

Town of Brunswick, Maine

DEPARTMENT OF PLANNING AND DEVELOPMENT

DRAFT FINDINGS OF FACT REQUEST FOR CERTIFICATE OF APPROPRIATENESS FOR ADDITIONS AND ALTERATIONS VILLAGE REVIEW BOARD

PROJECT NAME: 9 Cleaveland Street; Pilgrim House Rooftop Solar

CASE NUMBER: VRB 25-014

LOCATION: Map U08, Lot 112; 9 Cleaveland Street

**OWNER/
APPLICANT:**
First Parish Church
9 Cleaveland Street
Brunswick, ME 04011

REVIEW DATE: June 17, 2025

PROJECT SUMMARY

The applicant is requesting a Certificate of Appropriateness for Alterations to add insulation and solar panels to the roof of the Pilgrim House building located at 9 Cleaveland Street. The added insulation will raise the height of the existing roof by nine inches therefore requiring an extension of the fascia boards. This method will ensure that the church can keep the wood vaulted ceilings on the interior of the building. The existing asphalt roof shingles will be replaced and roof-top solar panels will be added, mounted flush, and covering approximately 80% of the south-facing (Cleaveland Street side) roof surface. The neo-colonial chapel building, known today as the Pilgrim House, is a contributing structure located in the nationally registered Federal Street Historic District and it was constructed in 1955.

REVIEW STANDARDS, SECTION 5.2.8.C, TOWN OF BRUNSWICK ZONING ORDINANCE

(1) General Standard

- a. **All Certificates of Appropriateness for new construction, additions, alterations, relocations or demolition shall be in accordance with applicable requirements of this Ordinance.**

The proposed modifications will require building and electrical permits in addition to a Certificate of Appropriateness.

- b. **In meeting the standards of this Ordinance, the applicant may obtain additional guidance from the *U.S. Secretary of Interior's Standards for Rehabilitating Historic Buildings* and the *Village Review Zone Design Guidelines*.**

The Village Review Overlay District Design Guidelines state that, "roof-mounted solar panels should be located on the upper roof and laid as flat as possible. Installing roof-

mounted solar panels on the front of the roof, or installing solar panels with a high degree of tilt is not recommended.”

(2) New Construction and Additions and Alterations to Existing Structures

- a. In approving applications for a Certificate of Appropriateness for new construction, additions or alterations to contributing resources, the reviewing entity shall make findings that the following standards have been satisfied:**

- i. Any additions or alterations shall be designed in a manner to minimize the overall effect on the historic integrity of the contributing resource.**

The applicant's proposal to raise the roof slightly will require minimal change to the appearance of the existing fascia. The rooftop solar panels must make use of the southern facing side of the building which also happens to be the most visible roof surface. While the panels will cover the majority (80%) of the south-facing roof, they will be mounted flush to the building. They are also an appendage that is easily removed with no effect on the original structure.

- ii. Alterations shall remain visually compatible with the existing streetscape.**

While highly visible, rooftop solar panels are a common element on today's streetscapes and are not perceived as out of context.

- iii. Concealing of distinctive historic or architectural character-defining features is prohibited. If needed, the applicant may replace any significant features with in-kind replacement and/or accurate reproductions.**

No significant features are to be concealed. The solar panels are also a modification that is easily removed with no effect on the original structure.

- iv. New construction or additions shall be visually compatible with existing mass, scale and materials of the surrounding contributing resources.**

Not applicable.

- v. When constructing additions, the applicant shall maintain the structural integrity of existing structures.**

Not applicable.

- b. In approving applications for a Certificate of Appropriateness for new construction of, or additions to commercial, multi-family and other non-residential structures, the Village Review Board shall make findings that the following additional standards have been satisfied.**

- i. Where practicable, new off-street parking shall be located to the rear of the principal building and shall be accessed from a secondary street. In cases where off-street parking currently exists in a front or side yard, the parking area shall be screened from the public right-of-way with landscaping or**

fencing.

Not applicable.

- ii. **Site plans shall identify pedestrian ways and connections from parking areas to public rights-of-way.**

Not applicable.

