption and equipment input rates to be 0 hours/year.

1.2.3 Recommendations

Nova Group, GBC has recommended two (2) HVAC Energy Conservation measure options and eleven (11) Energy Conservation Measures (ECMs) that do not modify or replace the existing HVAC.

HVAC option one (1) includes replacing the existing oil burning furnaces with new, more efficient, condensing furnaces.

HVAC option two (2) includes replacing the existing oil burning furnaces with new, more efficient electric bay heaters.

The savings for each measure is calculated using standard engineering methods followed in the industry.

The following table summarizes the recommended ECMs in terms of description, investment cost, energy consumption reduction, and cost savings.

Evaluated Energy Conservation Measures: Financial Impact			
	HVAC Option #1 - Condensing Furnaces	**HVAC Option #2 - Electric Bay Heaters**	**ECM Package Excluding HVAC**
Total Projected Initial ECM Investment	$69,000	$86,250	$163,731
Estimated Annual Cost Savings Related to all ECMs	$(1,314)	$(7,927)	$2,229
Estimated Annual Cost Savings-Electricity	N/A	$(17,556)	$320
Estimated Annual Cost Savings-Propane	$(10,943)	N/A	N/A
Estimated Annual Cost Savings-Natural Gas	N/A	N/A	N/A
Estimated Annual Cost Savings-Fuel Oil	$9,629	$9,629	$1,908
Net Effective ECM Payback	N/A	N/A	73.47 Yrs.
Estimated Annual Energy Savings	11.4%	3.5%	19.5%
Estimated Annual Utility Cost Savings (excluding water)	(11.5)%	(69.1)%	19.4%

Solar and Battery Analysis

Nova Group, GBC has evaluated the site for a two (2) potential combined solar and battery systems, estimated at $90,110 and $627,005 respectively (Total Investment Cost).

Option one (1) includes a 7.77 kW rated solar panel system and a 54 kWh storage battery system, sized for the current electric demand.

Option two (2) includes a 74.37 kW rated solar panel system and a 554 kWh storage battery system, sized for the future electric demand if HVAC Option #2 were to be implemented.

The roof is assumed to be older than ten (10) years and will need to be replaced before the system is installed.

The current electrical panel will likely need to be upgraded, a licensed electrical engineer should be consulted to verify.

The system was designed with a depth of discharge at 50% and a cold weather factor of 1.3 to provide energy for one (1) full day of power. The system assumes that net metering will be available as an option if the building needs are met. For additional information please see Appendix D.

On Site RENEWABLE GENERATION Solar Photovoltaic Analysis with Battery		
	Option One (1) - Current Electric Demand	Option Two (2) - Future Electric Demand - Electric Heaters
Estimated number of panels	21	201
Estimated kW Rating	7.77 kW	74.37 kW
Potential Annual kWh Produced	9,778 kWh solar system with a 54.0 kWh battery storage system	93,853 kWh solar system with a 554 kWh battery storage system
% of Current Electricity Demand	101%	102%
New Roof Cost	$24,000	$48,280
New Electrical Panel Cost	$5,000	$5,000
Battery Storage Investment Cost	$37,800	$387,800
Solar Panel Investment Cost	$23,310	$185,925
Federal Investment Tax Credit (FITC)	$18,333	$172,118
Total Investment Cost (Solar+ Battery + Electrical Panel + Roof)	$90,110	$627,005
Estimated Annual Energy Cost Savings	$1,888	$18,119
Payback without Incentives	47.73Years	34.60 Years
Payback with all Incentives	38.02 Years	25.11 Years

1.2.4 ECM Recommendations

HVAC Energy Conservation Measures

Evaluated HVAC Energy Conservation Measures with Savings												
ECM #	Description of ECM	Projected Initial Investment ($)	Natural Gas (Therms)	Propane (gal)	No. 2 Oil (gal)	Wood Pellets (Tons)	Electricity (kWh)	Energy Savings (kBTU)	% Savings (Energy)	Estimated Annual Maintenance Savings	Total Estimated Annual Cost Savings ($)	Simple Payback (Years)
Evaluated Measures												
1	Option 1a: Replace the existing Furnace in the old building with a new condensing propane furnace, 95% AFUE	$ 20,000	N/A	(1,285)	970	N/A	N/A	16,916	4.7%	N/A	$ (547)	N/A
2	Option 1b: Replace the existing Furnace in New Building West with a new condensing propane furnace, 95% AFUE	$ 20,000	N/A	(1,082)	818	N/A	N/A	14,253	4.0%	N/A	$ (461)	N/A
3	Option 1c: Replace the existing Furnace in New Building East with a new condensing propane furnace, 95% AFUE	$ 20,000	N/A	(717)	542	N/A	N/A	9,444	2.7%	N/A	$ (306)	N/A
	Totals	$ 60,000	N/A	(3,084)	2,330	N/A	N/A	40,613	11.4%	N/A	$ (1,314)	N/A
	Interactive Savings Discount @ 10%	N/A	N/A	(3,084)	2,330	N/A	N/A	40,613	11.4%	N/A	$ (1,314)	N/A
	Total Contingency Expenses @ 15%	$ 69,000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Totals for Improvements	$ 69,000	N/A	(3,084)	2,330	N/A	N/A	40,613	11.4%	N/A	$ (1,314)	N/A
1	Option 1a: Replace the existing Furnace in the old building with a new electric bay heater, 95% AFUE	$ 25,000	N/A	N/A	970	N/A	(34,433)	16,916	4.7%	$ 50.00	$ (2,637)	N/A
2	Option 1b: Replace the existing Furnace in New Building West with a new electric bay heater, 95% AFUE	$ 25,000	N/A	N/A	818	N/A	(29,013)	14,253	4.0%	$ 50.00	$ (2,222)	N/A
3	Option 1c: Replace the existing Furnace in New Building East with a new electric bay heater, 95% AFUE	$ 25,000	N/A	N/A	542	N/A	(19,223)	9,444	2.7%	$ 50.00	$ (1,472)	N/A
	Totals	$ 75,000	N/A	N/A	2,330	N/A	(82,668)	40,613	11.4%	N/A	$ (6,331)	N/A
	Interactive Savings Discount @ 10%	N/A	N/A	N/A	2,330	N/A	(90,935)	12,406	3.5%	N/A	$ (7,927)	N/A
	Total Contingency Expenses @ 15%	$ 86,250	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Evaluated HVAC Energy Conservation Measures with Savings											
Totals for Improvements	$ 86,250	N/A	N/A	2330	N/A	(90,935)	12,406	3.5%	N/A	$ (7,927)	N/A

Energy Conservation Measure Options Excluding HVAC

Evaluated Energy Conservation Measures with Savings													
ECM #	Description of ECM	Projected Initial Investment ($)	Natural Gas (Therms)	Propane (gal)	No. 2 Oil (gal)	Steam (ML)	Wood (Tons)	Electricity (kWh)	Energy Savings (kBTU)	% Savings (Energy)	Total Estimated Annual Cost Savings ($)	Estimated annual Maintenance Savings	Simple Payback (Years)
Evaluated Measures													
1	Install low flow, 1.0 GPM WaterSense certified aerators in the bathroom.	$ 10	N/A	N/A	N/A	N/A	N/A	104	356	0.1%	N/A	$ 20	0.50
2	Insulate exposed domestic hot water lines with R-4 or greater insulation.	$ 50	N/A	N/A	N/A	N/A	N/A	275	938	0.3%	N/A	$ 53	0.94
3	Insulate exposed domestic hot water tanks with R-8 or greater insulation.	$ 50	N/A	N/A	N/A	N/A	N/A	237	809	0.2%	N/A	$ 46	1.09
4	Install three (3) programmable thermostats to control the heating systems.	$ 600	N/A	N/A	93	N/A	N/A	N/A	12,946	3.6%	N/A	$ 386	1.55
5	Replace the existing refrigerator with a new ENERGY STAR rated refrigerator.	$ 175	N/A	N/A	N/A	N/A	N/A	142	485	0.1%	N/A	$ 27	6.38
6	Improve air sealing by reducing the ACH50 to 14.7 or less in the East side of the New Building and perform the air sealing measures located in Section 6.1 in the Old Building and the West side of the New Building.	$ 24,140	N/A	N/A	308	N/A	N/A	N/A	42,612	12.0%	N/A	$ 1,272	18.98
7	Upgrade lighting with ENERGY STAR or DLC certified LED technologies. Please see the lighting tool for specific recommendations.	$ 4,950	N/A	N/A	N/A	N/A	N/A	974	3,323	0.9%	$ 1	$ 188	26.18
8	Replace the current DHW with a new point of use water heater, 0.98 EF	$ 3,500	N/A	N/A	N/A	N/A	N/A	111	377	0.1%	N/A	$ 21	164.00

Evaluated Energy Conservation Measures with Savings													
9	Add fiberglass batt to R-49 in the new building. In the Old building, add blown in cellulose to achieve a uniform coverage of R-49. Clean up moisture in ceiling prior to insulation.	$ 36,420	N/A	N/A	53	N/A	N/A	N/A	7,409	2.1%	N/A	$ 221	164.72
10	Replace the current clear plastic window with new ENERGY STAR rated double pane windows, minimums U-value .35, minimum SHGC .50.	$ 36,000	N/A	N/A	44	N/A	N/A	N/A	6,096	1.7%	N/A	$ 182	197.88
11	Install drywall and add R-11 fiberglass batt insulation to the exterior walls in the old building.	$ 36,480	N/A	N/A	14	N/A	N/A	N/A	1,995	0.6%	N/A	$ 60	612.69
Totals		$ 142,375	N/A	N/A	513	N/A	N/A	1,843	77,347	21.7%	$ 1	$ 2,476	57.50
Interactive Savings Discount @ 10%		N/A	N/A	N/A	462	N/A	N/A	1,659	69,613	19.5%	$ 1	$ 2,229	73.47
Total Contingency Expenses @ 15%		$ 163,731	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals for Improvements		$ 163,731	N/A	N/A	462	N/A	N/A	1,659	69,613	19.5%	$ 1	$ 2,229	73.47

1.2.5 Measures that Warrant Further Study

The following items are presented for consideration in operational and capital planning:

- There were no other measures identified.

ENERGY CALCULATIONS AND ASSUMPTIONS

A property energy model was created using spreadsheet calculations based on appropriate and industry-accepted engineering formulas and standards for organizations such as ASHRAE. Nova cost estimates are based on construction cost data from sources such as RS-Means and technical discussions with equipment manufacturers and local contractors. The property owner may wish to solicit competitive bids from qualified contractors to ensure the most accurate pricing. Nova's cost estimates are general industry standards and may not account for all variations and specificities related to this site.

The building's historical energy consumption and the data collected on site were analyzed and "trued-up" in order to create energy models of the building systems. These models were used to predict energy and cost savings for the recommended measures. For this audit, Nova used proprietary spreadsheet models to estimate savings for the proposed retrofits.

Key information on building systems, including the results of performance tests conducted onsite are included in the tables on the following pages.

2.0 PROPERTY OVERVIEW

Facility Schedule	
Building Type/Name	Garage
# of Stories	One (1)
Year Built/Renovated	The old building was constructed approximately 1950. The new building was constructed in 1977.
Building Size	4,828 square feet
Hours of Operations/Week	40 hours
Operational Weeks/Year	52 weeks
Estimated Facility Occupancy	Four (4) people

Property Contact	
Point of Contact Name	Jeremy Disorda
Point of Contact Title	Road Foreman
Point of Contact - Contact Number	(802) 558-7094

3.0 SITE VISIT

The objective of the Document Review and Interview process is to augment the walk-through survey and to further assist in understanding the Site's latent physical components, physical deficiencies as well as preceding or on-going efforts toward energy and water conservation and/or waste diversion. The information obtained as a result of the Document Review and Interview process is assumed to be true and correct, provided that such information appears to be reasonable.

3.1 Site Visit Information

SITE VISIT INFORMATION	
Date of Site Observation	May 22, 2024
Weather Conditions	Sunny, 80°F
Nova Field Associate	Johanna Stuz, BPI-BA
Nova Reviewers	Naushad Amlani, BPI-MFBA Morgan Carson, CEM Keely Felton, CEA

3.2 Interviews

PROVISION OF INFORMATION	
	Property Management did not provide us with service provider information as requested in our Pre-Survey Questionnaire.
✔	Property Management did provide us with some information regarding service providers.

Based upon the Pre-Survey Questionnaire and the interview process, the individuals and organizations listed below were contacted and/or interviewed:

INTERVIEWS					
Service Provider/Property Rep.	**Title / Organization**	**Contact Information**	**Contact Attempted**	**Contact Made**	**No Reply / No Response**
Jeremy Disorda	Road Foreman, Town of Brandon	(802) 558-7094		✔	

4.0 ENERGY AUDIT - HISTORIC UTILITY CONSUMPTION

4.1 Utility Consumption

A preliminary end use analysis was performed on the subject property to understand how the property is using energy, to understand its performance relative to similar properties and to establish baseline GHG Emissions.

4.1.1 Historical Energy Consumption and Costs

Site Utilities	
Facility Electric Service Size	The old building has a 50 Amp main breaker. The new building has a 100 Amp main breaker.
Onsite Transformer	There is no transformer on-site.
Electric Meter Location	The electrical meter for the facility is pole mounted at the street.

Utility Analysis						
Utility Type	**Utility Provider**	**Meter Quantity**	**Energy/Water Uses**	**Annual Consumption**	**Est./Act.**	**Annual Cost**
Electric (Grid)	Green Mountain Power	One (1)	Lighting, Water Heating, Plug Loads	8,013 kWh	Actual	$1,547 (calculated using Green Mountain Power rate of $0.19306)
No. 2 Oil	Champlaine Valley Fuels	None	N/A	2,330 Gal	Actual	$9,629 (calculated using EIA rate of $4.133)

4.1.2 On-Site Utility Storage

Heating oil is stored on-site.

Onsite Utility Storage	
Battery Storage	
Storage Capacity	None
Year Installed	N/A
Location Installed	N/A
Space Served	N/A
Fossil Fuel Storage	
No. 2 Oil	Three (3) 275 gallon above ground tank.
Propane Gas	None
Wood Chips/Pellet	None

4.1.3 On-Site Generation

There is no on-site energy generation.

4.1.4 On-site Electric Vehicle Charging

There are no electric vehicle charging stations on-site.

Onsite Electric Vehicle Charging	
Installed Chargers	None
Electrical Charger Type	N/A
Location Installed	N/A
Charger Manufacturer	N/A
Electric Metering to Chargers	N/A
Recommendations	Electric vehicle charging is not recommended due to limited available parking.

4.2 Delivered Fuel

Nova was provided with twenty-four (24) months of heating oil #2 usage history in Excel format from the property for one (1) owner-paid account. Total consumption was provided. Cost data was not provided, but estimated using the EIA rate. The most recent twelve (12) months of historical data was considered in Nova's analysis.

The following charts show heating oil #2 consumption month by month for the period from 1/1/2023 to 12/31/2023.

4.2.1 Provision of Data

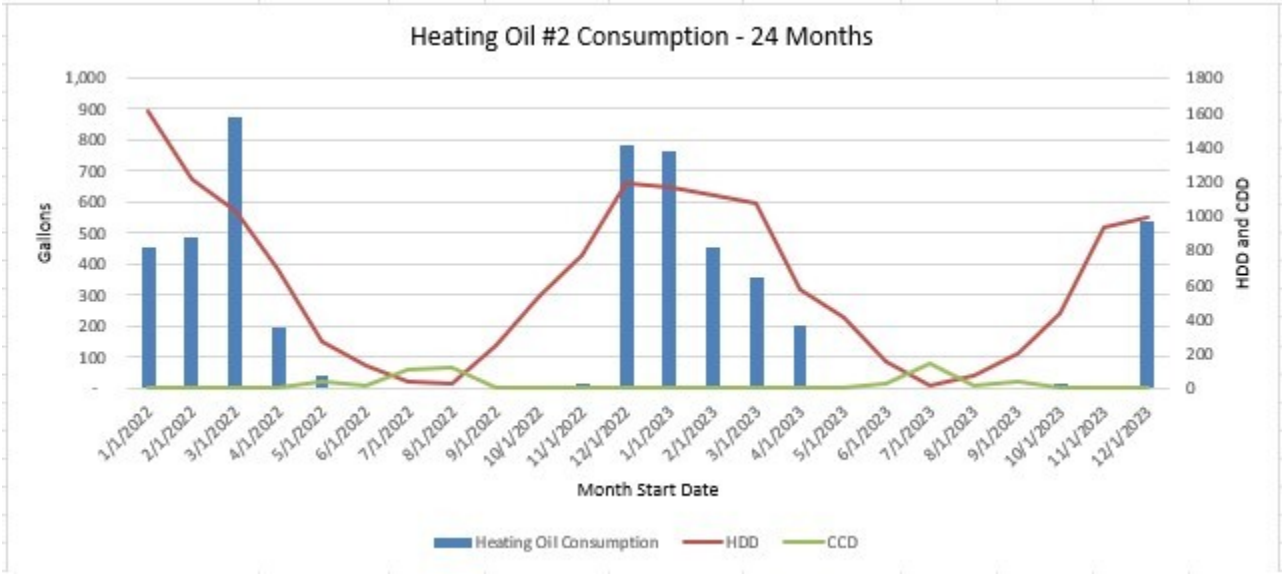
ANNUAL CONSUMPTION FOR HEATING FUEL					
Start	**End**	**Consumption**	**Cost (calculated using EIA rate)**	**Estimated**	**Days**
1/1/2022	12/31/2022	2,845	$11,756	Actual	365
1/1/2023	12/31/2023	2,330	$9,629	Actual	365

HEATING OIL #2 CONSUMPTION					
Start	**End**	**Consumption (Gallons)**	**Cost (calculated using EIA rate)**	**Estimated?**	**Days**
1/1/2023	1/31/2023	764	$ 3,159	No	31
2/1/2023	2/28/2023	454	$ 1,878	No	28
3/1/2023	3/31/2023	358	$ 1,481	No	31
4/1/2023	4/30/2023	203	$ 840	No	30
5/1/2023	5/31/2023	-	$ -	No	31
6/1/2023	6/30/2023	-	$ -	No	30

HEATING OIL #2 CONSUMPTION					
Start	**End**	**Consumption (Gallons)**	**Cost (calculated using EIA rate)**	**Estimated?**	**Days**
7/1/2023	7/31/2023	-	$ -	No	31
8/1/2023	8/31/2023	-	$ -	No	31
9/1/2023	9/30/2023	-	$ -	No	30
10/1/2023	10/31/2023	14	$ 56	No	31
11/1/2023	11/30/2023	-	$ -	No	30
12/1/2023	12/31/2023	536	$ 2,215	No	31
		2,330	$ 9,629		365

4.2.2 Analysis

When charted against heating degree days, it is evident that whole property heating oil #2 consumption peaks during the colder months, likely due to increased heating load. Heating oil is delivered on an as needed basis; therefore the spikes in consumption represent larger deliveries of oil during those months.



4.3 Electricity

4.3.1 Provision of Data

Nova was provided with twenty-four (24) months of electricity usage history in Excel format from the property for one (1) owner-paid account. Total consumption and cost were provided, but estimated using the Green Mountain Power rate. The most recent twelve (12) months of historical data was considered in Nova's analysis.

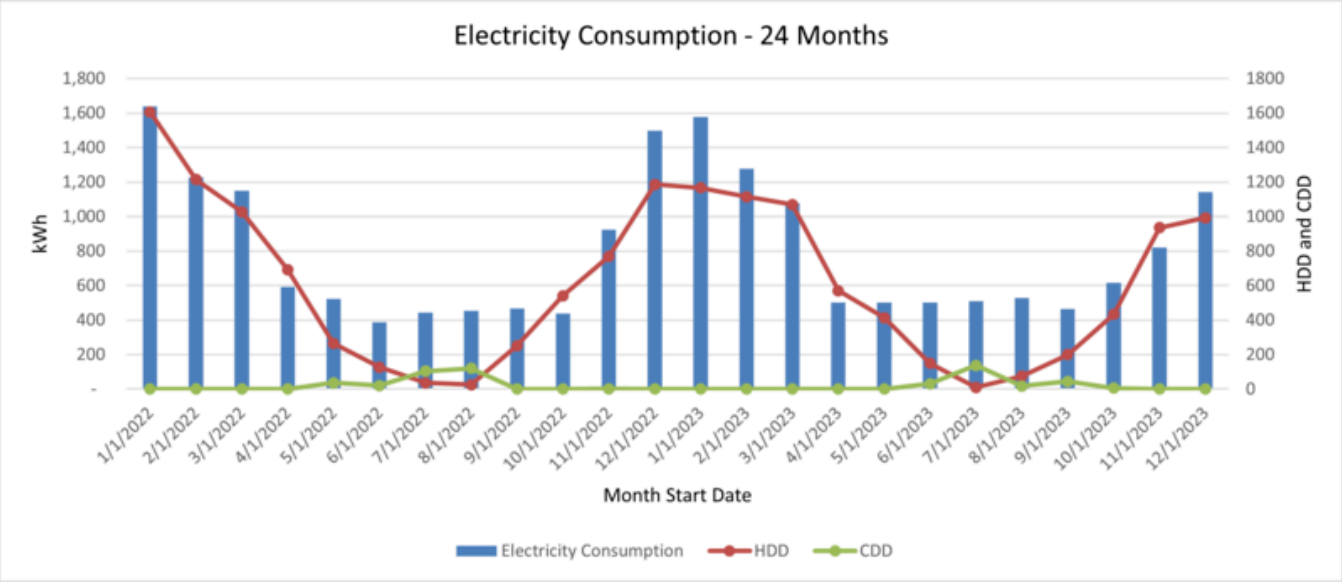
The following charts show electricity consumption totals month by month for the period from 1/1/2023 to 12/31/2023.

Annual Consumption of Electricity					
Start	**End**	**Consumption**	**Cost (calculated using Green Mountain Power rate)**	**Estimated**	**Days**
1/1/2022	12/31/2022	9,746	$1,882	Actual	365
1/1/2023	12/31/2023	9,516	$1,837	Estimated	365
**Consumption data from April 2023 to June 2023 were not provided, therefore estimations were made using 2022 data from the same timeframe.*					

ELECTRICITY CONSUMPTION					
Start	**End**	**Consumption (kWh)**	**Cost (calculated using EIA rate)**	**Estimated?**	**Days**
1/1/2023	1/31/2023	1,577	$ 304	No	31
2/1/2023	2/28/2023	1,277	$ 247	No	28
3/1/2023	3/31/2023	1,079	$ 208	No	31
4/1/2023	4/30/2023	501	$ 97	Yes	30
5/1/2023	5/31/2023	501	$ 97	Yes	31
6/1/2023	6/30/2023	501	$ 97	Yes	30
7/1/2023	7/31/2023	509	$ 98	No	31
8/1/2023	8/31/2023	529	$ 102	No	31
9/1/2023	9/30/2023	465	$ 90	No	30
10/1/2023	10/31/2023	615	$ 119	No	31
11/1/2023	11/30/2023	820	$ 158	No	30
12/1/2023	12/31/2023	1,142	$ 220	No	31
		9,516	$ 1,837		365

4.3.1.1 Analysis

When charted against heating degree days, it is evident that whole property electric consumption peaks during the colder months, likely due to increased heating load.



4.3.1.2 Renewable (Green Power) Energy Sources

No renewables or energy generation systems were observed on site.

4.4 Utility Rate Structure Analysis

Rates for common area utilities were provided on the utility tariff for each company.

UTILITY RATE STRUCTURE ANALYSIS						
Service	**Utility**	**Rate**	**Service/Customer Charge**	**Demand Charge**	**EIA Rate**	**Rate Used In Calculation**
Electricity	Green Mountain Power (GMP)	$0.19306 per kWh	$0.690 per day	No	$0.1826 per kWh	$0.19306 per kWh
Heating Oil #2	Champlaine Valley Fuels	Rates vary	NA	No	$4.133 per gallon	$4.133 per gallon

4.4.1 Billing Irregularities

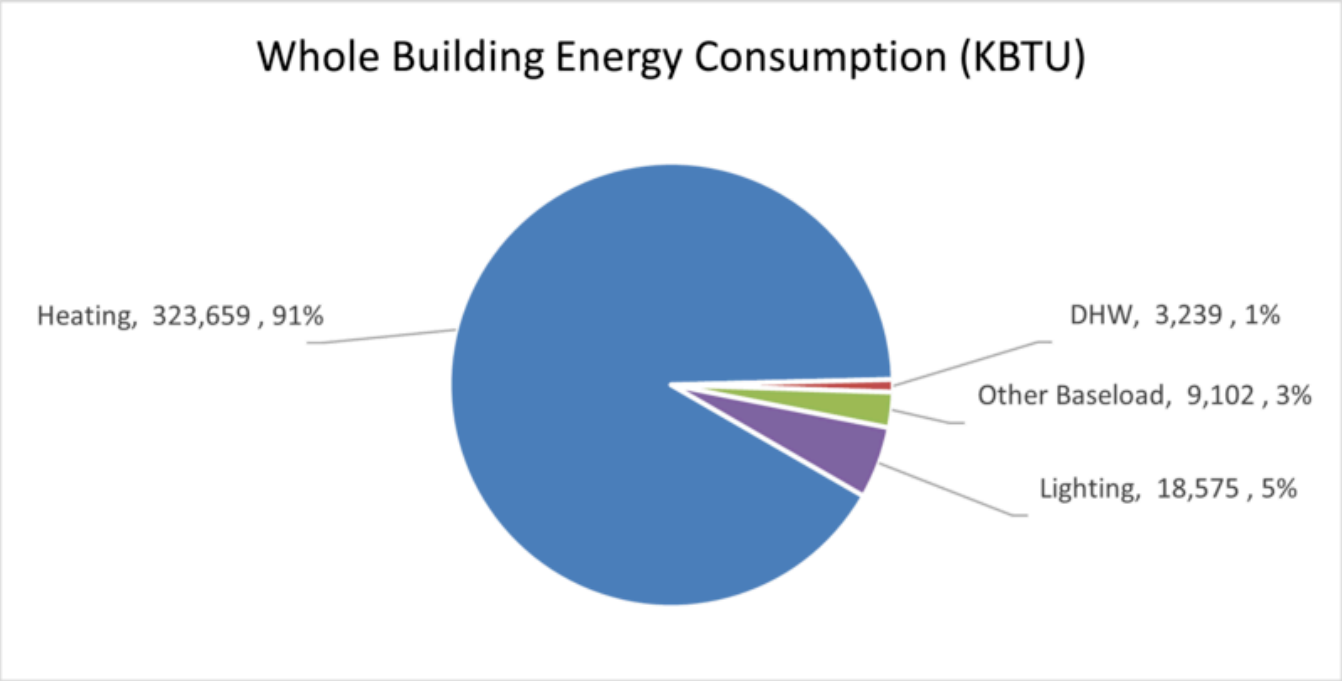
Nova was not provided electric utility data for the months of April through June 2023. The consumption was estimated utilizing April through June 2022 data and calculating an average usage per month.

4.5 Utility End Use Analysis

Utility end use at the subject property was observed to be consistent with other buildings with the similar occupancy and HVAC equipment.

4.5.1 End Use Breakdown

The figure below shows an annual breakdown of energy consumption for the entire facility. There is no cooling load at this building.



5.0 EXISTING SYSTEMS AND EQUIPMENT - ENERGY

5.1 Existing Conditions

This section includes an inventory of existing systems and equipment and their current conditions.

Detailed equipment tables are included in Exhibit C of this report.

5.2 Building Envelope

The old building has a poured concrete slab on grade foundation. The walls are mostly painted CMU block and some walls are wood framed with clapboard sided. The walls and ceiling are finished but with a lot of unnecessary penetrations (holes). The wood framed gable roof has a history of leaks.

The new building has wood framed walls and ceiling with metal siding and metal roof. The interior walls and ceiling are finished gypsum drywall; except for the west room ceiling which is corrugated metal. The wood overhead door frames are dry rotted.

5.2.1 Structure

STRUCTURE	
Component	**Description**
Construction Drawings	Construction drawings were not made available for review
Foundation Type	Building foundations appear to be slab-on-grade
Wall Type and Framing	Old building walls are CMU block. New building walls have conventional wood stud framing.
Upper Floor Framing	There are no upper floors.
Exterior Facade Description	The old building exterior fascade is CMU block. The new building exterior fascade is corrugated metal.
Wall Insulation Verification	Insulation was verified visually.
Roof Type	Buildings on site are constructed with gable roofs
Roof Framing	Roof framing consists of wood trusses, supporting plywood or OSB roof sheathing.
Roofing Material	Building sloped roofs are unpainted, corrugated metal.
Median Roof Age	The new building's roof is original, 1977 and in poor condition. The old building's corrugated metal roof was installed "in the late '90s" and is in fair condition.
Roofing Reflectance	0.05-0.07, which is considered reflective
Roof Water Intrusion	The new building has active roof leaks. The old building once had leaks but they have been repaired.
Roof Insulation Verification	Insulation was verified visually.

ENVELOPE INSULATION			
Slab	**Basement Walls**	**Above Grade Walls**	**Roof/Attic**
No Insulation	N/A	The old building has no wall insulation. The new building has R-11 fiberglass batts.	The old building has no roof insulation. The new building has 5.5" fiberglass Batts; R-19.

DOORS AND WINDOWS	
Component	**Description**
Windows	
Window Frame	The old building has a hollow, wood door with no window in a wood frame The new building has a metal door with no window in a metal frame.
Window Operation	Windows are fixed, non-operable units.
Window Glazing	Old building windows are double glazed. New building windows are made with clear plastic board to allow light in.
Window Weatherstripping	Weather stripping does not appear to provide an adequate air seal to the exterior.
Window Age	Old building windows are as old, but the age is unknown. New building windows are original.
Window Center of Glass (COG) Values	Old Building: U-value: 0.35, SHGC: 0.50 New Building: U-Value: 0.87, SHGC: 0.80
Window Tint/Films	Windows are not tinted.
Window to Wall Ratio	Old building: 1% (2,195 square feet of exterior wall surface area; 20 square feet of window surface area) New building: 0% window surface area; however, some siding (50 square feet) was replaced by clear plastic wiggle board to allow light in.
Doors	
Main Entry Doors	The old building has a hollow, wood door with no window in a wood frame The new building has a metal door with no window in a metal frame.
Door Weatherstripping	Weather stripping does not appear to provide an adequate air seal to the exterior.
Door Age	Doors are original to the Property. Overhead doors are original to the new building. The old building overhead doors are relatively new compared to the building.
Overhead Doors	The new building has three (3) vinyl over metal frame, insulated overhead doors that are unglazed. The old building has three (3) vinyl over metal frame, insulated overhead doors. Each door has 6.5 square feet of double glazed window surface area.

Blower Door Testing	
Blower Door Equipment	Retrotec
Building Volume	Old Building: 16,606 cubic feet New Building: 42,400 cubic feet New Bldg 1 Bay Garage: 14,310 cubic feet
Leakage Rate @ -50 Pa (CFM50)	Old Building: Too leaky; unable to pressurize New Building: Too leaky; unable to pressurize New Bldg 1 Bay Garage: 4,130 CFM50
Leakage Rate ACH50	Old Building: Too leaky to calculate New Building: Too leaky to calculate New Bldg 1 Bay Garage: 17.3 ACHN50

Blower Door Testing	
Noted areas of infiltration	The blower door testing indicated there were leaks within the building. The areas of infiltration can be identified in the old building as the holes in the ceiling and walls, overhead doors, and the entry door seal and in the new building as the overhead doors, the holes in the walls, the attic access, and the bottom and the top plates.

Infrared Imaging	
Infrared Equipment	Flir One Pro
Outdoor temperature	80°F
Indoor space temperature	New Building 80°F Old Building 74°F
Infrared Comments	The infrared camera showed there are areas of infiltration in both buildings. The areas of infiltration in the old building are the ceiling, the overhead doors, and the exposed concrete floors. The areas of infiltration in the new building are the top plates, the ceiling gaps around the insulation, the exposed concrete slab floor, and the entry and overhead doors.

5.3 Heating, Ventilation and Air Conditioning (HVAC)

5.3.1 Heating

Heat is provided by three (3) oil-fired furnaces. The new garage restroom has one (1) electric baseboard heater.

HEATING SYSTEM SUMMARY		
	Heating Primary System	**Heating Secondary System**
Area Served	Entire Facility	Restroom
Heating System Type	Furnace	Electric Baseboard/Room Heater
Heating Fuel	Oil	Electric
Heating System Configuration	Individual heating systems are installed in commercial spaces	Individual Room Heater
Heating Equipment Location	Garage	New Garage Restroom
Typical Range of Efficiency	Old Building: 81% AFUE New Building West: 81% AFUE New Building East: 88% AFUE	100% AFUE
Equipment Manufacture Date Range	Old Building: 1971 New Building West: 2001 New Building East: 2011	2001 (Estimated)
Quantity	Three (3)	One (1)
Access Issues	None	None
Description of Variation in Type, Fuel, Configuration or Location Between Areas	Furnace in each garage room	Four Foot Baseboard Heater

COMMERCIAL HEATING EQUIPMENT - PROPERTY WIDE	
Sample Representation	100% of systems on site were observed as part of the sample.
Explanation of Discrepancy	None
Heating Systems Recommended for Replacement	The furnaces are all recommended for replacement.
Reason for Replacement	Equipment is inefficient and has exceeded or is approaching its EUL

5.3.2 Cooling

There is no cooling system for the facility.

5.3.3 Distribution, Controls and Ventilation

The two (2) bay garage in the new building has a ducted furnace. The one (1) bay garage in the new building and the old building have one (1) point source furnace each. All furnaces are oil-fired. Thermostats are non-programmable. The restroom is mechanically vented to the exterior.

DISTRIBUTION & CONTROLS
Ducted Distribution

DISTRIBUTION & CONTROLS	
HVAC Duct Location	HVAC ducts are hung below the finished ceiling
Access HVAC to Ductwork	Exposed ductwork is fully visible.
HVAC Ductwork Air Sealing	Ducts are in conditioned space
HVAC Duct Insulation	Most observed ductwork was uninsulated.
Affected Systems	Heating
HVAC Blower Fan Motors	
Type of Blower Fan Motors	Multi-Speed
Hydronic or Steam Distribution	
Type of Distribution	N/A
Hydronic or Steam Pipe Insulation	N/A
Affected Systems	N/A
Controls	
Leased Area Thermostats	There are no leased areas.
Common Area Thermostats	Non-programmable
Building Automation System	N/A
Heating Setpoints	60°F
Cooling Setpoints	N/A
Opportunity for Improvement	Programmable Thermostats are opportunities for improvement

VENTILATION	
Kitchen Ventilation Type	There is no kitchen.
Kitchen Exhaust Destination	N/A
Bathroom Ventilation Type	Mechanical exhaust fans - individual
Bathroom Exhaust Destination	Vented to the exterior.
Garage Ventilation Type	Mechanical exhaust fans - individual
Garage Exhaust Destination	Vented to the exterior.

5.4 Domestic Water Heating

5.4.1 DHW Equipment

One (1) 30 gallon, electric water heater serves the entire facility.

DOMESTIC HOT WATER SYSTEM SUMMARY	
Area Served	Entire Facility
DHW System Type	Tank - Direct
DHW Fuel	Electricity
DHW System Capacity	30 gallons; 6,000W
DHW Equipment Location	Restroom
Typical Range of Efficiency	0.87 EF
Equipment Manufacture Date Range	July 1974
Quantity	One (1)
Access Issues	None
DHW Lines	Domestic hot water piping was observed to be uninsulated where exposed.
Is a re-circ pump installed?	No
Existing High Rise Water Pressure Boosting System	No
Are Existing Booster(s) Variable Speed?	N/A
Description of Water Fixtures Related to DHW Usage (Faucet Aerators and Showerheads)	One (1) faucet
Description of Variation in Type, Fuel, Configuration or Location Between Areas	N/A

DHW EQUIPMENT - PROPERTY WIDE	
Sample Representation	100% of systems on site were observed as part of the sample.
Explanation of Discrepancy	None
DHW Systems Recommended for Replacement	The domestic water heater in the new building is recommended for replacement.
Reason for Replacement	Equipment is inefficient and has exceeded its EUL

WATER FIXTURES - SUMMARY

Fixture Type	Location	Range Rated Flow Rate (GPM or GPF)	Average Rated Flow Rate (GPM or GPF)	Qty	% of Sample
Faucet	Restroom	2.2-2.2 GPM	2.2 GPM	One (1)	100%
Toilet	Restroom	3.5-3.5 GPF	3.5 GPM	One (1)	100%

5.5 Lighting

5.5.1 Interior Lighting

LED light fixtures containing 9W to 80W bulbs provide all interior lighting in the building except for in the restroom which has a 60W incandescent bulb.

The facility doesn't have any automatic lighting controls on internal light fixtures**.**

The EXIT signs in the facility consist of LED lamp-based fixtures that are located in the new building.

Interior Lighting			
Fixture Types	**Wattage**	**% of Total Fixtures**	**Recommended for Replacement**
Incandescent	60-60 W	4%	Yes
LED	9-80 W	96%	No

5.5.2 Exterior Site Lighting

The exterior lighting primarily consists of LED fixtures containing 20W and 75W bulbs. There is one (1) incandescent fixture on the back side of the old building that has two (2) 65W bulbs.

Exterior Lighting Lighting			
Fixture Types	**Wattage**	**% of Total Fixtures**	**Recommended for Replacement**
Incandescent	65-65 W	20%	Yes
LED	20-75 W	80%	No

5.6 Appliances

5.6.1 Kitchen Appliances

Breakroom Appliances			
Item	**Type**	**Estimated Age & Condition**	**ENERGY STAR Certified**
Refrigerator	1.8 cubic feet Freezer location: Top Manufacturer/s: Magic Chef Estimated Annual Consumption: 350 KWh	24 years old and in poor condition	Not ENERGY STAR Certified

REFRIGERATORS - PROPERTY WIDE	
Sample Representation	100% of appliances on site were observed as part of the sample.
Explanation of Discrepancy	None
Refrigerators Recommended for Replacement	Refrigerator in the new building.
Reason for Replacement	Equipment is inefficient and has exceeded its EUL

5.6.2 Laundry

No laundry equipment or hookups were observed on site.

5.7 Process Equipment and Loads

There are air compressors, welders, and other machinery on site.

5.8 Other Systems

No other systems were noted on site as significant energy-consumers.

5.9 Onsite Energy Generation

There is no energy generation on site.

5.9.1 Solar Energy & Cogeneration

Existing building roof types appear to be corrugated metal sheeting. Installation on this roof type is at an increased risk of leak. Selected company's installation warranty should explicitly cover penetrations during the life of the system.

There is currently no on-site energy generation at the Property.

The property has significant potential for a solar photovoltaic (PV) system, with a large unshaded pitched roof area with minimal mechanical equipment.