- iii. **All dumpsters and mechanical equipment shall be located no less than 25 feet away from a public right-of-way, unless required by a public utility, and shall be screened from public view.**

Not applicable.

- iv. **Roof-top mounted heating, ventilation, air conditioning and energy producing equipment shall be screened from the view of any public right-of-way or incorporated into the structural design to the extent that either method does not impede functionality. Parapets, projecting cornices, awnings or decorative roof hangs are encouraged. Flat roofs without cornices are prohibited.**

Not applicable.

- v. **The use of cinder block, concrete and concrete block is prohibited on any portion of a structure that is visible from the building's exterior, with the exception of use in the building's foundation.**

Not applicable.

- vi. **The use of vinyl, aluminum or other non-wood siding is permitted as illustrated in the Village Review Board Design Guidelines. Asphalt and asbestos siding are prohibited.**

Not applicable.

- vii. **Buildings with advertising icon images built into their design ("trademark buildings") are prohibited.**

Not applicable.

- viii. **No building on Maine Street shall have a horizontal expanse of more than 40 feet without a pedestrian entry.**

Not applicable.

- ix. **No building on Maine Street shall have more than 15 feet horizontally of windowless wall.**

Not applicable.

- x. **All new buildings and additions on Maine Street shall be built to the front property line. This may be waived if at least 60 percent of the building's front facade is on the property line, and the area in front of the setback is developed as a pedestrian space.**

Not applicable.

- xi. **If adding more than 50 percent new floor area to a structure located on Maine Street, the addition shall be at least two (2) stories high and/or not less than 20 feet tall at the front property line.**

Not applicable.

- xii. **The first-floor facade of any portion of a building that is visible from Maine Street shall include a minimum of 50 percent glass. Upper floors shall have a higher percentage of solid wall, between 15 percent and 40 percent glass.**

Not applicable.

- c. **Proposed additions or alterations to noncontributing resources shall be designed to enhance or improve the structure's compatibility with nearby contributing resources as compared to the existing noncontributing resources.**

The building is a contributing structure and therefore this standard is not applicable.

(3) Signs

Signs shall comply with the requirements of Section 4.13 (Signs) with consideration given to the Village Review Zone Design Guidelines.

No new signage is proposed as part of this project; not applicable

(4) Demolition and Relocation

- a. **Demolition or partial demolition or relocation of a contributing or, if visible from a public right-of-way, a noncontributing resource, excluding incidental or noncontributing accessory buildings and structures located on the same property, shall be prohibited unless the application satisfies at least one of the following criteria.**

- i. **The structure poses an imminent threat to public health or safety. An application must be accompanied by a report from a qualified structural engineer for review by the Codes Enforcement Officer and photographs depicting the current condition of the building.**

There is no demolition proposed and therefore this standard is not applicable.

- ii. **The condition of the structure is such that it cannot be adapted for any other permitted use, whether by the current owner or by a purchaser, resulting in a reasonable economic return, regardless of whether that return represents the**

most profitable return possible, provided that the applicant can document he/she has not contributed significantly to the deterioration of the structure. An opinion shall be provided from an architect, licensed engineer, developer, real estate consultant or appraiser or from a professional experienced in historic rehabilitation, as to the economic feasibility for restoration, renovation, or rehabilitation of the contributing resource versus demolition or relocation of same.

Not applicable.

- b. Demo, partial demolition or relocation of a noncontributing resource visible from a public right-of-way, shall be approved by the Village Review Board if it is determined that the proposed replacement structure or reuse of the property is deemed more appropriate and compatible with the surrounding contributing resources than the resource proposed for demolition.**

Not applicable.

DRAFT MOTIONS
MAP U08 LOT 112 (9 CLEAVELAND STREET)
REQUEST FOR A CERTIFICATE OF APPROPRIATENESS FOR ALTERATIONS
VILLAGE REVIEW BOARD
REVIEW DATE: JUNE 17, 2025

Draft Motion 1: That the Certificate of Appropriateness application is deemed complete.