Nova bases solar sizing calculations on the following considerations:

1. Maximize available roof space
2. Only use the orientations that will be the most profitable (aiming for <15 year paybacks)
3. Offset more than 100% of owner paid electricity after factoring in the kWh reduction of the recommended ECMs. The 100% value helps ensure that the property is more likely to over-produce electricity during cyclical periods of lower electricity consumption throughout the year to feed battery storage system.
4. Any additional electricity produced will be fed back into the grid for net metering credits.

6.0 RECOMMENDED ENERGY CONSERVATION MEASURES (ECMS)

6.1 Building Envelope

ECM: IMPROVE AIR SEALING

Green Alternative	Engage a BPI-accredited air sealing contractor to reduce the ACH50 rate to 17.4 or less in the old building and the new building west garage and the ACH50 to 14.8 or less. Recommended areas of focus include: Old Building: Holes in the wall and ceiling, the overhead doors, and the entry doors New Building West: Overhead doors, the holes in the wall, the attic access, ceiling gaps, and the top and bottom plates New Building East: Overhead Doors and the holes in the wall
Benefits Attained	Air sealing reduces heat loss in the winter and heat gain in the summer. Air sealing can reduce the risk of fire, and stop interior moisture from reaching attics. Comfort may improve as the air sealing reduces the transfer of odors and noise between different parts of the building.
Assumptions	The ACH50 rate was not able to reach test pressure in the old building and the west garage in the new building. › New Building East ACH50: 17.4; verified via blower door test › New Building West ACH50: 20, Assumed based on visual inspection › Old Building ACH50: 20, Assumed based on visual inspection
Recommendation	This "green alternative" is recommended based on energy savings.

ECM: IMPROVE ATTIC INSULATION

Green Alternative	Nova recommends adding fiberglass batt insulation to the attic space to total R-49 in the new building and add blown-in cellulose to achieve uniform coverage to R-49 in the old building. Before adding the insulation, we recommend air sealing and cleaning up any moisture in the ceiling. Site staff should confirm that the roof is in good condition and is leak-free prior to insulation work. Larger openings, such as chases, shall be sealed with rigid foam board or sheet metal. Before insulation is installed, dams should be built around access hatches, chimney flues, and open ventilation shafts. Blocking should be installed around soffit vents to ensure adequate air flow while preventing 'wind washing' through the insulation near the eaves.
Benefits Attained	Improved roof insulation reduces heat loss in the winter and heat gain in the summer.
Assumptions	The following assumptions were made to calculate savings from the proposed roof insulation: › The existing R value of the attic was considered to be 7 in the old building and 19 in the new building, based on visual inspection.
Recommendation	This "green alternative" is recommended based on energy savings.

ECM: IMPROVE WALL INSULATION

Green Alternative	Nova recommends insulating the walls to R-11 in the old building. Insulation is recommended for all above-grade exposed surfaces to ~2ft below grade. Select an insulation material that will not be damaged by moisture such as closed cell spray foam, rigid foam, or mineral wool. Nova recommends adding drywall and fiberglass batt insulation. Site staff should confirm that the walls are in good condition and area leak-free prior to insulation work. Ensure that humidity levels are <60% to avoid moisture-related issues such as mold or rot. Larger openings, such as chases, shall be sealed with rigid foam board or sheet metal. Ensure that any foam insulation is covered with a fire-rated rated barrier if required per local building code.
Benefits Attained	Improved foundation insulation reduces heat loss in the winter and lessens the impact of poor distribution efficiency from heating and cooling systems located in these areas.
Assumptions	The following assumptions were made to calculate savings from the proposed roof insulation: › The existing R value of the walls were considered to be R7 based on visual inspection
Recommendation	This "green alternative" is recommended based on energy savings.

ECM: REPLACE WINDOWS

Green Alternative	Nova recommends replacing existing clear plastic windows with new, high-efficiency ENERGY STAR® certified units. Select windows that are appropriate for this climate zone in order to optimize heating and cooling savings. Air seal the rough opening around each unit during install with low-expanding foam. Flash each unit appropriately to prevent water damage.
Benefits Attained	Replacing windows are an expensive measure, and the utility savings associated with this improvement is not enough to fully offset the install cost. However, the existing clear plastic needs replacement as it is not a proper window. Replacing now with a high efficiency alternative provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	The following assumptions were made to calculate savings from the propos ed window and glass door replacement: › The existing windows are modeled with a u-value of 0.80 and a SHGC of 0.87. › New windows are modeled with a u-value of 0.35 and a SHGC of 0.5.
Recommendation	This "green alternative" is recommended based on energy savings.

6.2 HVAC Systems

ECM: INSTALL PROGRAMMABLE THERMOSTATS

Green Alternative	Nova recommends installing three (3) digital programmable thermostat to control the operation of the heating systems within each building. Because these thermostats are often difficult for the building staff to properly program, we recommend that the contractor install and program all new thermostats.
Benefits Attained	Replacing the existing thermostat with a programmable thermostats will reduce overheating of the shed. It will also allow staff to control the heating, improving comfort.
Assumptions	We modeled the savings using common engineering practices. We based a load profile on engineering practices and property staff interviews. The savings baseline assumes that overall temperature in the apartments will be adjusted by at least 5 degrees F.
Recommendation	This "green alternative" is recommended for its energy savings and ability to increase staff comfort.

HVAC OPTION #1: ECM: INSTALL HIGH EFFICIENCY CONDENSING FURNACES

Green Alternative	Install high efficiency, ENERGY STAR® rated condensing furnaces rated at 95% AFUE or higher. The condensing furnaces will require floor space in the garages to accommodate the equipment. The furnaces will also require ducting to be added for distribution.
Benefits Attained	While replacing the furnace is an expensive measure, this system has reached the end of its useful life. Replacing now with high-efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate heating savings we assumed an improvement in efficiency from 81% to 95% AFUE for affected units. In determining feasible exterior wall vent locations, proximity to windows, doors and walkways should be considered. Venting for this type of system is pressurized and cannot be vented into a chimney which is utilized by atmospherically vented appliances. If vented into an existing chimney, positive pressure venting should be extended to the building exterior. Local codes and manufacturer's specifications should always be consulted to ensure feasibility, legality, and safety.
Recommendation	This "green alternative" is recommended for its energy savings. Electric furnaces were considered as another option however this measure has a better cost savings.

HVAC OPTION #2: ECM: INSTALL HIGH EFFICIENCY ELECTRIC GARAGE BAY FURNACES

Green Alternative	Install high efficiency, ENERGY STAR® rated electric garage bay furnaces rated at 95% AFUE or higher.
Benefits Attained	While replacing the furnace is an expensive measure, this system has reached the end of its useful life. Replacing now with high-efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate heating savings we assumed an improvement in efficiency from 81% to 95% AFUE for affected units. In determining feasible exterior wall vent locations, proximity to windows, doors and walkways should be considered. Venting for this type of system is pressurized and cannot be vented into a chimney which is utilized by atmospherically vented appliances. If vented into an existing chimney, positive pressure venting should be extended to the building exterior. Local codes and manufacturer's specifications should always be consulted to ensure feasibility, legality, and safety.
Recommendation	This "green alternative" is recommended for its energy savings. Condensing furnaces were considered as the HVAC option #1.

6.3 Domestic Water Systems

ECM: INSULATE DOMESTIC HOT WATER PIPING

Green Alternative	Nova recommends insulating all exposed hot water piping and the first ten (10) feet of exposed cold water piping located in garages to R4. Installer to ensure compliance with all applicable codes.
Benefits Attained	Exposed pipes in unconditioned spaces are a significant cause of heat loss from domestic hot water systems. Moreover, when their surface temperature exceeds 100 degrees F, they present a health and safety liability. Insulating these pipes will reduce energy consumption by reducing the heat loss through uninsulated piping.
Assumptions	We modeled the savings using spread-sheet based calculations.
Recommendation	This “green alternative” is considered cost-effective for early replacement and is recommended.

ECM: INSULATE DOMESTIC HOT WATER TANKS

Green Alternative	Nova recommends insulating all hot water tanks with R8 tank wrap insulation. Installer to ensure compliance with all applicable codes. The sides and top of each tank should be insulated but electrical components should not be covered.
Benefits Attained	While hot water tanks are manufactured to have some insulating value, there is still standby heat loss. This results in the use of more energy to keep the water hot. Savings are greater for older tanks, or tanks located in unconditioned spaces.
Assumptions	We modeled the savings using spread-sheet based calculations. Existing tanks were assumed to have an R-value of 4.
Recommendation	This “green alternative” is considered cost-effective for early replacement and is recommended.

ECM: INSTALL HIGHER EFFICIENCY ELECTRIC WATER HEATERS

Green Alternative	Replace existing electric water heater with higher efficiency point of use water heater rated at 0.98 EF or higher.
Benefits Attained	While replacing domestic hot water units is an expensive measure, many of the units will need replacement in the coming years as they are reaching the end of their useful life. Replacing now with high efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate domestic hot water savings we assumed an improvement in efficiency from 0.87 EF to 0.98 EF.
Recommendation	This “green alternative” is considered for its energy savings.

6.4 Lighting Systems

ECM: UPGRADE EXTERIOR LIGHTING

Green Alternative	Nova recommends the following: › Retrofit existing incandescent, compact and linear-fluorescent technology fixtures with LED technology lamps. › Existing LEDs lamps and fixtures to remain in place. › Property staff shall be trained on the operation and maintenance of the new high-efficiency lighting system.
Benefits Attained	Installing high-efficiency lighting will significantly reduce the property's electrical consumption while maintaining equivalent or better light levels. Also, many of the recommended bulbs and fixtures have longer lifespans. This measure will reduce the number of bulbs replaced at the property as well as maintenance costs.
Assumptions	We modeled the savings using spreadsheet-based calculations. We based light runtime hours on observations from our site visit and on discussions with property staff and residents.
Recommendation	This "green alternative" is considered for its energy savings.

ECM: UPGRADE INTERIOR LIGHTING

Green Alternative	Nova recommends the following: › Retrofit existing incandescent, compact and linear-fluorescent technology fixtures with LED technology lamps. › Existing LEDs lamps and fixtures to remain in place. › Property staff shall be trained on the operation and maintenance of the new high-efficiency lighting system.
Benefits Attained	Installing high-efficiency lighting will significantly reduce the property's electrical consumption while maintaining equivalent or better light levels. Also, many of the recommended bulbs and fixtures have longer lifespans. This measure will reduce the number of bulbs replaced at the property as well as maintenance costs.
Assumptions	We modeled the savings using spreadsheet-based calculations. We based light runtime hours on observations from our site visit and on discussions with property staff and residents.
Recommendation	This "green alternative" is considered for its energy savings.

6.5 Appliances

ECM: REPLACE REFRIGERATORS

Green Alternative	Nova recommends installing approximately one (1) new ENERGY STAR®-qualified refrigerators (designed to consume 10% less than minimum federal efficiency standards) in place of the existing inefficient refrigerators. Refrigerators shall possess top-mounted freezers and be appropriately sized. Ice-maker and dispenser models are not recommended because they use 15% more energy than standard ENERGY STAR-qualified models and will increase the purchase price.
Benefits Attained	ENERGY STAR qualified refrigerators are equipped with high-efficiency compressors that have improved insulation; they also consume approximately 25% less energy than similar non-ENERGY STAR models. Models with top-mounted freezers use 10-25% less energy than bottom or side-by-side models.
Assumptions	We based the costs for this measure on common costs of equivalent sized ENERGY STAR-qualified refrigerators. The savings calculations assume existing refrigerator consumption at 350 kWh and proposed consumption at 208 kWh annually.
Recommendation	This “green alternative” is considered cost-effective for early replacement and is recommended.

6.6 Resilience Options

ECM: INSTALL SOLAR PHOTOVOLTAIC SYSTEM

Green Alternative	We analyzed the property for a potential solar PV system based on available roof space, and found the property may be a good candidate for up to 74.37 kW of installed solar capacity. A complete solar evaluation and design by a qualified contractor should be completed as part of this work scope. Because the roofing material is greater than 15 years old on average and in bad condition, the roof should be replaced prior to a solar PV system is installed.
Benefits Attained	By cleanly generating electricity onsite, a solar electric system would significantly reduce the property's utility electric purchase, eliminating associated carbon emissions, and reduce the property's exposure to future electric price swings. A PV system could also be paired with onsite battery storage to provide additional resilience in the case of an extended blackout (for additional cost and design considerations).
Assumptions	The solar PV system feasibility and size was assessed given available roof space, pitch and orientation and typical electricity production We modeled this EWEM using OpenSolar.
Recommendation	This "green alternative" is recommended for decarbonization and resiliency reasons.

ECM: REPLACE SECTION OF ROOF FOR PHOTOVOLTAIC INSTALLATION

Green Alternative	Based on the type of the current roofing systems, if a photovoltaic system is installed, it is required that prior to work starting the affected roof section be re-roofed.
Benefits Attained	Since roofing will likely need to be replaced within the next 25 years (the expected useful life of a photovoltaic system), re-roofing now will save costly removal and re-installation fees and prevent solar credit losses from down-time that the system is not producing during future re-roofing.
Assumptions	Nova estimates that based on the optimal location and size of the photovoltaic system that approximately 4,828 square feet of roof space be replaced with a solar-viable roofing material.
Recommendation	This "green alternative" is recommended for decarbonization and resiliency reasons.

7.0 GLOSSARY OF ABBREVIATIONS

This report may use abbreviations to describe various site or building system components. Not all abbreviations may be applicable to this report. Frequently used abbreviations are listed and defined below.

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
AC	Air Conditioner	HRV	Heat-Recovery Ventilator
ACH	Air Changes per Hour	HSPF	Heating Seasonal Performance Factor
ACH50	Air Changes per Hour at 50 Pascals Building Pressure	HUD	U.S. Department of Housing and Urban Development
ACHN	Natural Air Changes per Hour	HVAC	Heating, Ventilation and Air Conditioning
AEE	Association of Energy Engineers	HWS	Hot Water Supply
AFUE	Annual Fuel Utilization Efficiency	IAQ	Indoor Air Quality
AHU	Air Handling Unit	IBC	International Building Code
ANSI	American National Standards Institute	IECC	International Energy Conservation Code
ASHP	Air Source Heat Pump	IES	Illuminating Engineering Society of North America
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers	IMEF	Integrated Modified Energy Factor
ASTM	American Society for Testing and Materials	IPLV	Integrated Part Load Value
BEAP	Building Energy Assessment Professional (ASHRAE)	ISO	Polyisocyanurate
BESA	Building Energy Simulation Analyst (Association of Energy Engineers)	IWF	Integrated Water Factor
BMS	Building Management System	kBTU	One Thousand British Thermal Units
BPI	Building Performance Institute	kW	Kilowatt
BPI-BA	Building Performance Institute Certified Building Analyst	kWh	Kilowatt-Hour
BPI-MFBA	Building Performance Institute Certified Multifamily Building Analyst	LED	Light Emitting Diode
BTL	Building Tightness Limit	LEED	Leadership in Energy and Environmental Design
BTU	British Thermal Unit	LEED AP(BD&C)	LEED Accredited Professional - Building Design & Construction
BTUH	British Thermal Units per Hour	Low-E	Low Emissivity
CAZ	Combustion Air Zone	LPG/LP Gas	Liquefied Petrolium Gas (ex - Propane)
CDD	Cooling Degree Days	MAU	Makeup Air Unit
CEA	Certified Energy Auditor (Association of Energy Engineers)	MEF	Modified Energy Factor
CEC	California Energy Commission	MEP	Mechanical, Electrical and Plumbing
CEER	Combined Energy Efficiency Ratio	MH	Metal Halide

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
CEF	Combined Energy Factor	MMBTU	One Million British Thermal Units
CEM	Certified Energy Manager (Association of Energy Engineers)	MTCO2e	Metric Tons Carbon Dioxide Equivalent
CF	Cubic Feet	MVG	Minimum Ventilation Guideline
CFL	Compact Fluorescent Lamp	MVL	Minimum Ventilation Level
CFM	Cubic Feet per Minute	NABCEP	North American Board of Certified Energy Practitioners
CFM50	Measured Air Flow through Blower Door at 50 Pascals	NAHB	National Association of Home Builders
CMVP	Certified Measurement & Verification Professional (Association of Energy Engineers)	NFPA	National Fire Protection Association
CO	Carbon Monoxide	NFRC	National Fenestration Rating Council
CO2	Carbon Dioxide	NRA	Net Rentable Area
CO2e	Carbon Dioxide Equivalent	NREL	National Renewable Energy Laboratory
COP	Coefficient of Performance	NRSF	Net Rentable Square Feet
CPVC	Chlorinated Polyvinyl Chloride	ODS	Oxygen Depletion Sensor
CRI	Color-Rendering Index	OSB	Oriented Strand Board
CUFT	Cubic Feet	OSHA	Occupational Safety and Health Administration
DB	Dry-Bulb (Temperature)	PCA	Property Condition Assessment
DHW	Domestic Hot Water	PCR	Property Condition Report
DLC	DesignLights Consortium	PPM	Parts per Million
DWH	Domestic Water Heater	PSC	Permanent Split Capacitor
DX	Direct Expansion	PSI	Pounds per Square Inch
ECM	Electronically Commutated Motor	PTAC	Packaged Terminal Air Conditioner
EER	Energy Efficiency Ratio	PTHP	Packaged Terminal Heat Pump
EF	Energy Factor	PVC	Polyvinyl Chloride
EIFS	Exterior Insulation and Finish System	R-	R-Value
EMF	Electro Magnetic Field	RAC	Room Air Conditioner
EMS	Energy Management System	RESNET	Residential Energy Services Network
EPA	Environmental Protection Agency	RPM	Revolutions per Minute
EPDM	Ethylene Propylene Diene Monomer	RTU	Rooftop Unit
EPS	Expanded Polystyrene	RUL	Remaining Useful Life
ERV	Energy-Recovery Ventilator	R-Value	Thermal Resistance
EUI	Energy Use Intensity	SC	Shading Coefficient
EUL	Expected Useful Life	SEER	Seasonal Energy Efficiency Ratio
EWEM	Energy and Water Efficiency Measure	SF	Square Feet
FCU	Fan Coil Unit	SHGC	Solar Heat-Gain Coefficient
FHA	Forced Hot Air	SIR	Savings to Investment Ratio
FHR	First Hour Rating	SOG	Slab on Grade
FHW	Forced Hot Water	TE	Thermal Efficiency

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
FPM	Feet per Minute	TPO	Thermoplastic Polyolefin
FT	Feet	TRV	Thermostatic Regulator Valve
GA	Gross Area	TTD	Thermostatic Tub Diverter
gal	Gallons	U-	U-Factor (U-Value)
GBA	Gross Building Area	UBC	Uniform Building Code
GFCI	Ground Fault Circuit Interrupter	UL	Underwriters Labaratories
GPC	Gallons per Cycle	USGBC	U.S. Green Buildung Council
GPF	Gallons per Flush	UV	Ultraviolet
GPM	Gallons per Minute	V	Volt
GSHP	Ground Source Heat Pump	VAV	Variable Air Volume
HDD	Heating Degree Days	VFD	Variable Frequency Drive
HERS	Home Energy Rating System	VOC	Volatile Organic Compound
HHW	Heating Hot Water	W	Watt
HID	High-Intensity Discharge (Lighting)	WB	Wet-Bulb (Temperature)
HP	Horsepower	WH	Watt-hour
HPB	High Performance Building	WRT	With Reference to
HPBD	High-Performance Building Design Professional (ASHRAE)	WUI	Water Use Intensity
HPS	High-Pressure Sodium	XPS	Extruded Polystyrene

8.0 RECOMMENDED OPERATIONS AND MAINTENACE PLAN

BEST PRACTICES TO IMPROVE ENERGY PERFORMANCE

LOW-COST O&M CHECKLIST

Use the following checklist of low-cost O&M practice to identify opportunities, assign responsibility and track progress toward goals at your facility.