Motion: Second: Vote:

Draft Motion 2: That the Board approves the **Certificate of Appropriateness for Alterations** to insulate/raise the roof, replace roof shingles and add roof-top solar panels to the structure located at Map U08, Lot 112; 9 Cleaveland Street, as outlined in the application and as satisfied by Subsection 5.2.8.C with the following condition:

1. That the Board's review and approval does hereby refer to these findings of fact, the plans and materials submitted by the applicant and the written and oral comments of the applicant, his representatives, reviewing officials, and members of the public as reflected in the public record. Any changes to the approved plan not called for in these conditions of approval or otherwise approved by the Director of Planning and Development as a minor modification, shall require further review and approval in accordance with the Brunswick Zoning Ordinance.

Motion: Second: Vote:

UG-112

HISTORIC PRESERVATION SURVEY

Cumberland
County

Brunswick
City/Town

9 Cleaveland
Street Address and Number

Name of Building/site: common: 1955 chapel
Common and/or Historic

Approximate Date: ca. 1955..... Style: Neo-Colonial.....

Type of Structure:

Residential Commercial Industrial Other: Religious..... 1980 photos J. Goff

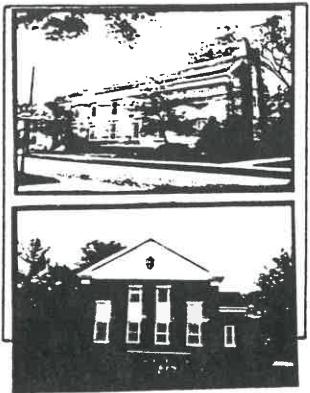
Condition: Good Fair Poor

Endangered: No Yes

Surveyor: J. Goff..... Organization: Date: 1980; Aug. '83
Pejepcot Regional Survey

Rating:

Historic Significance to the Community:
Earlier building on site was late 19th c.
mansard roofed structure (1874 Ridley & Stanwood store?). See photo
on reverse. Another structure on site previously was early Greek
Revival double house 9/11 Cleaveland (see photos).
(For Additional Information - Use Reverse Side)



Cleaveland St.

Re present building: see Brunswick Record 11/24/1955, cornerstone laid.
Brunswick Record 5/17/1956 "nears completion"



Cover Page

First Parish Church
BRUNSWICK, MAINE

Village Review Overlay

Certificate of Appropriateness Application

First Parish Church - Brunswick

Rep: Tyler Spillane

Document Number:

- 1) Village Review Overlay - Certificate of Appropriateness Application
- 2) Response to question 8 from application
- 3) Roof extension designs from G.M.Wild Construction
- 4) Roof condition report from Lincoln/Hanney detailing need to replace roof
- 5) Energy audit from UpCountry detailing need from insulation (see page 9)
- 6) Proposed solar panel materials used from Maine Solar Solution
- 7) Computer render of proposed solar panel array
- 8) Drone photos of the roof and and surrounding area

Received: _____
By: _____

VRB Case #: _____

**VILLAGE REVIEW OVERLAY
CERTIFICATE OF APPROPRIATENESS
APPLICATION**

1. Project Applicant:

Name: First Parish Church - Brunswick
Address: 9 Cleaveland St

Phone Number: (207) 729-7331
Email Address: office@firstparish.net

2. Project Property Owner:

Name: First Parish Church - Brunswick
Address: _____

Phone Number: _____
Email Address: _____

3. Authorized Representative: (If different than applicant)

Name: Tyler Spillane
Address: 55 Intrepid St

Phone Number: 207-319-2222
Email Address: spillanetyler@gmail.com

4. Physical Location of Property Being Affected:

Address: 9 Cleaveland Street

5. Tax Assessor's Map #U08 Lot #112 of subject property.

6. Underlying Zoning District GM6

7. Type of Activity (check all that apply):

- Additions and New Construction
- Structural Alteration
- Demolition/Moving of Structure
- Sign Permit

8. Describe the location and nature of the proposed change(s), including a brief description of the proposed construction, reconstruction, alteration, demolition, proposed re-use, or other change (use separate sheet if necessary): See attached

Applicant Name (printed): Tyler Spillane

Applicant Signature: Tyler Spillane

Property Owner Name (printed): First Parish Church - John Allen

Property Owner Signature: John Allen

Revised 12/17/2024

**VILLAGE REVIEW OVERLAY
APPLICATION FOR CERTIFICATE OF COMPLIANCE
APPLICATION CHECK-LIST**

This checklist will be completed by the Department of Planning and Development. The Department requires that all application materials be submitted in BOTH hard copy and digital format. In addition, for Major Review applications, EIGHT (8) HARD COPIES are required after your application is considered complete by Department staff. Your project will not be placed on the Village Review Board's agenda until this determination is made. For assistance, please contact the Department of Planning and Development at (207)725-6660.