	Opportunity Exists	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
OPERATIONS & MAINTENANCE						
Ensure all equipment is functioning as designed	Y					
Calibrate thermostats	Y					
Adjust dampers	Y					
Implement janitorial best practices	Y					
Properly maintain existing equipment	Y					
Review ENERGY STAR Registry of Labeled Buildings for ideas	Y					
OCCUPANTS' BEHAVIOR						
Turn off equipment	Y					
Institute an energy awareness program	Y					
Adopt a procurement policy for ENERGY STAR qualified equipment	Y					
Maximize use of daylight	Y					
Install task lighting	Y					
Train staff	Y					
LIGHTING						
Change incandescents to CFLs						
Change T12s to T8 or T5						
Install occupancy sensors in back-of-the house, infrequently used areas						
Install high efficiency LED exit signs						
Periodically clean the bulbs with a dry cloth	Y					
De-lamp where illumination is excessive	Y					
Only use lights that are needed	Y					

www.energystar.gov/benchmark

E-mail: energystarbuildings@epa.gov

	Opportunity Exists?	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
KITCHENS						
Pre-heat ovens no more than 15 minutes prior to use						
Keep refrigerator coils clean and free of obstructions	Y					
Bleach clean with warm water						
Use fan hood only when cooking						
Purchase ENERGY STAR commercial cooking equipment						
COMPUTERS AND OFFICE EQUIPMENT						
Utilize power down feature on computers						
Purchase ENERGY STAR office equipment						
Install energy control devices on vending machines						
HVAC AND PLANT SYSTEMS						
Adjust thermostats for seasonal changes and occupancy	Y					
Balance air and water systems						
Replace boiler burners						
Unblock air flow from unit ventilators						
Clean centrifugal chiller water tubes						
Clean and repair chilled water plants or package units						
Repair leaking steam traps						
Repair pipe and vessel insulation from steam and hot water distribution lines						
Repair malfunctioning dampers on unit ventilators						
Chemically treat feedwater						
Annually test combustion efficiency	Y					
Clean and lubricate moveable surfaces and check actuator movement and set-points in the damper and economizer						
Perform boiler tune-ups						
Clean filters and fans	Y					
Clean air conditional evaporator and condenser coil fins						
Align and adjust belts						

	Opportunity Exists?	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
HVAC AND PLANT SYSTEMS (CONTINUED)						
Check for air leaks in equipment cabinets and ducts						
Ensure proper operation of air damper						
Clean condenser and evaporator coils						
Properly charge refrigerant						
Install VFDs and energy efficient motors						
FANS						
Clean fan blades						
Inspect bearings						
Adjust/change belts						
Check fan current						
BUILDING ENVELOPE						
Regularly inspect doors and windows for air leaks	Y					
Periodically inspect building for water leaks	Y					
Check the caulking and weather stripping for leaks	Y					
WATER HEATING						
Adjust water temperature to lower legal limit	Y					
Periodically check the hot water systems for leaks	Y					
Test the burners of gas or oil fired water heaters annually						
Periodically flush fixtures to prevent bacteria growth	Y					
Annually flush storage-type hot water tanks	Y					
Periodic maintenance on the hot water system	Y					
Install or repair pipe insulation	Y					

EPA
United States
Environmental Protection
Agency

April 2006
XXX-X-XX-XXX

EXHIBIT A: PHOTOGRAPHIC RECORD

Photographs

New - Elevation South and East

New - Elevation East and North

New - Elevations North and West

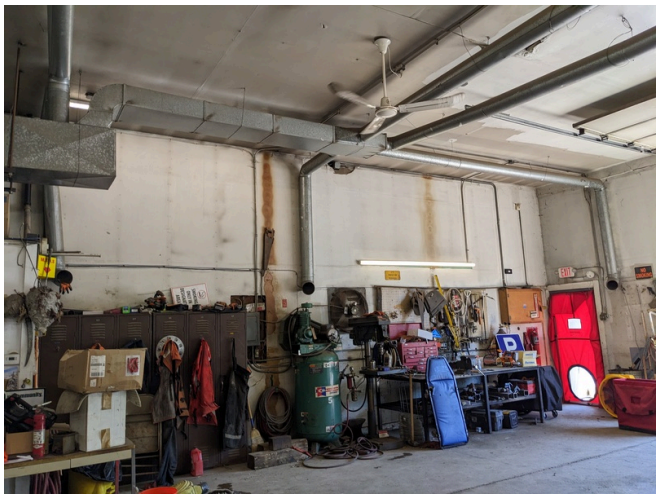
New - Elevation West

New - Elevation South

New -South Wall

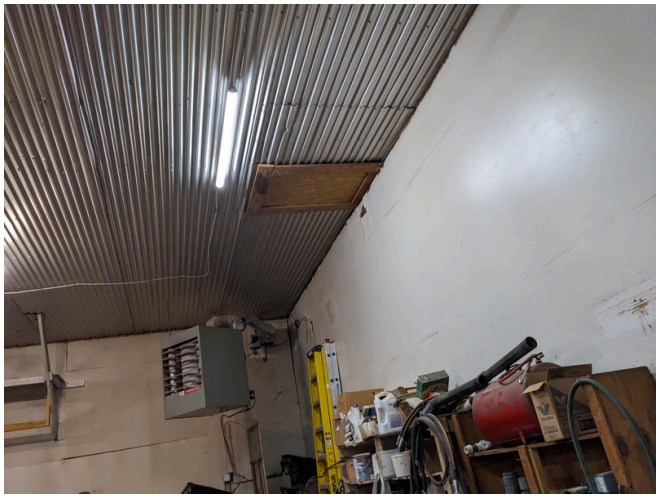
New - Southeast Entry Door

New - South Manual Overhead Door



New - East Wall

New - West Room



New - Ceiling

Old - Elevation North and West

Old Building, Elevation North

Old - Elevation West and South

Old - South Wall

Old - East Wall CMU block

Old - East Wall

Old - Northeast Corner

Old - Northeast Corner

Old - Northeast Corner

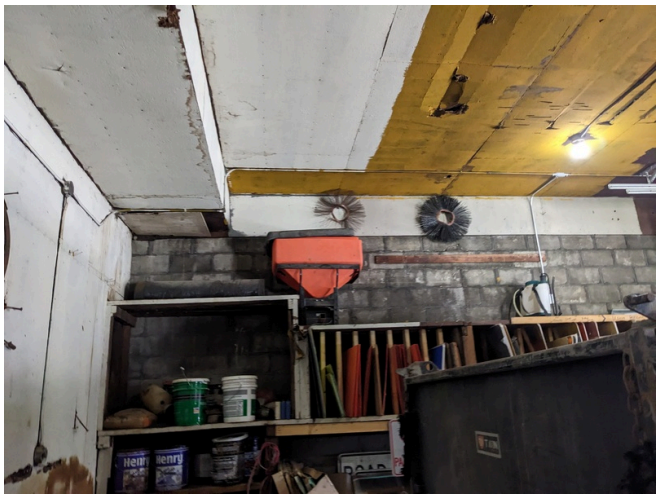
Old - East Wall

Old - Northwest Corner Entry Door

Old - Looking North

Old - East Wall

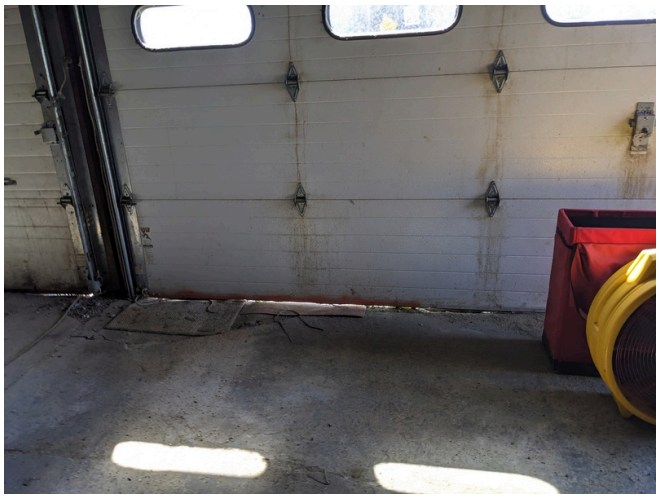
Old - West Wall



Old - South Wall

Old - Entry Door on the North Wall

Old - North Wall Overhead Door



Old - West Wall Overhead Doors

New - Attic

New - Attic Fiberglass Batt Insulation

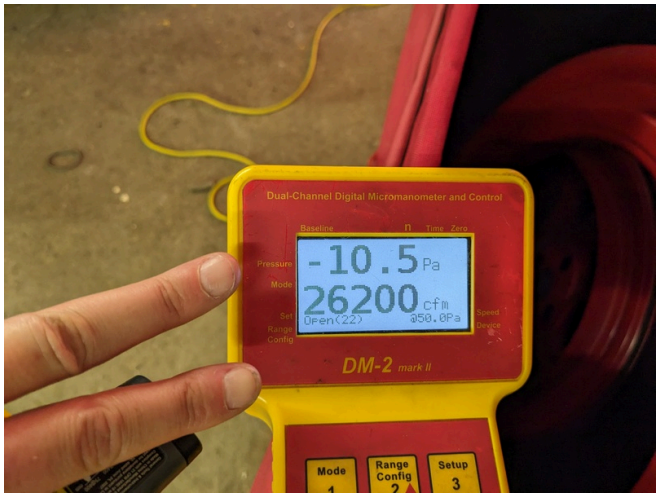
New - Attic

New - Insulation

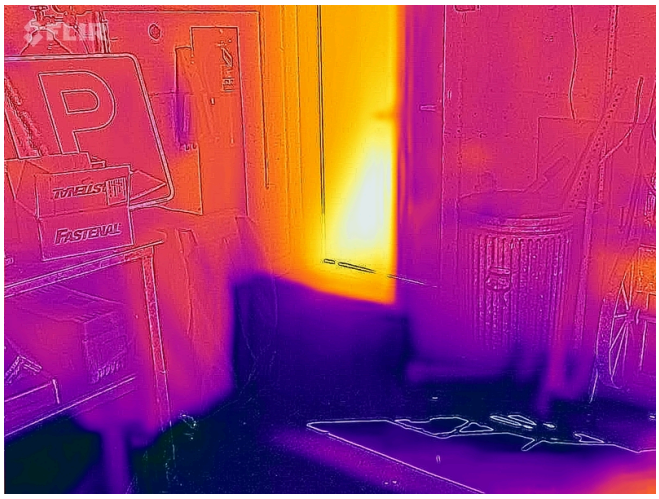
New - Exposed Insulation

New - Wall Insulation

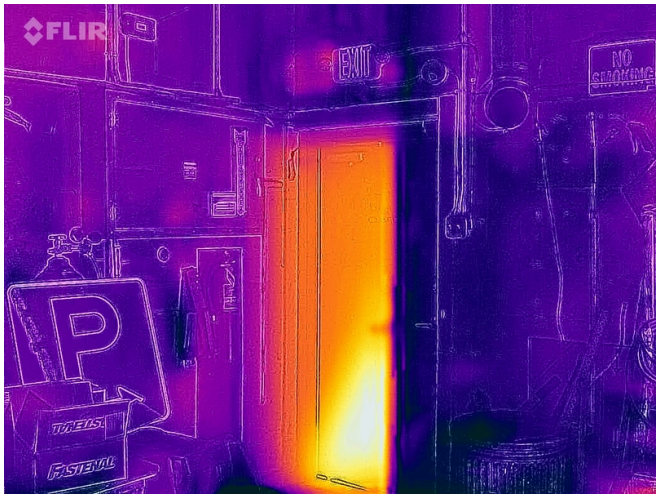
New - Clear Plastic Windows



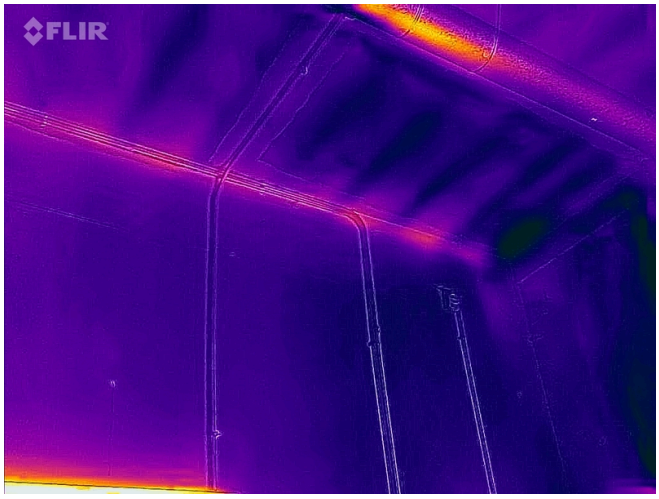
Final New Building Both Room Cannot Depressurize



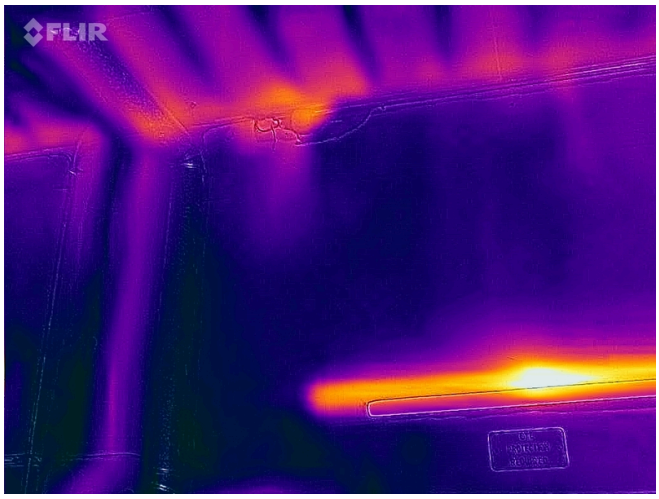
New - IR Southeast Corner Entry Door



New - IR Southeast Entry Door

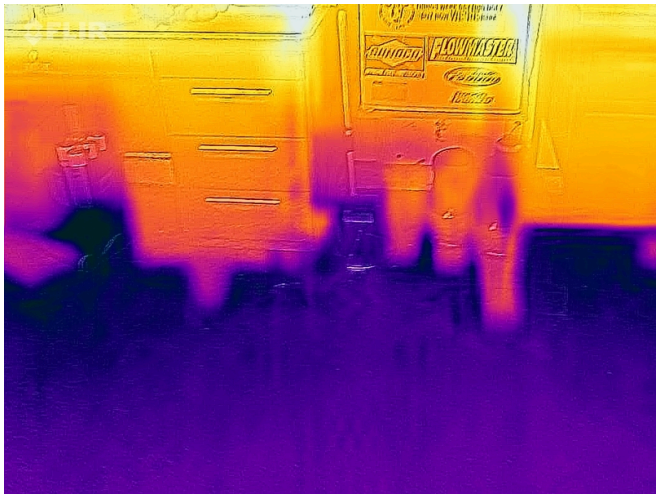


New - IR East Wall and Ceiling

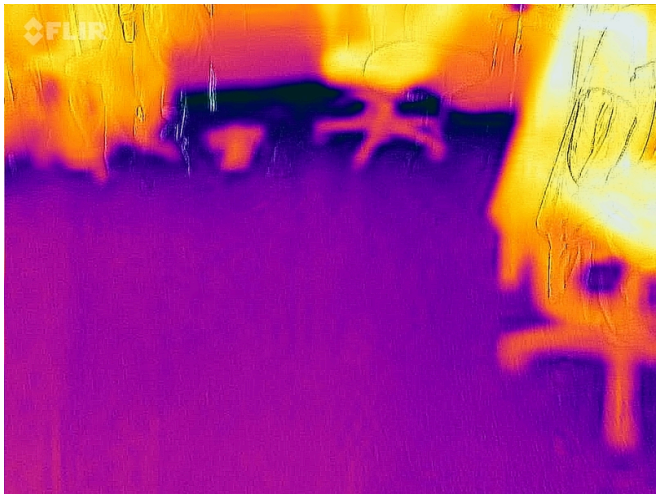


New - IR East Wall Top Plates and Ceiling

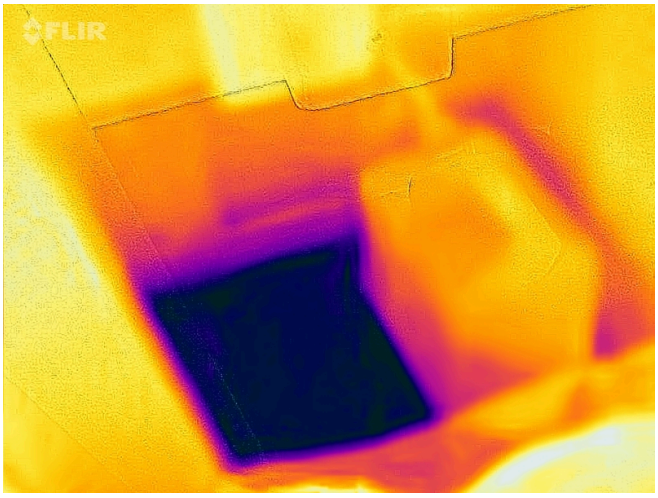
New - IR Northeast Corner and Ceiling



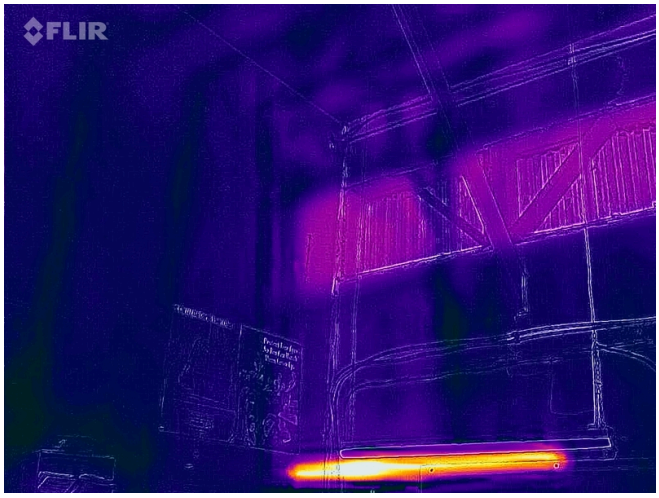
New - IR North Wall and Floor



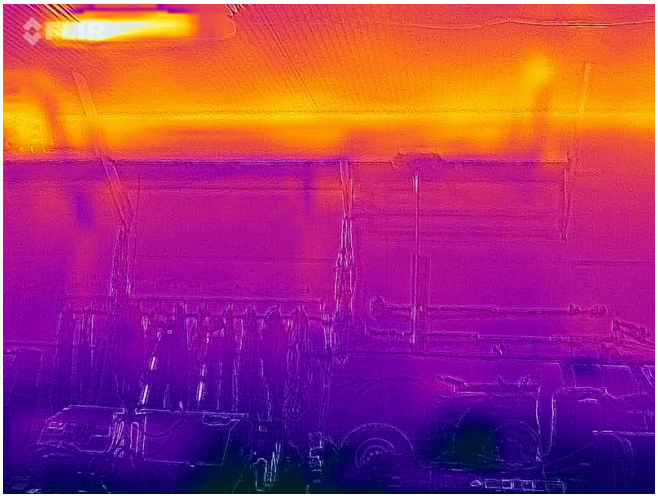
New - IR East Room Concrete Floor



New - IR Floor



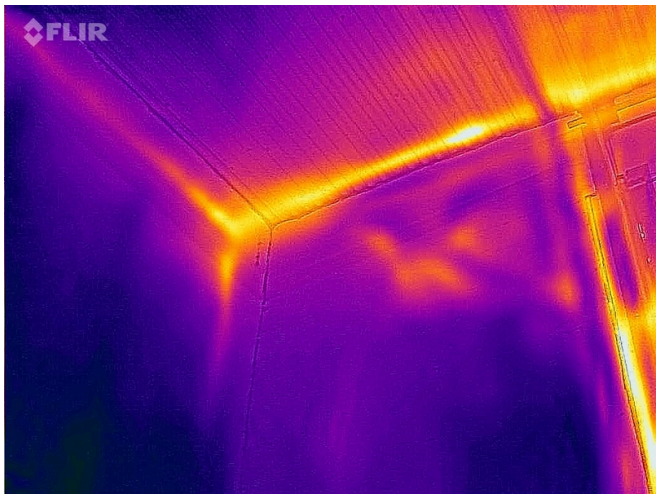
New - IR North Wall in the East Room



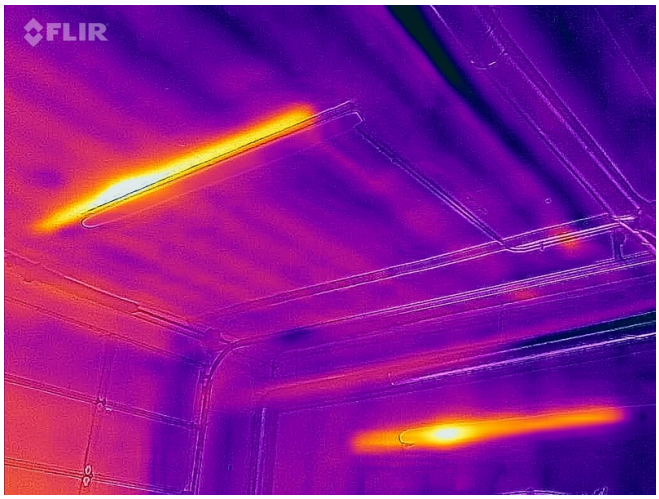
New - IR North Wall in the West Room

New - IR North and West Wall Top Plates and Ceiling in the West Room

New - IR South Wall Overhead Door in the West Room; Southwest Corner Top Plates

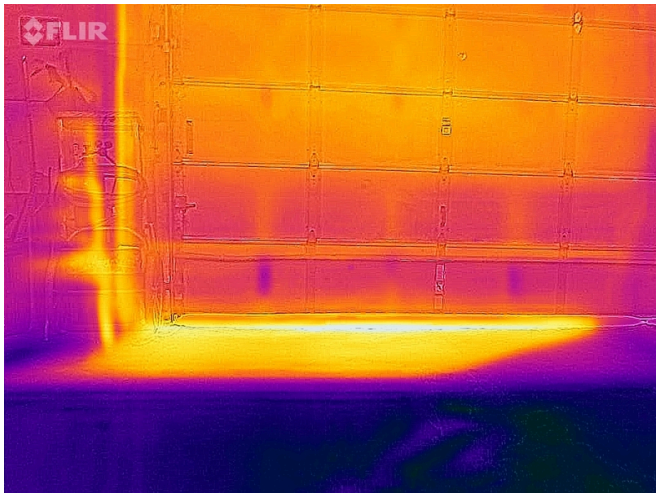


New - IR South Wall Top Plates

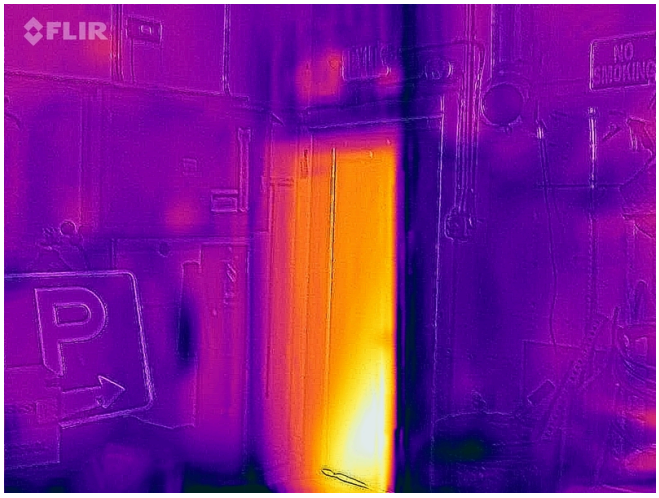


New - IR East Room Ceiling

New - IR East Room Ceiling



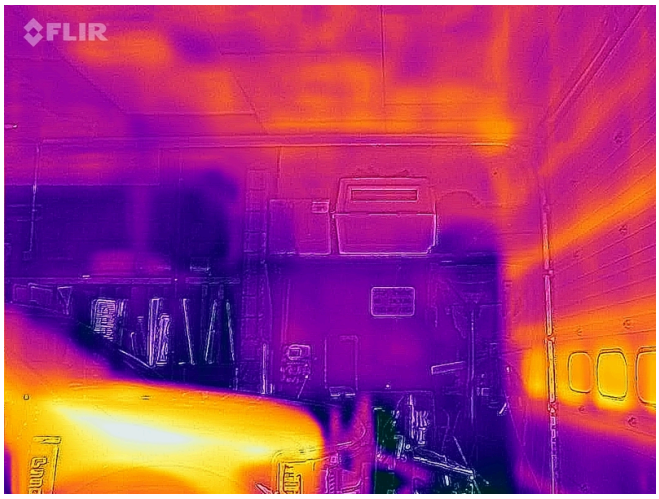
New - IR South Wall Overhead Door and Concrete Floor



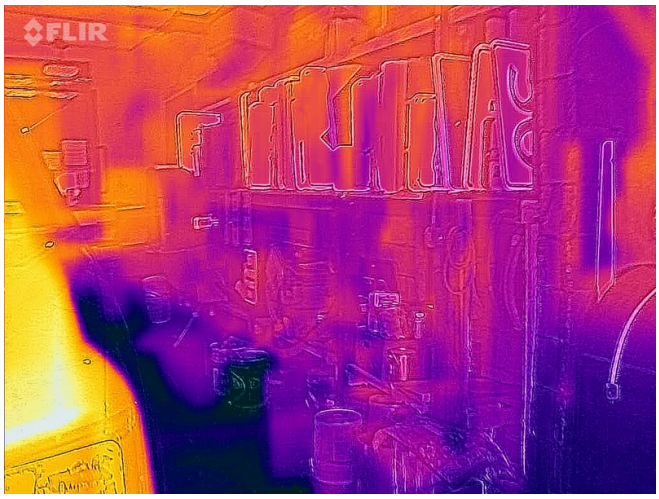
New - IR Southeast Corner Entry Door

Old - Final Result; Old Building 2 Cannot Be Depressurized

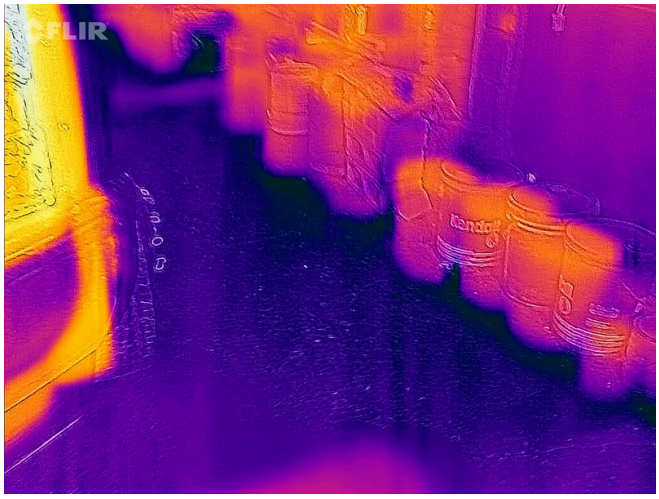
Old - IR West Overhead Doors



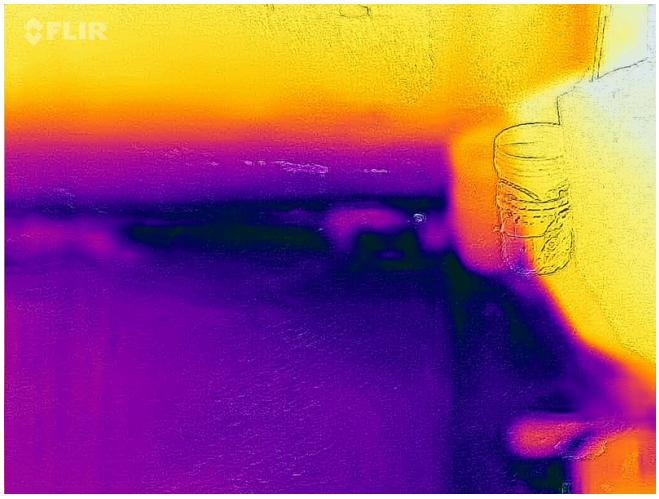
Old - IR Southwest Corner Wall and Ceiling



Old - IR South Wall

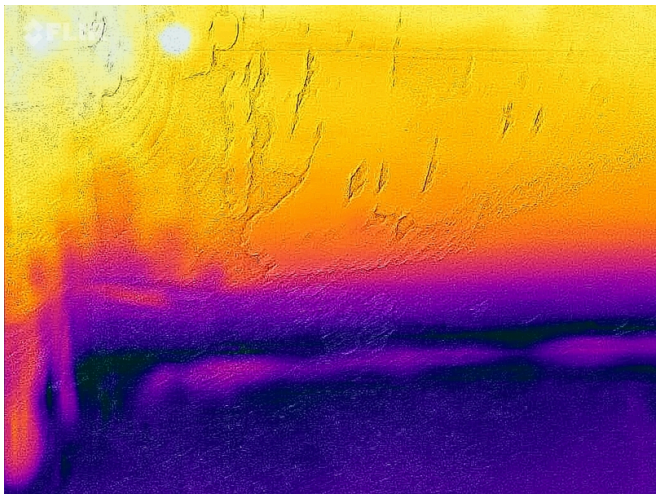


Old - IR Floor

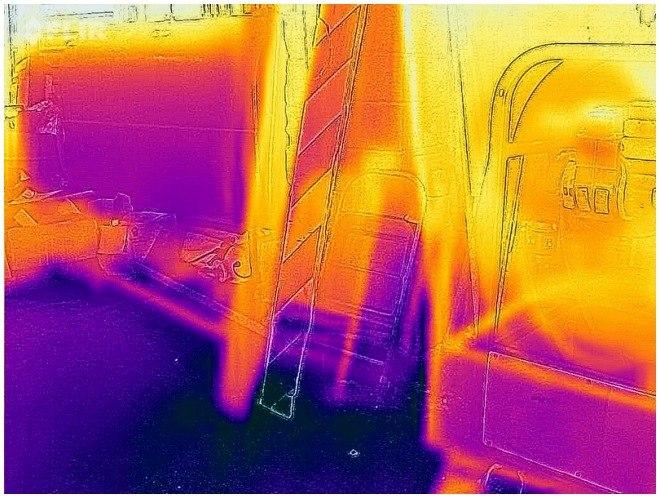


Old - IR Southeast Corner and Floor

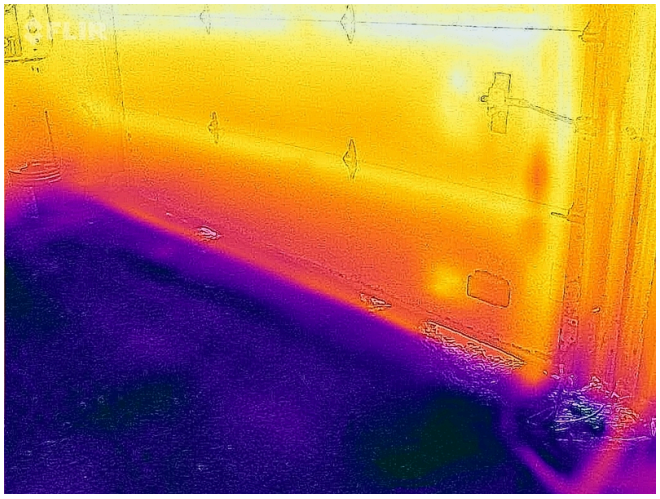
Old - IR Southeast Corner and Ceiling



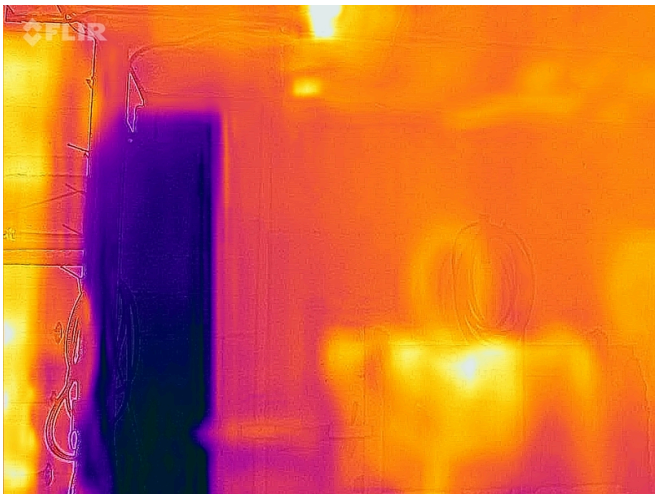
Old - IR East Wall and Foundation



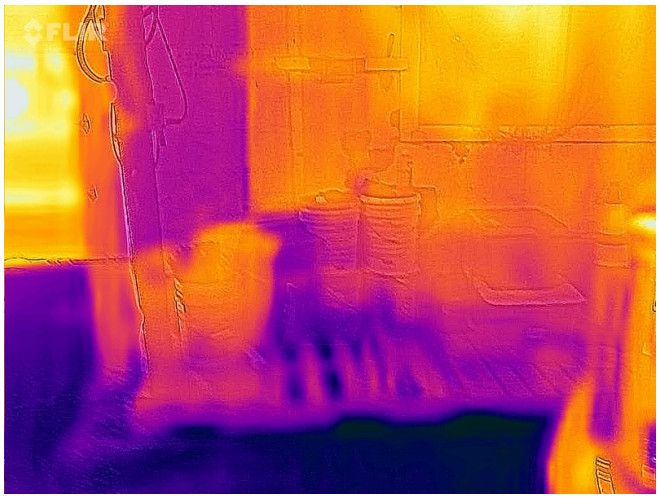
Old - IR East Wall



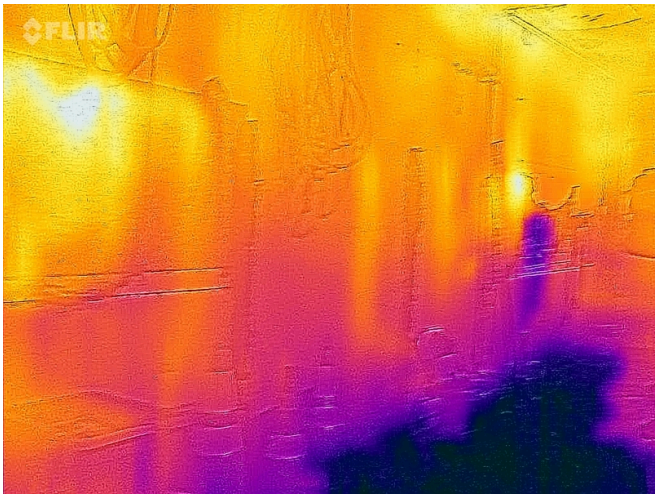
Old - IR North Wall Overhead Door



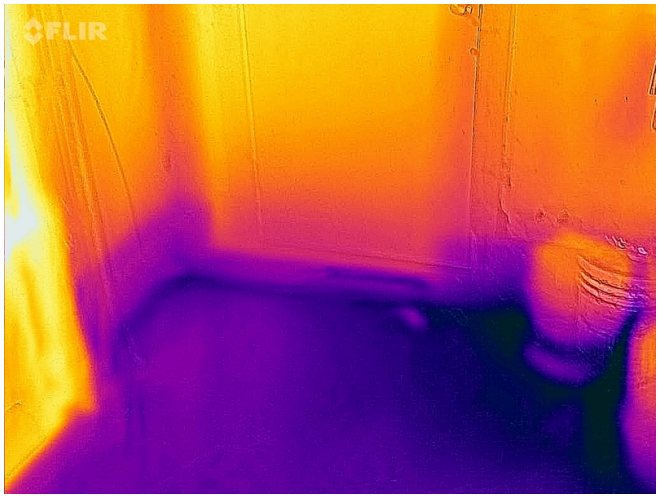
Old - IR West Wall



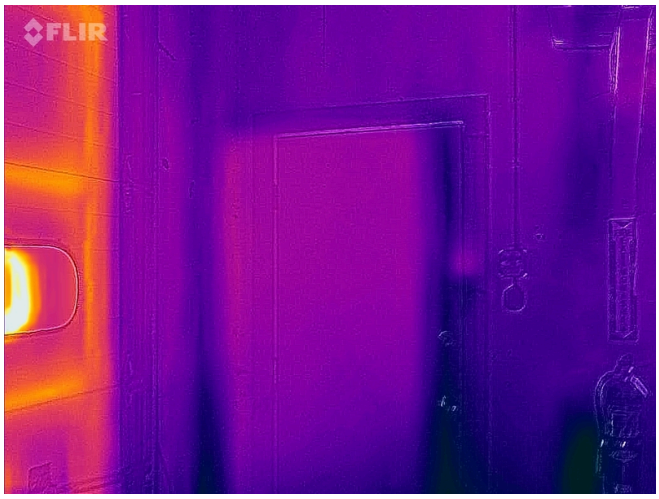
Old - IR West Wall and Floor



Old - IR West Wall and Foundation



Old - IR North Wall Entry Door and Floor



Old - IR North Wall Entry Door

New - Draft Around Overhead Door

New - Draft Around Overhead Door

New - Draft Under the South Overhead Door

Old - East Wall has Holes

New - East Room Lighting

Old - Ceiling is not Sealed

Old - Draft Under the Overhead Doors

New - Furnace by Olsen; Model: MPL-1208

New - Furnace

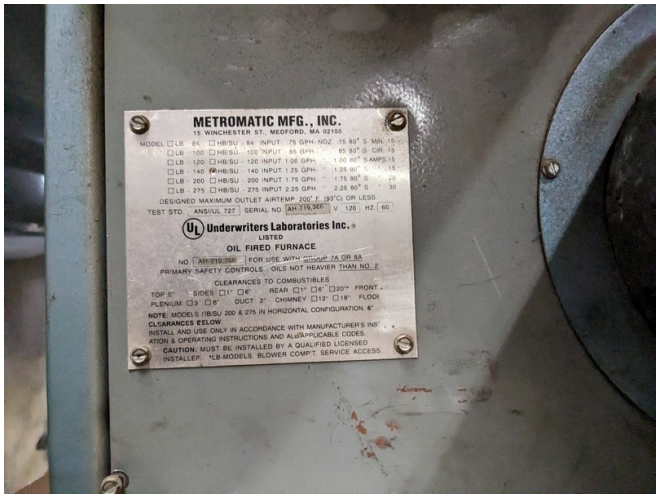
New - Ductless Furnace by Modine in the West Room of the New Building