- Completed application form
- A copy of the building survey prepared by the Pejepscot Historical Society pertaining to the structure under review (provided by Department Staff).
- A drawing showing the design, texture, and location of any construction, alteration, demolition for which a certificate is required. The drawing shall include plans and exterior elevations drawn to scale, with sufficient detail to show their relations to exterior appearances and the architectural design of the building. Drawings need not be prepared by an architect or engineer, but shall be clear, complete, and specific.
- A site plan or photographs showing the relationship of the changes to the surroundings.
- If architectural features are to be removed or replaced (including but not limited to original windows, siding, roofing material and other design elements), provide photographic documentation or a written assessment from a preservation professional or contractor explaining the condition of the material and reason for removal/replacement.
- Photographs of the building(s) involved, its context, and detailed photos of immediate area.
- List all proposed materials and products, and clearly identify their location on the drawings. Indicate texture of material, if applicable.
- Provide manufacturer's product information and, if possible, bring material samples to the meeting.
- Provide information such as dimensions, photographs or source for salvaged or reused materials.
- For demolition applications, provide detailed information addressing standards contained in Subsections 5.2.8.C (4) of the Brunswick Zoning Ordinance.

This application was certified as being complete on 6/3/25 (date) by Julie E. Erlandson of the Department of Planning and Development.

THIS APPLICATION WAS:

- Granted
- Granted With Conditions
- Denied
- Forwarded to Village Review Board
- Building Permit Required
- Building Permit NOT Required

Applicable Comments: _____

Signature of Department Staff Reviewing Application

COMPLIANCE WITH ZONING STANDARDS

Notice: This form is to be completed by the Codes Enforcement Officer and filed with the application.

This is to certify that the application for Certificate of Appropriateness submitted by

First Parish Church, relating to property designated on Assessors Tax Map # 108 and

Lot # 112 has been reviewed by the Codes Enforcement Officer and has been found to be in compliance with all applicable zoning standards:

Comments: _____

Signed: Taylor Burdin Date: 4-12-25
Print: Taylor Burdin
Code Enforcement Officer

8) Describe the location and nature of the proposed change(s), including a brief description of the proposed construction, reconstruction, alteration, demolition, proposed re-use, or other change (use separate sheet if necessary)

The proposed changes are to First Parish Church's Pilgrim House building located at 9 Cleveland. The aim of the project is to increase the energy efficiency of the building with insulation and add solar panels to offset our energy usage. The existing asphalt shingle roof will be removed, a layer of 3" rigid insulation will be added, secured to the existing roof decking by 5/8 " plywood, and new asphalt shingles will be installed. This will raise the overall roof 9 inches and the fascia will be extended with minimal aesthetic changes. This insulation strategy is required to maintain the wood vaulted ceiling of the building. Additionally, black frame solar panels (REC 460 Watt) will be placed flush on the south facing side of the roof, covering approximately 80% of the roof area.

> C O N C E P T <
NOT FOR
CONSTRUCTION
02-JUN-2025

NOTES:

1. PERSPECTIVES SHOW ADDITIONAL ROOF TRIM REQ'D. TO ACCOMMODATE THE ADDITION OF 5-6 POLYISO INSULATION APPLIED TO ROOF EXTERIOR SURFACE IN CONJUNCTION WITH ROOFING REPLACEMENT, AND PRIOR TO ROOF-MOUNT SOLAR PANEL INSTALLATION.

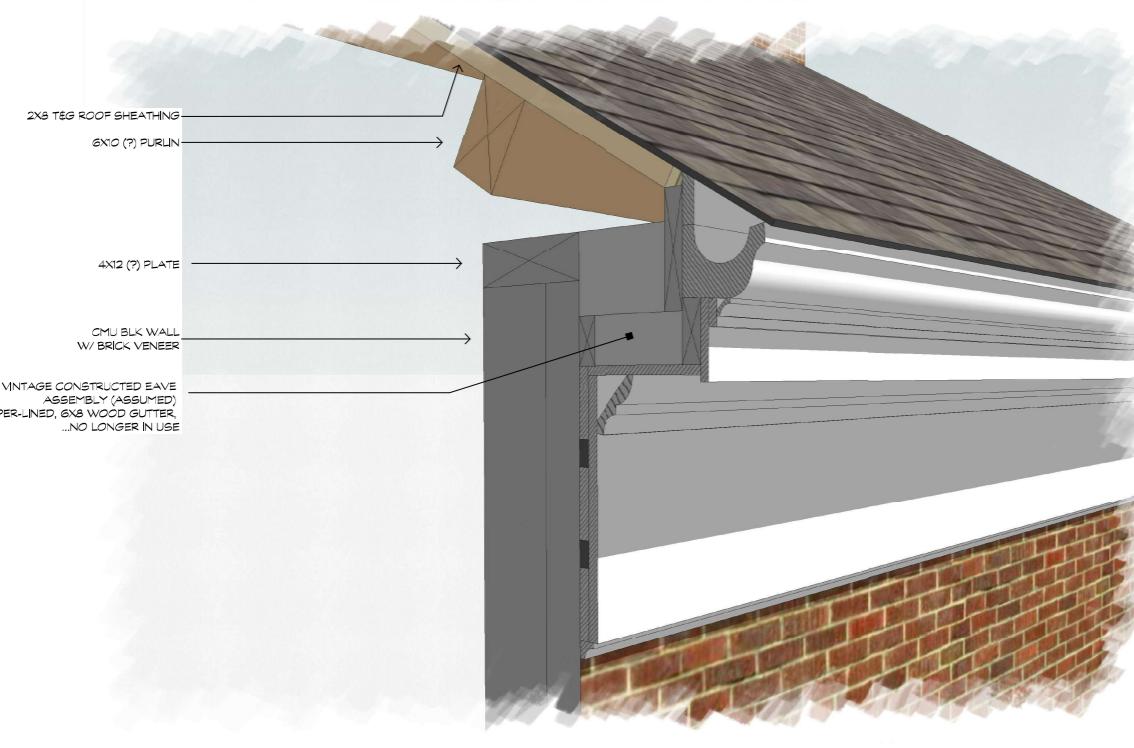
2. PERSPECTIVES ARE NOT SCALABLE.



EXISTING, TYP.



PROPOSED



EXISTING, TYP.



PROPOSED

ROOF TRIM
SCALE: N/A

PROJECT:
GMWC-25-024-PCS-FPC
MUBEC 2021:
INSULATION/ ROOFING

LOCATION/ DELIVERY:
FIRST PARISH CHURCH
PILGRIM HOUSE
9 CLEAVELAND STREET
BRUNSWICK, ME 04011

MBLU: UOB/112/000 000/

ZONE: GM6

OWNER:
FIRST PARISH CHURCH

CONTRACTOR:
GM WILD CONSTRUCTION, INC.
PO BOX 996
BRUNSWICK, ME 04011-0996
207-722-6184

PERSPECTIVE

A-901

Lincoln/Haney Engineering Associates, Inc.

Structural Engineering Consultants

Michael A. Cunningham, P.E., LEED AP
Thad Gabryszewski, P.E., S.E.

August 03, 2022

William Stoy
First Parish Church
9 Cleveland Street
Brunswick, Maine 04011

Re: Pilgrim House roof analysis

Dear Bill:

As requested, Lincoln/Haney Engineering has completed our analysis of the existing roof structure. Of interest is the existing timber trusses and steel rod assemblies that run the entire length of the roof. This letter is provided to document the results of the analysis. We understand that there is a plan to add insulation and potentially add solar panels on the roof.