New - Furnace by Modine; Model: POR185B 0101

New - East Wall; Furnace Above the Restroom

New - Restroom Baseboard Heater

Old - Furnace



Old - Furnace by Metromatic MFG; Model HB/SU-140; 1.25 GPH

New - DHW in the Restroom

New - DHW by Vaughn Corp; Model C-30; 30 gallon

New - Restroom

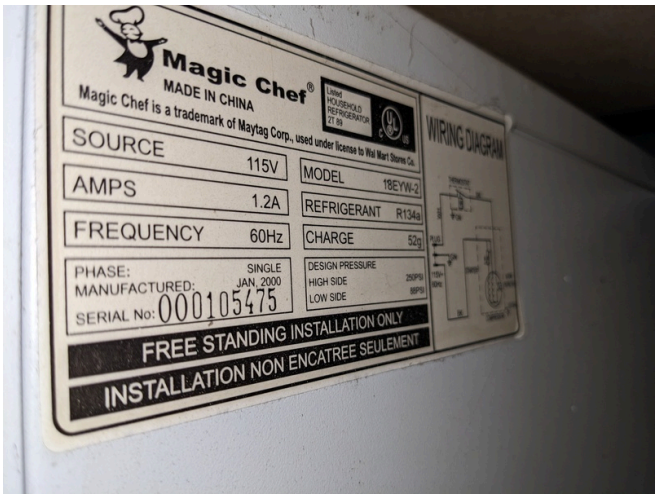
New - 2.2 GPM Rated Flow at the One Faucet

New - Thermostat

Old - Thermostat

New - Garage Exhaust Fan

New - Refrigerator



New - Refrigerator by Magic Chef: Model: 18EYW-2; Dated 2000

New - Lighting in the in the West Garage

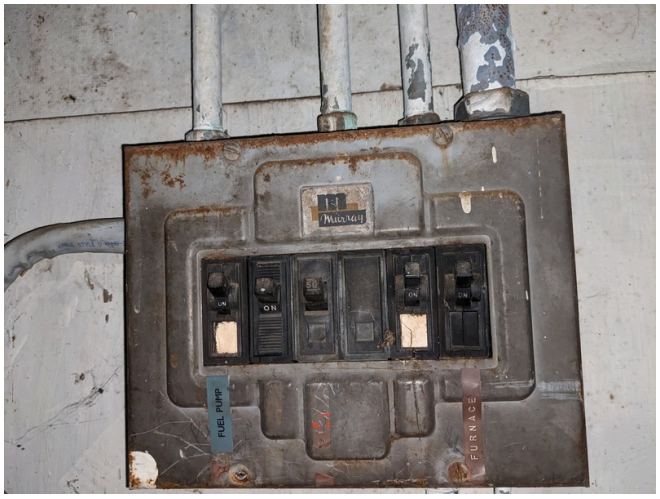
New - West Room Lighting

New - Restroom Lighting in the Ceiling Mounted Exhaust Fan

Old - Lighting

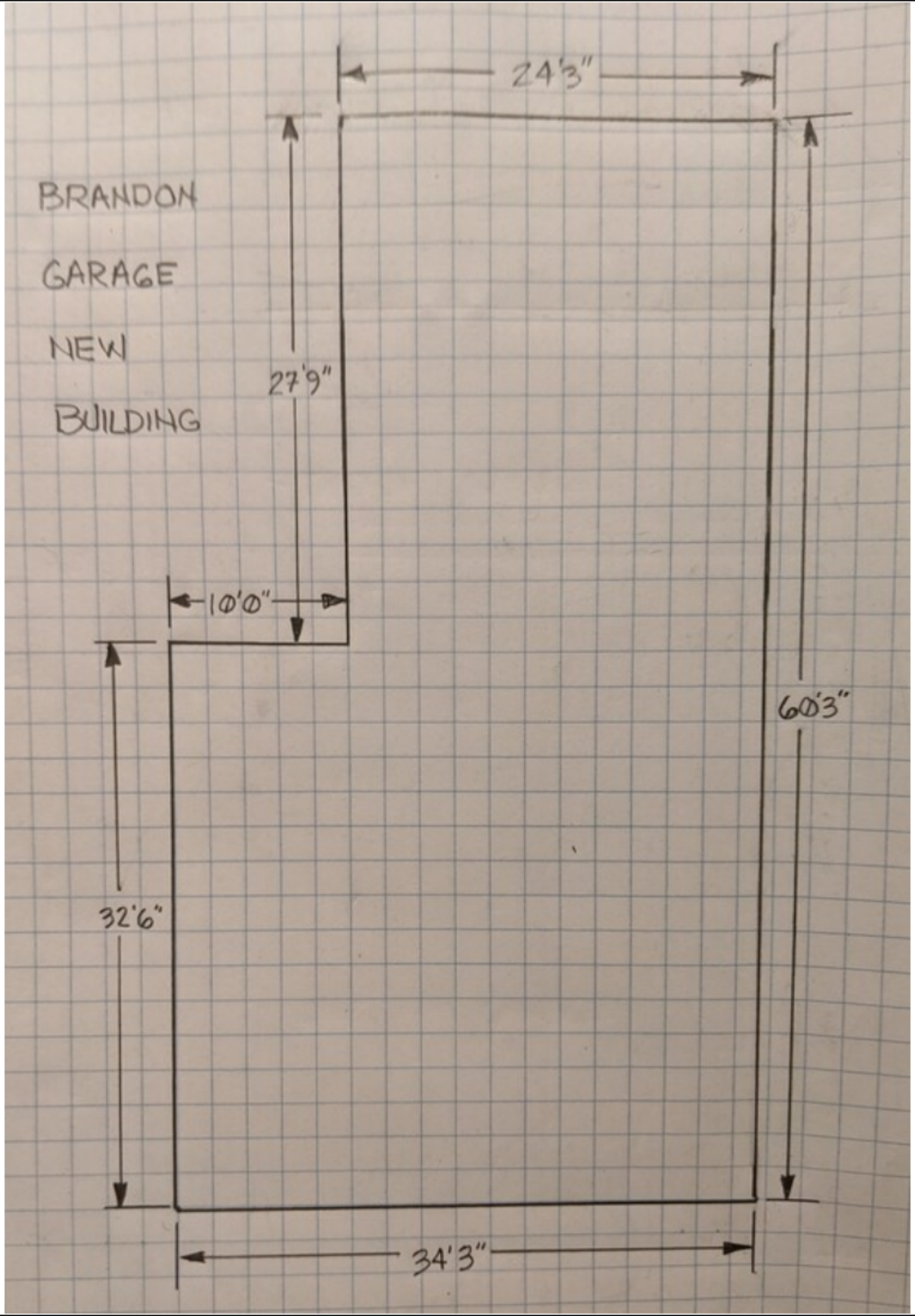
Old - Outside Lighting

New - Electrical Service Panel



Old - Electrical Panel

EXHIBIT B: SITE AND FLOOR PLANS


BRANDON
GARAGE
NEW
BUILDING
24'3"
27'9"
10'0"
60'3"
32'6"
34'3"

BRANDON GARAGE NEW BUILDINGS

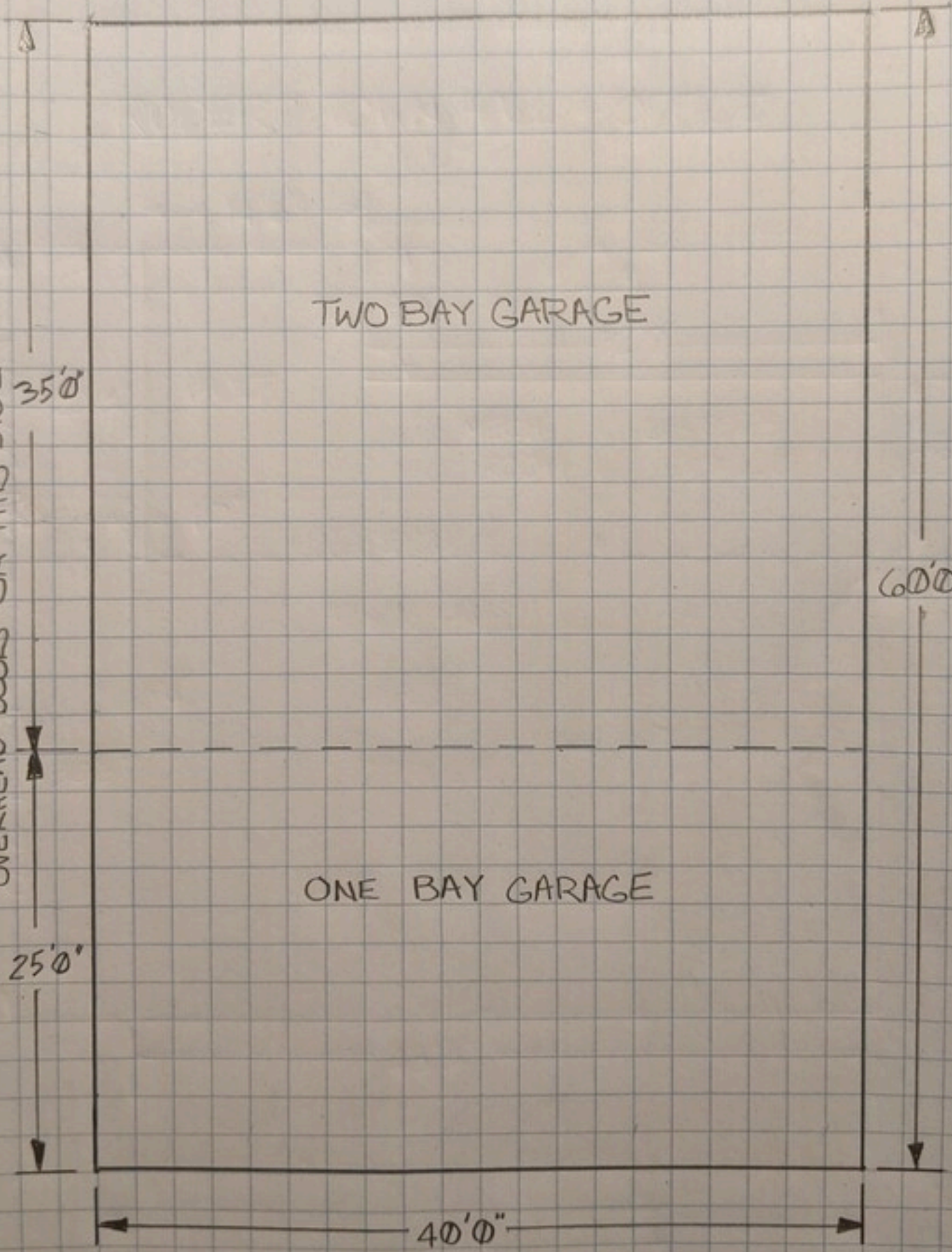


EXHIBIT C: MECHANICAL EQUIPMENT INVENTORY

HEATING EQUIPMENT													
Equip. Location	**Area Served**	**System Type**	**Make**	**Model #**	**Capacity**	**Cap. Units**	**Efficiency**	**Eff. Units**	**Year**	**Qty**	**Fuel**	**Dist.**	**RUL**
RECOMMENDED FOR REPLACEMENT													
New Bldg West Room	West Room	Point Source Furnace	Modine	POR185B	228,525	BTUh	81%	AFUE	2001	One (1)	Heating Oil	Point Source	Seven (7) years
New Bldg East Room	East Room	Furnace	Olsen	MPL-120B	138,500	BTUh	88.8%	AFUE	2011	One (1)	Heating Oil	Ducted	Seventeen (17) years
Old Bldg	Old Bldg	Furnace	Metromatic	HB/SU - 140	173,125	BTUh	81%	AFUE	1971	One (1)	Heating Oil	Ducted	0 years
NOT RECOMMENDED FOR REPLACEMENT													
None													

DHW EQUIPMENT												
Equip. Location	**Area Served**	**Make**	**Model #**	**Capacity (BTU or kWh)**	**Efficiency**	**Direct or Indirect**	**Tank Size**	**Recirc. Pump HP**	**Year**	**Qty**	**Fuel**	**RUL**
RECOMMENDED FOR REPLACEMENT												
New Garage	Restroom	Sepco Stoneste el	C-30	6,000W	0.87 EF	Direct	30 gallon	None	1974	One (1)	Electric	0 Years
NOT RECOMMENDED FOR REPLACEMENT												
None												

INTERIOR SITE LIGHTING									
Fixture Location	**Fixture Type**	**Lamp Type**	**Fixture Count**	**Lamp Count Per Fixture**	**Existing Lamp Wattage**	**Proposed Lamp Wattage**	**Control Type**	**Daily Run Hours**	**Type of Upgrade**
RECOMMENDED FOR REPLACEMENT									
Restroom	Edison Socket	Incan	One (1)	One (1)	60	Nine (9)	On/Off	Eight (8)	Lamp
NOT RECOMMENDED FOR REPLACEMENT									
Old Building	Edison Socket	LED	Six (6)	One (1)	Nine (9)	None	On/Off	Eight (8)	None
New Bldg 2 Bay Garage	Edison Socket	LED	Three (3)	Two (2)	Nine (9)	None	On/Off	Eight (8)	None
New Bldg 2 Bay Garage	LED	LED	Six (6)	One (1)	40	None	On/Off	Eight (8)	None
New Bldg 1 Bay Garage	LED	LED	Five (5)	Five (5)	80	None	On/Off	Eight (8)	None
New Bldg 1 Bay Garage	LED	LED	Two (2)	Two (2)	40	None	On/Off	Eight (8)	None

EXTERIOR SITE LIGHTING									
Fixture Location	**Fixture Type**	**Lamp Type**	**Fixture Count**	**Lamp Count Per Fixture**	**Existing Lamp Wattage**	**Proposed Lamp Wattage**	**Control Type**	**Daily Run Hours**	**Type of Upgrade**
RECOMMENDED FOR REPLACEMENT									
Back Side of Old Bldg	Edison Socket	Incan	One (1)	Two (2)	65	Nine (9)	On/Off	Two (2)	Lamp
NOT RECOMMENDED FOR REPLACEMENT									
Pole Mount	LED	LED	Two (2)	One (1)	75	None	PC	Two (2)	None
Salt Shed	LED	LED	One (1)	Two (2)	Twenty (20)	None	On/Off	Two (2)	None
Front Door New Bldg	LED	LED	One (1)	One (1)	Twenty (20)	None	PC	Two (2)	None

REFRIGERATORS							
Location	**Make**	**Model #**	**Year**	**kWh/Year**	**Size (ft3)**	**Qty**	**RUL**
RECOMMENDED FOR REPLACEMENT							
Garage	Magic Chef	18EYW-2	2020	200	1.8	One (1)	0 years
NOT RECOMMENDED FOR REPLACEMENT							
None							

FLOW RATE SUMMARY - SAMPLE			
Location	**Fixture Type**	**Qty**	**Flow (GPM or GPF)**
RECOMMENDED FOR REPLACEMENT			
Restroom	Faucet	One (1)	2.2 GPM
Restroom	Toilet	One (1)	3.5 GPF
NOT RECOMENDED FOR REPLACEMENT			
None			

EXHIBIT D: SOLAR PROPOSAL

Nova Group, GBC

Proposal for Customer

Prepared by:
morgan.carson@novagroupgbc.com
4047904052
morgan.carson@novagroupgbc.com

For:
356 Champlain St, Brandon

Quote #: 4649427
Valid until: Jul 10 2024

Solar Energy System Proposal

Dear ,

Thank you for the opportunity to present your Solar Energy System Proposal.

Best Regards,
morgan.carson@novagroupgbc.com
Nova Group, GBC

This proposal is no longer valid, please contact morgan.carson@novagroupgbc.com (morgan.carson@novagroupgbc.com) to get an updated proposal.

Recommended System Option

101 %	$28,144	$42,777	$14,633
Consumption Offset	Lifetime Electricity Bill Savings	Net Cost of this solar system	Clean Energy Premium over system lifetime

Your Solution

Solaria PowerXT-370R-PD Series

21 Solaria PowerXT-370R-PD
370 Watt panels
with 25 Year Performance Warranty
Up to **20.5%** Module efficiency
9,778 kWh per year

SOLARIA

Battery

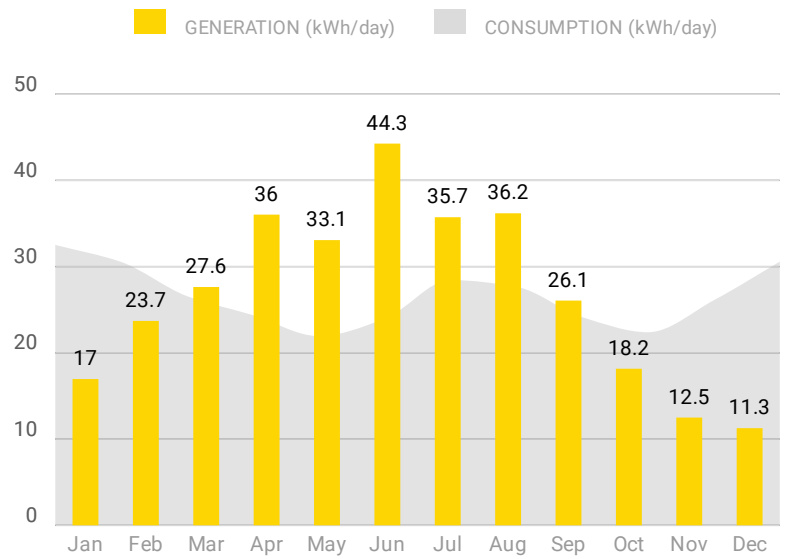
TBB Power
54.0 kWh Total Battery Storage
1 x EnergyCube LH75-54.0

Warranties: 25 Year Panel Product Warranty, 25 Year Panel Performance Warranty

System Performance

101%

Energy From Solar



System Performance Assumptions: System Total losses: 15.4%, Inverter losses: 2.5%, Optimizer losses: 0%, Shading losses: 0%, Performance Adjustment: 0%, Output Calculator: System Advisor Model 2020.02.29.r2. Panel Orientations: 21 panels with Azimuth 188 and Slope 20.

The solar system(s) quoted in this proposal are not intended to be portable.

Environmental Benefits

Solar has no emissions. It just silently generates pure, clean energy.

Each Year

101%
Of CO_2, SO_x & NO_x

268 kg
Avoided CO_2 per year

Over System Lifetime

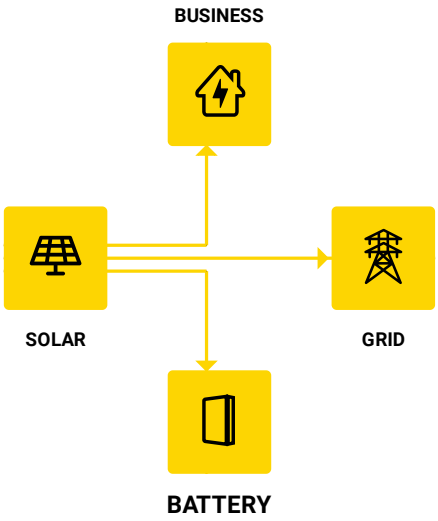
4,915
Car miles avoided

51
Trees planted

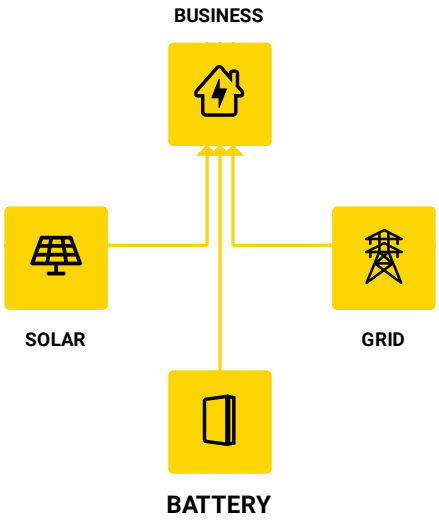
6
Long haul flights avoided

How your system works

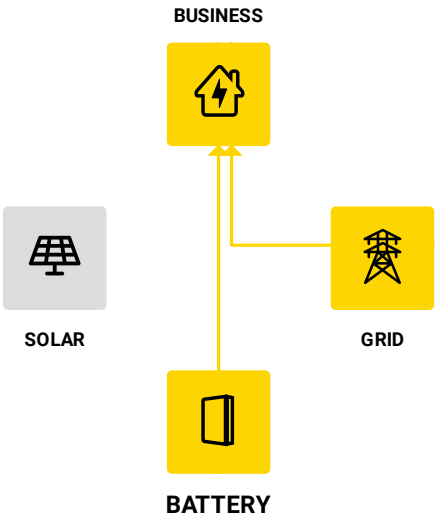
Generating Excess Solar



Partially Offset Usage

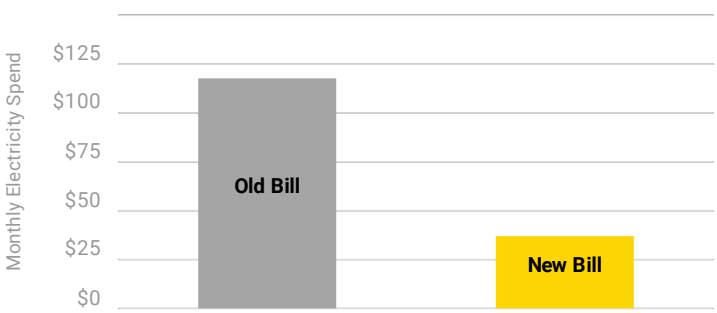


Night

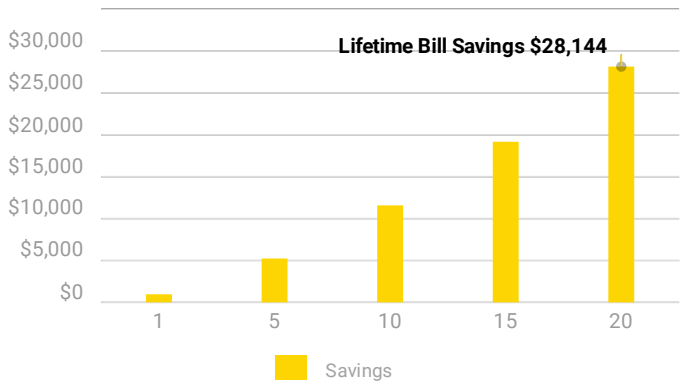


Electricity Bill Savings

First Year Monthly Bill Savings



Cumulative Bill Savings



Month	Solar Generation (kWh)	Electricity Consumption before solar (kWh)	Electricity Consumption after solar (kWh)	Utility Bill before solar ($)	Utility Bill after solar ($)	Cumulative Energy Credit ($)	Estimated Savings ($)
Jan	526	1,008	508	139	85	0	54
Feb	664	855	237	123	56	0	67
Mar	857	824	26	119	33	0	87
Apr	1,081	731	(292)	109	30	32	79
May	1,025	680	(291)	104	30	63	74
Jun	1,328	718	(571)	108	30	125	78
Jul	1,107	882	(178)	126	30	144	96
Aug	1,122	857	(227)	123	30	169	93
Sep	782	724	(37)	109	30	173	79
Oct	563	694	185	105	30	153	75
Nov	375	783	403	115	30	109	85
Dec	349	948	613	133	30	0	103

Rate not specified specified, using Single Phase Service based on location.

Your projected energy cost is calculated by considering a 4.0% increase in energy cost each year, due to trends in the raising cost of energy. This estimate is based on your selected preferences, current energy costs and the position and orientation of your roof to calculate the efficiency of the system. Projections are based on estimated usage of 9705 kWh per year, assuming Single Phase Service Electricity Tariff.

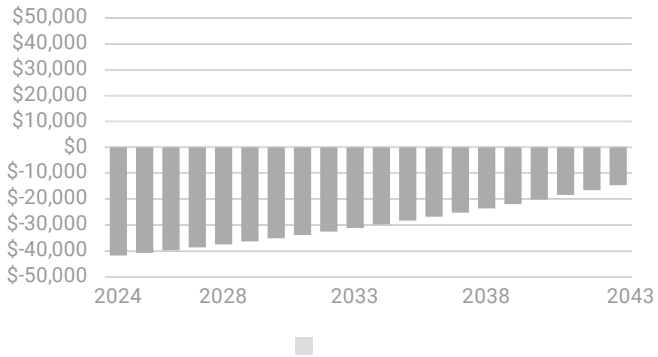
Your electricity tariff rates may change as a result of installing the system. You should contact your electricity retailer for further information.

Proposed Tariff Details - High Plains Power Inc Single Phase Service	
Energy Charges	
Usage Charge *All Day*	$0.11 / kWh
Fixed Charges	
Fixed Charge	$30.00 / month

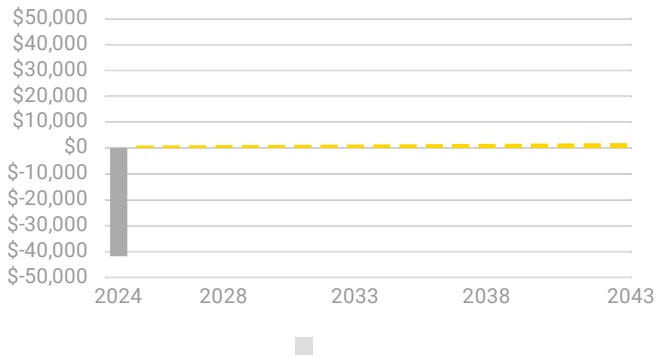
Net Financial Impact Cash

$28,144	-	$42,777	=	$14,633
Utility Bill Savings		Net System Cost		Clean Energy Premium

Cumulative Savings From Going Solar



Annual Savings From Going Solar



Estimates do not include replacement costs of equipment not covered by a warranty. Components may need replacement after their warranty period. Financial discount rate assumed: 6.75%

Quotation

Payment Option: Cash

21 x Solaria Corporation 370 Watt Panels (Solaria PowerXT-370R-PD) 1 x EnergyCube LH75-54.0 (TBB Power)	
Total System Price	$61,110.00
Purchase Price	**$61,110.00**

Additional Incentives

Federal Investment Tax Credit (ITC) The Federal Solar Tax Credit or The Federal Investment Tax Credit (ITC) for constructions starting in 2023.	$18,333.00
Net System Cost	**$42,777.00**

Price excludes Retailer Smart Meter should you want us to install your Smart Meter it will be an additional cost.
This proposal is valid until Jul 10 2024.

SOLARIA®

Solaria PowerXT® | DC Panel

Solaria PowerXT®-370R-PD

Achieving 20.5% efficiency, Solaria PowerXT solar panels are one of the highest power panels in the residential and commercial solar market. Compared to conventional panels, Solaria PowerXT panels have fewer gaps between the solar cells; this leads to higher power and superior aesthetics. Solaria PowerXT Pure Black™ panels are manufactured with black backsheet and frames, enhancing a home or building's architectural beauty.

Developed in California, Solaria's patented cell cutting and panel assembly takes processed solar wafers and turns them into PowerXT solar panels. The process starts by creating a highly reliable PowerXT cell where busbars and ribbon interconnections are eliminated. Solaria then packages the cells into the PowerXT solar panel, reducing inactive space between the cells. This process leads to an exceptionally cost effective and efficient solar panel.

Higher Efficiency, Higher Power

Solaria PowerXT panels achieve up to 20.5% efficiency; conventional panels achieve 15% – 17% efficiency. Solaria PowerXT panels are one of the highest power panels available.

Lower System Costs

Solaria PowerXT panels produce more power per square meter area. This reduces installation costs due to fewer balance of system components.

Improved Shading Tolerance

Sub-strings are interconnected in parallel, within each of the four panel quadrants, which dramatically lowers the shading losses and boosts energy yield.

Improved Aesthetics

Compared to conventional panels, Solaria PowerXT panels have a more uniform appearance and superior aesthetics.

Durability and Reliability

Solder-less cell interconnections are highly reliable and designed to far exceed the industry leading 25 year warranty.

About Solaria

Established in 2000, The Solaria Corporation has created one of the industry's most respected IP portfolios, with over 350 issued and pending patents in PV solar cell and module technology. Headquartered in Oakland, California, Solaria has developed a technology platform that unlocks the potential of solar energy.

TOP PERFORMER 2018 DNV·GL PV MODULE RELIABILITY SCORECARD

TÜVRheinland® Precisely Right.

The Solaria Corporation 1700 Broadway, Oakland, CA 94612 P: (510) 270-2500 www.solaria.com

Rev 3D 12-2019

SOLARIA®

Solaria PowerXT®-370R-PD

Performance at STC (1000W/m², 25° C, AM 1.5)

Solaria PowerXT-		365R-PD	370R-PD
Max Power (P_{max})	[W]	365	370
Efficiency	[%]	20.2	20.5
Open Circuit Voltage (V_{oc})	[V]	48.0	48.3
Short Circuit Current (I_{sc})	[A]	9.58	9.60
Max Power Voltage (V_{mp})	[V]	39.9	40.2
Max Power Current (I_{mp})	[A]	9.16	9.20
Power Tolerance	[%]	-0/+3	-0/+3

Performance at NOCT (800W/m², 20°C Amb, Wind 1 m/s, AM 1.5)

Max Power (Pmax)	[W]	269	272
Open Circuit Voltage (V_{oc})	[V]	45.1	45.4
Short Circuit Current (I_{sc})	[A]	7.73	7.74
Max Power Voltage (V_{mp})	[V]	36.7	37.0
Max Power Current (I_{mp})	[A]	7.32	7.35

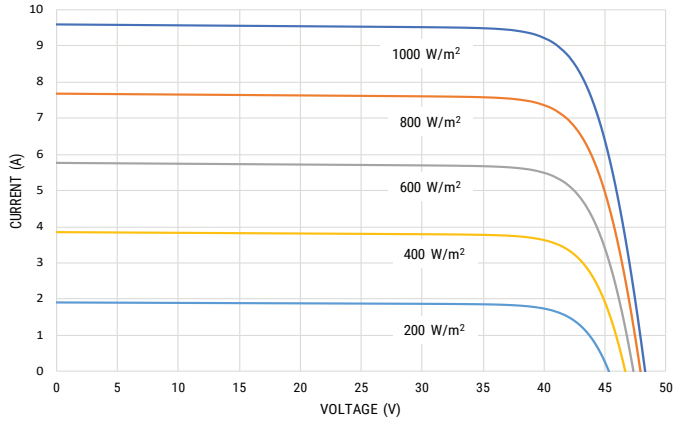
Temperature Characteristics

NOCT	[°C]	45 +/-2
Temp. Coeff. of P_{max}	[% / °C]	-0.39
Temp. Coeff. of V_{oc}	[% / °C]	-0.29
Temp. Coeff. of Isc	[% / °C]	0.04

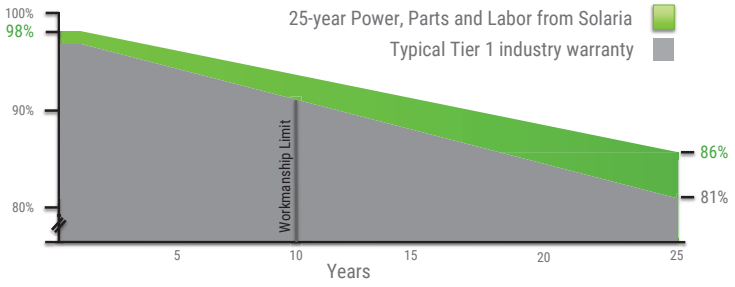
Design Parameters

Operating temperature	[°C]	-40 to +85
Max System Voltage	[V]	1000
Max Fuse Rating	[A]	15
Bypass Diodes	[#]	4

IV Curves vs. Irradiance (370W Panel)



Comprehensive 25-Year Warranty



Mechanical Characteristics

Cell Type	Monocrystalline Silicon
Dimensions (L x W x H)	63.8" x 43.9" x 1.57" 1621mm x 1116mm x 40mm
Weight	21 kg / 46 lbs
Glass Type / Thickness	AR Coated, Tempered / 3.2mm
Frame Type	Black Anodized Aluminum
Cable Type / Length	12 AWG PV Wire (UL) / 1000mm
Connector Type	MC4
Junction Box	IP67 / 4 diodes
Front Load	5400 Pa / 113 psf*
Rear Load	3600 Pa / 75 psf*

* Refer to Solaria Installation Manual for details

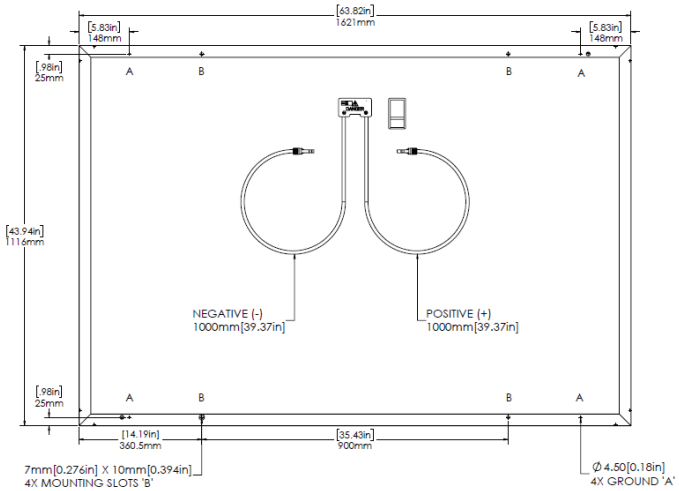
Certifications / Warranty

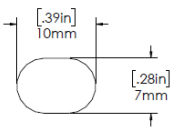
Certifications	UL 1703/IEC 61215/IEC 61730/CEC CAN/CSA-C22.2
Fire Type (UL 1703)	1
Warranty	25 years*

* Warranty details at www.solaria.com

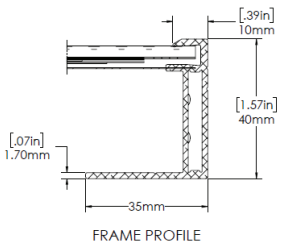
Packaging

Stacking Method	Horizontal / Palletized
Panels/ Pallet	25
Pallet Dims (L x W x H)	65.7" x 45.3" x 48.4" 1668mm x 1150mm x 1230 mm
Pallet Weight	590 kg / 1300 lbs
Pallets / 40-ft Container	28
Panels / 40-ft Container	700





MOUNTING SLOT 'B'



FRAME PROFILE

Nova Group, GBC

Proposal for Customer

Prepared by:
morgan.carson@novagroupgbc.com
4047904052
morgan.carson@novagroupgbc.com

For:
356 Champlain St, Brandon

Quote #: 4649427
Valid until: Jul 10 2024

Solar Energy System Proposal

Dear ,

Thank you for the opportunity to present your Solar Energy System Proposal.

Best Regards,
morgan.carson@novagroupgbc.com
Nova Group, GBC

This proposal is no longer valid, please contact morgan.carson@novagroupgbc.com (morgan.carson@novagroupgbc.com) to get an updated proposal.

Recommended System Option

102%	$269,201	$401,608	$132,407
Consumption Offset	Lifetime Electricity Bill Savings	Net Cost of this solar system	Clean Energy Premium over system lifetime

Your Solution

Solaria PowerXT-370R-PD Series

201 Solaria PowerXT-370R-PD
370 Watt panels
with 25 Year Performance Warranty
Up to **20.5%** Module efficiency
93,853 kWh per year

SOLARIA

Battery

Agreate
500.0 kWh Total Battery Storage
1 x ATEN-500-500R

Battery

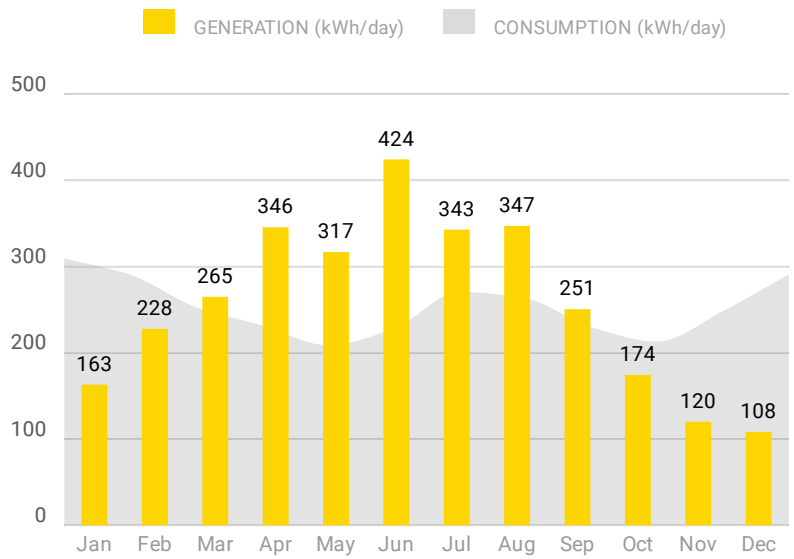
TBB Power
54.0 kWh Total Battery Storage
1 x EnergyCube LH75-54.0

Warranties: 25 Year Panel Product Warranty, 25 Year Panel Performance Warranty, 5 Year Battery Product Warranty

System Performance

102%

Energy From Solar



System Performance Assumptions: System Total losses: 15.3%, Inverter losses: 2.5%, Optimizer losses: 0%, Shading losses: 0%, Performance Adjustment: 0%, Output Calculator: System Advisor Model 2020.02.29.r2. Panel Orientations: 63 panels with Azimuth 188 and Slope 20, 63 panels with Azimuth 189 and Slope 20, 75 panels with Azimuth 171 and Slope 20.

The solar system(s) quoted in this proposal are not intended to be portable.

Environmental Benefits

Solar has no emissions. It just silently generates pure, clean energy.