Existing Conditions

The Pilgrim House roof is framed with timber wood trusses placed at 12 ft. on center in the middle of the roof structure and varying spacings of 16ft. 6in. and 18ft. 8in. on the ends. There are two types of trusses as specified in the original design drawings: Truss A which is comprised of (2) 6x14 timbers bolted together in the plane of the roof and a 1 1/4in. horizontal rod; and Truss B, which is comprised of (2) 8x14 timbers bolted together in the plane of the roof and a 1 1/2in. horizontal rod. The placement of the horizontal rods, which are elevated above the eaves, has a significant impact on the stresses applied to the timber rafters. The species of the wood utilized is identified on the drawings as pine – select structural grade. The purlins that tie the trusses together are 6x8, 6x10 and 6x12 timbers, and the species is fir. Based on the age of this structure, the existing timber sizes are not consistent with planed lumber that would be purchased locally today. Hence our analysis is based on the true rough-cut dimension of the lumber as specified in the original design drawings. In past experiences with grading of historic lumber in place, we have found wide variations in quality. Limited observations of the lumber on this project appear to indicate that this is likely the case here. Hence our analysis is based on assumed values for select structural grade southern pine for the trusses, and douglas fir-larch (north) grade no. 1 for the purlins. Current building code references the National Design Specification by the American Wood Council for allowable stresses. Select structural grade of southern pine has an allowable bending stress of 1500 psi before applying appropriate modifiers identified in the code. Those modification factors increase the allowable bending stress to nearly 1700 psi for the roof trusses supporting snow loads. Number 1 grade of Douglas Fir-Larch has an allowable bending stress of 1200 psi before applying appropriate modifiers identified in the code. Those modification factors increase the allowable bending stress to nearly 1400 psi for the roof purlins supporting snow loads. The trusses span approximately 37 feet, and the gable roof slopes 7:12 on both sides.

The steel rods and connector plates were assumed to be grade A36 steel for this analysis.

Current Code Requirements

The current Maine Uniform Building and Energy Code (MUBEC) references the 2015 edition of the International Building Code (IBC), which references the 2010 edition of the American Society of Civil Engineers' publication "Minimum Design Loads for Buildings and Other Structures", ASCE 7-10. That

document identifies ground snow load for Brunswick as 50 psf, which translates to a flat roof snow load of 35 psf. At the time of the Pilgrim House original construction, there was no state-wide building code in effect and many communities had not adopted a code. The first snow load maps were published in the early 1970's. The first snow drifting provisions appeared in the Appendix of the 1975 BOCA Building Code. Hence it is not known what snow load was considered for the existing design for the original, 1955 Pilgrim House construction. Also, current code requires consideration of unbalanced snow loads, which can occur when snow blows from one side of the ridge to accumulate on the other side. This phenomenon was not understood in 1955.

Modifications to existing buildings are regulated by the International Existing Building Code (IEBC). The IEBC requires that a structure be evaluated if alterations increase loading. In this case, the addition of insulation will increase snow accumulation, and the addition of solar collectors will add 2 to 3 psf in dead load.

The differences in snow load design requirements in the current code from earlier editions relate to the consideration for non-uniform snow distributions. There are two such load cases that apply to the roofs being considered:

1. Snow can drift from one side of the gable roof surface over the ridge to the other side of the roof, resulting in an increased snow load for one side of the roof structure.
2. An equally distributed snow load is applied to both surfaces of the gable roof structure.

We analyzed the existing roof framing system for the two load cases as described above, and the worst-case scenario was used.

Results of Analysis

The analysis of this roof structure assumed a risk category II building per ASCE7-10.

Our analysis indicates that the existing wood trusses and purlins are over-stressed by the snow loading required under the current code, with the greatest overstress at the rod tie connections. The attached diagram shows the proposed modifications that are needed to bring the existing wood framing structure into compliance. The proposed modifications must be done to all the wood trusses, with special attention to the ones that are labeled "Truss A" and "Truss B" per the original design drawings. The purlins and ridge beams must also be modified throughout the entire length of the roof structure. The proposed alterations combined will increase the capacity to support the design snow loads prescribed by code and the proposed solar panel installation.

Attached is a diagram showing the proposed structural alterations needed for the roof structure to comply with current building codes. After the modifications are complete, the roof structure strength capacity will be at 111% of the demand per current code.