Each Year

102%
Of CO_2, SO_x & NO_x

3 tons
Avoided CO_2 per year

Over System Lifetime

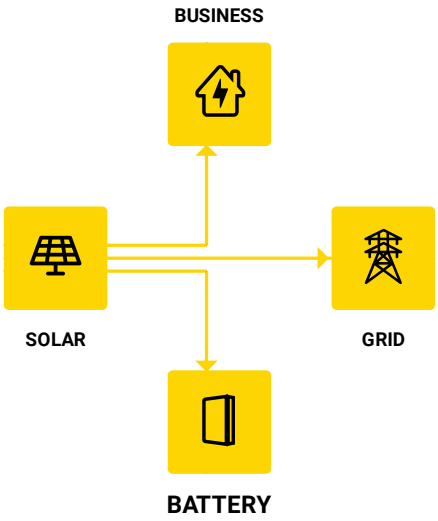
47,176
Car miles avoided

488
Trees planted

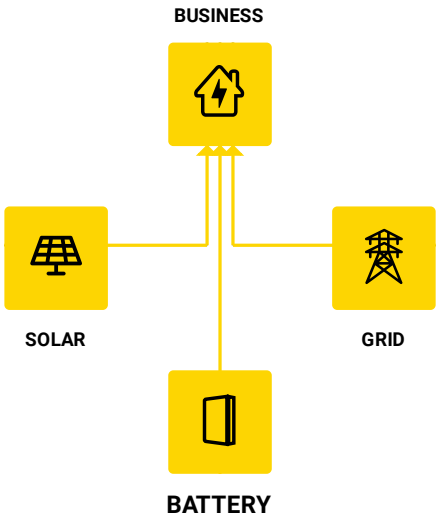
54
Long haul flights avoided

How your system works

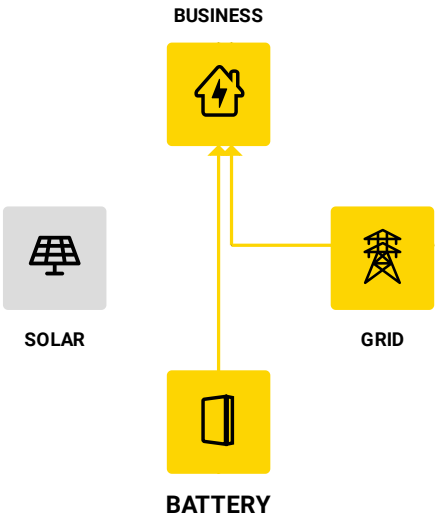
Generating Excess Solar



Partially Offset Usage

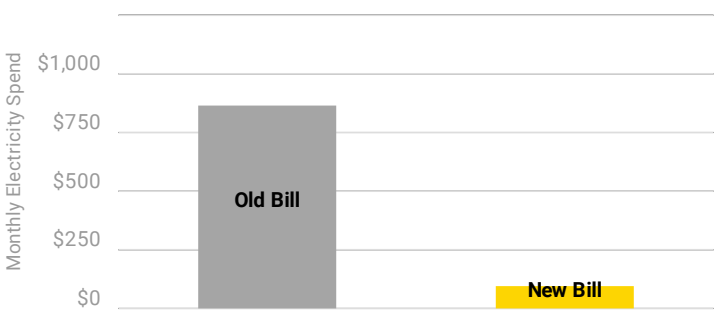


Night

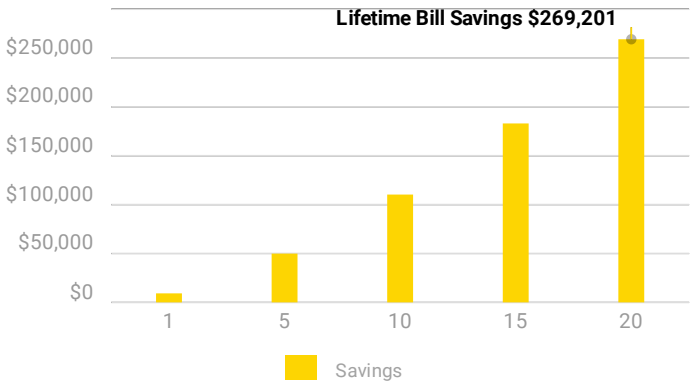


Electricity Bill Savings

First Year Monthly Bill Savings



Cumulative Bill Savings



Month	Solar Generation (kWh)	Electricity Consumption before solar (kWh)	Electricity Consumption after solar (kWh)	Utility Bill before solar ($)	Utility Bill after solar ($)	Cumulative Energy Credit ($)	Estimated Savings ($)
Jan	5,056	9,595	4785	1,071	549	0	522
Feb	6,379	8,139	2200	913	269	0	644
Mar	8,214	7,841	222	880	54	0	826
Apr	10,370	6,959	(2866)	785	30	311	755
May	9,823	6,474	(2837)	732	30	618	702
Jun	12,728	6,838	(5524)	772	30	1,218	742
Jul	10,627	8,393	(1776)	940	30	1,410	910
Aug	10,764	8,161	(2248)	915	30	1,654	885
Sep	7,518	6,893	(445)	778	30	1,702	748
Oct	5,406	6,606	1708	746	30	1,517	716
Nov	3,607	7,455	3799	839	30	1,105	809
Dec	3,360	9,021	5801	1,008	30	0	978

Rate not specified specified, using Single Phase Service based on location.

Your projected energy cost is calculated by considering a 4.0% increase in energy cost each year, due to trends in the raising cost of energy. This estimate is based on your selected preferences, current energy costs and the position and orientation of your roof to calculate the efficiency of the system. Projections are based on estimated usage of 92373 kWh per year, assuming Single Phase Service Electricity Tariff.

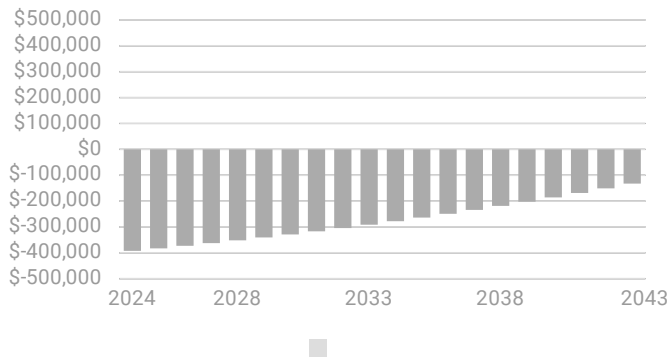
Your electricity tariff rates may change as a result of installing the system. You should contact your electricity retailer for further information.

Proposed Tariff Details - High Plains Power Inc Single Phase Service	
Energy Charges	
Usage Charge *All Day*	$0.11 / kWh
Fixed Charges	
Fixed Charge	$30.00 / month

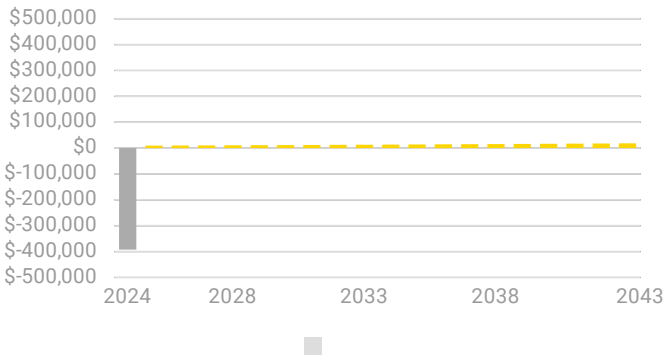
Net Financial Impact Cash

$269,201	-	$401,608	=	$132,407
Utility Bill Savings		Net System Cost		Clean Energy Premium

Cumulative Savings From Going Solar



Annual Savings From Going Solar



Estimates do not include replacement costs of equipment not covered by a warranty. Components may need replacement after their warranty period. Financial discount rate assumed: 6.75%

Quotation

Payment Option: Cash

201 x Solaria Corporation 370 Watt Panels (Solaria PowerXT-370R-PD) 1 x ATEN-500-500R, 1 x EnergyCube LH75-54.0 (Agreate/TBB Power)	
Total System Price	$573,725.00
Purchase Price	**$573,725.00**

Additional Incentives

Federal Investment Tax Credit (ITC) The Federal Solar Tax Credit or The Federal Investment Tax Credit (ITC) for constructions starting in 2023.	$172,117.50
Net System Cost	**$401,607.50**

Price excludes Retailer Smart Meter should you want us to install your Smart Meter it will be an additional cost.
This proposal is valid until Jul 10 2024.

SOLARIA®

Solaria PowerXT® | DC Panel

Solaria PowerXT®-370R-PD

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Solder-less cell interconnections are highly reliable and designed to far exceed the industry leading 25 year warranty.

About Solaria

Established in 2000, The Solaria Corporation has created one of the industry's most respected IP portfolios, with over 350 issued and pending patents in PV solar cell and module technology. Headquartered in Oakland, California, Solaria has developed a technology platform that unlocks the potential of solar energy.

TOP PERFORMER 2018 DNV·GL PV MODULE RELIABILITY SCORECARD

TÜVRheinland® Precisely Right.

The Solaria Corporation 1700 Broadway, Oakland, CA 94612 P: (510) 270-2500 www.solaria.com

Rev 3D 12-2019

SOLARIA®

Solaria PowerXT®-370R-PD

Performance at STC (1000W/m², 25° C, AM 1.5)

Solaria PowerXT-		365R-PD	370R-PD
Max Power (P_{max})	[W]	365	370
Efficiency	[%]	20.2	20.5
Open Circuit Voltage (V_{oc})	[V]	48.0	48.3
Short Circuit Current (I_{sc})	[A]	9.58	9.60
Max Power Voltage (V_{mp})	[V]	39.9	40.2
Max Power Current (I_{mp})	[A]	9.16	9.20
Power Tolerance	[%]	-0/+3	-0/+3

Performance at NOCT (800W/m², 20°C Amb, Wind 1 m/s, AM 1.5)

Max Power (Pmax)	[W]	269	272
Open Circuit Voltage (V_{oc})	[V]	45.1	45.4
Short Circuit Current (I_{sc})	[A]	7.73	7.74
Max Power Voltage (V_{mp})	[V]	36.7	37.0
Max Power Current (I_{mp})	[A]	7.32	7.35

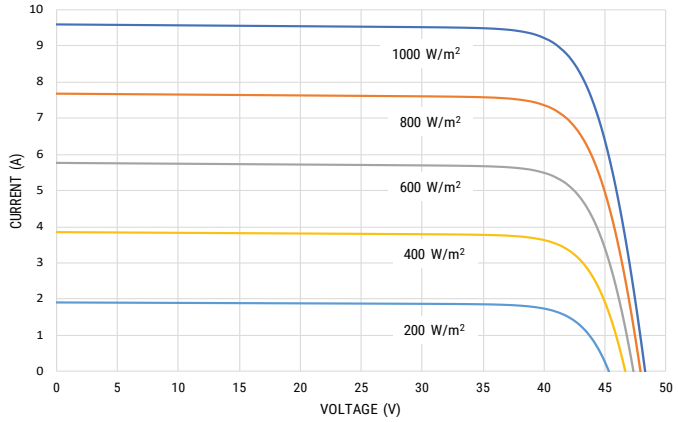
Temperature Characteristics

NOCT	[°C]	45 +/-2
Temp. Coeff. of P_{max}	[% / °C]	-0.39
Temp. Coeff. of V_{oc}	[% / °C]	-0.29
Temp. Coeff. of Isc	[% / °C]	0.04

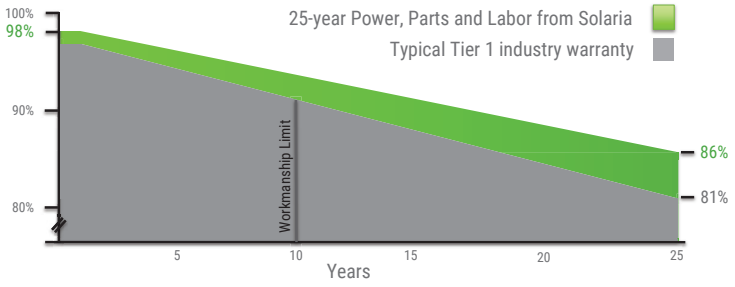
Design Parameters

Operating temperature	[°C]	-40 to +85
Max System Voltage	[V]	1000
Max Fuse Rating	[A]	15
Bypass Diodes	[#]	4

IV Curves vs. Irradiance (370W Panel)



Comprehensive 25-Year Warranty



Mechanical Characteristics

Cell Type	Monocrystalline Silicon
Dimensions (L x W x H)	63.8" x 43.9" x 1.57" 1621mm x 1116mm x 40mm
Weight	21 kg / 46 lbs
Glass Type / Thickness	AR Coated, Tempered / 3.2mm
Frame Type	Black Anodized Aluminum
Cable Type / Length	12 AWG PV Wire (UL) / 1000mm
Connector Type	MC4
Junction Box	IP67 / 4 diodes
Front Load	5400 Pa / 113 psf*
Rear Load	3600 Pa / 75 psf*

* Refer to Solaria Installation Manual for details

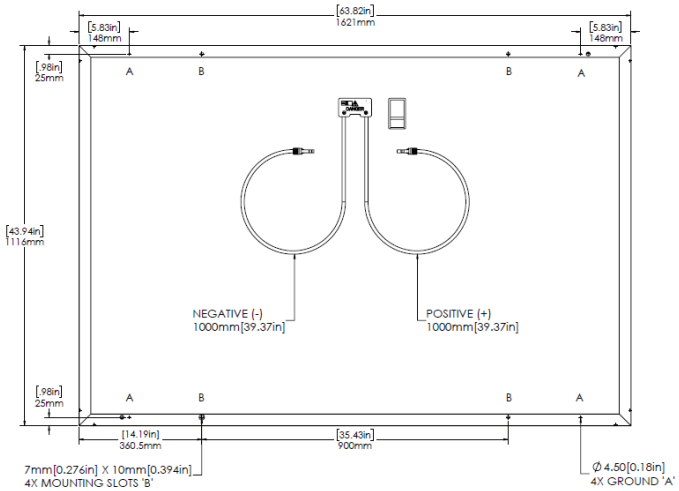
Certifications / Warranty

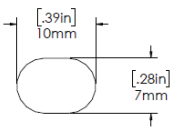
Certifications	UL 1703/IEC 61215/IEC 61730/CEC CAN/CSA-C22.2
Fire Type (UL 1703)	1
Warranty	25 years*

* Warranty details at www.solaria.com

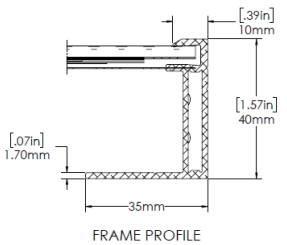
Packaging

Stacking Method	Horizontal / Palletized
Panels/ Pallet	25
Pallet Dims (L x W x H)	65.7" x 45.3" x 48.4" 1668mm x 1150mm x 1230 mm
Pallet Weight	590 kg / 1300 lbs
Pallets / 40-ft Container	28
Panels / 40-ft Container	700





MOUNTING SLOT 'B'



FRAME PROFILE

Nova Group

RESUMES OF PROJECT TEAM

EMPLOYEE RESUME

USING BUSINESS AS A FORCE FOR GOOD

KEELY FELTON, CEA
CHIEF SUSTAINABILITY OFFICER

PROFESSIONAL EDUCATION
Bachelor of Arts, Animal Behavior, Haverford College, Haverford, Pennsylvania, 2001

CERTIFICATIONS/QUALIFICATIONS
- Association of Energy Engineers (AEE) Certified Energy Auditor (CEA)
- AEE Certified Measurement and Verification Professional (CMVP), expired 2019
- Multifamily Building Analyst Training (to BPI-MFBA standard) – 36 hours
- TRUE Advisor Training Program
- Certified Water Efficiency Professional Training Program
- Certificate of Proficiency in Building Benchmarking, Consortium for Building Energy Innovation and the Department of Energy
- Certified Green Globes Professional
- Green Globes Fellow
- Certified GreenPoint Rater, Existing Home Multifamily
- Certified GreenPoint Rated, New Home
- BREEAM USA In-Use Assessor
- ASTM E1527 Environmental Site Assessment (ESA) for Commercial Real Estate Certificate
- HAZWOPER 8-hour Refresher (OSHA 29 CFR, Part 1910.120)

SELECTED EXPERIENCE
Ms. Felton oversees Nova Energy Group, a division within Nova Group, GBC. The group delivers, on average, 30 energy and water audits in addition to other green deliverables per month. In this capacity, she issues and reviews reports for the agency green lending programs (Fannie Mae Green Rewards, Freddie Mac Green Up, and HUD) while working closely with Nova's debt clients to make sure that all pertinent information is communicated throughout the due diligence process.

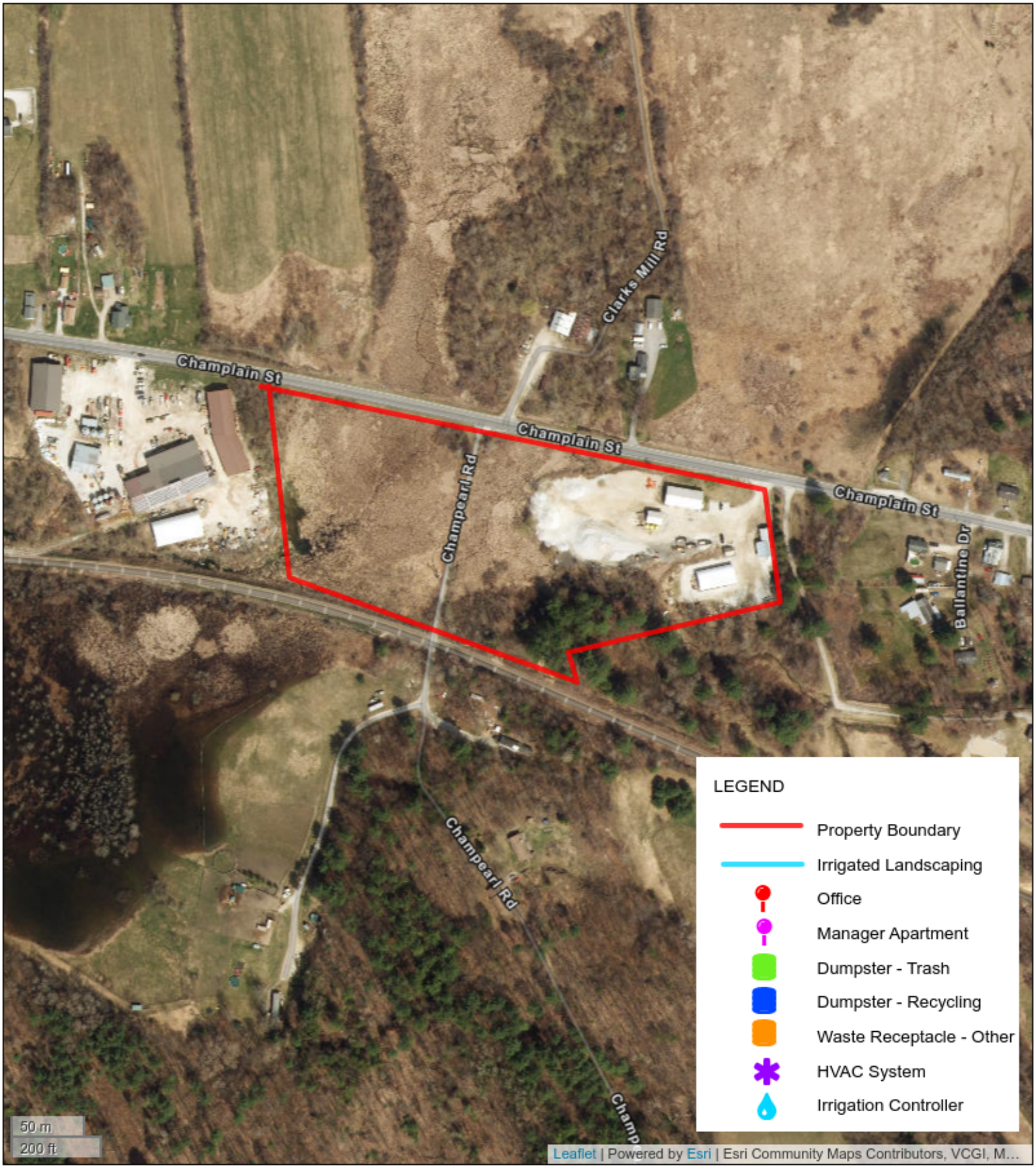
Additionally, Ms. Felton enjoys long-term relationships with property owners meeting more targeted energy and water goals with the group's equity energy work. These services include energy benchmarking and ongoing monitoring of utility consumption, energy modeling, strategic energy planning, project management, measurement and verification of energy savings, and ESG services.

Ms. Felton obtained her Certified Energy Auditor and Certified Measurement and Verification Professional certifications from the Association of Energy Engineers. She is highly experienced with utility data analysis for a broad spectrum of multifamily properties. Additionally, she is proficient in the use of ENERGY STAR's Portfolio Manager for obtaining benchmark scores and certification. Ms. Felton is certified as a Green Globes Professional, GreenPoint Rater, and BREEAM USE In-Use Assessor.

PROFESSIONAL ORGANIZATIONS
- Association of Energy Engineers (AEE)
- Urban Land Institute (ULI)
- Build it Green
- Green Building Initiative (GBI), Board of Directors

Nova Group

PARCEL MAP



Property Details Map

Brandon - Brandon Highway Garage
356 Champlain Street
Brandon, VT
Project Number: SE24-3894

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Group
Carbon
Neutral
Report
novagroupgbc.com/carbonneutral