I trust that the information provided in this letter provides clear resolution to the proposed installation. If we may be of any further assistance in this matter, perhaps for consideration of an alternative support arrangement, please call or email.

Sincerely,



Eric Anderson, P.E.
Structural Engineer





Energy Evaluation

Prepared for: The First Parish Church

Address: Pilgrim House
9 Cleavland Street
Brunswick, ME 04011

Report Date: May 25, 2023

Prepared by: Aaron Despres
Phone: 207-883-9876

Inspection Date: April 28, 2023

Blower Door System: TEC Minneapolis Blower Door

Imaging System: FLIR ThermaCAM BX320

Weather Conditions: Clear

Wind Conditions: Calm

Outside Temperature: 55 °F

Inside Temperature: 65 °F

Client Present: Yes

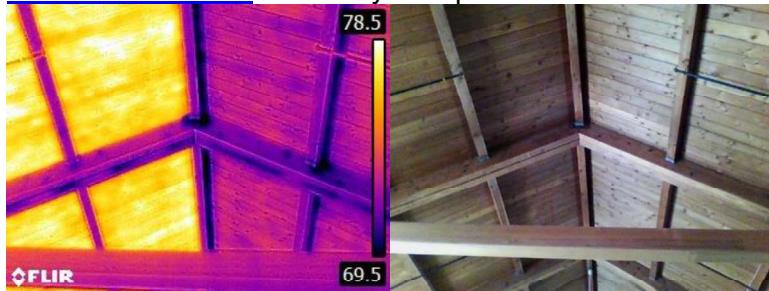


Observations and Recommendations

A list of observations and recommendations separated by floor is presented below. Following each recommendation, a level of priority is given as low (L), medium (M), or high (H) as evaluated by the auditor. **Please note:** It is critical that all health/safety and building durability issues outlined below be addressed before any efficiency improvement tasks are performed (noted as: **Safety/Durability**).

Roof assembly

- (H) Install rigid foam board insulation on the roof deck as part of the roofing replacement. Ideally, a minimum R-value of 49 would be achieved though this may not be realistic. Install either polyisocyanurate or polystyrene insulation with staggered horizontal and vertical joints if more than one layer of insulation is installed. An air barrier membrane must be installed between the existing tongue and groove roof deck and the insulation. Make sure all seams are sealed. The use of a fully-adhered membrane is recommended. For a good representation of the insulation detail, review Figure 5 in [BSI-046: Dam Ice Dam](#) written by Joseph Lstiburek.



- (H) An alternative to installing individual insulation and sheathing components described above would be to install roof insulation panels such as made by [Hunter](#). Ideally, the thickest insulation panel available would be installed which is 4" thick with an R-value of 21.1. It is still recommended that an air barrier membrane be installed between the roof deck and the insulation panels.

Upper Floor

- (H) **Safety** At 145° F, domestic hot water temperature was above the safe maximum temperature of 120° F at the kitchen sink. Adjust the temperature using the thermostat at the top of the water heater.
- (H) If the upper floor is not typically occupied during the week, consider lowering the thermostat (approximately 5-8 degrees below its typical occupied set point) for this area (if it is not done so already).
- (H) Air leakage appeared to be occurring at the purlin/exterior wall junctures. Air seal the perimeter of the purlins using high quality flexible sealant. Also seal the vertical cracks observed in the exterior walls including below the kitchen sink and near roof juncture.



- (H) The attic space above the southwest entrance was not insulated. It is recommended that the underside of the roof deck be insulated using 6 inches of closed cell spray foam. Current standards may require that the insulation be covered with a thermal barrier such as intumescent paint. Insulate the gable wall with 3 inches of closed cell spray foam as well.



- (H) Cathedral ceilings were present. There was likely significant temperature stratification present with the warmest air near ceiling. Use ceiling fans (on a very low setting) to circulate warm air that rises to the ceiling down to the occupied space.

Main Floor

- (H) There was significant solar heat gain occurring at the east entrance addition during the site visit. Consider installing overhangs above the windows at the exterior to reduce solar heat gain during the warmer months. Click [here](#) for an explanation of the benefits of overhangs and [here](#) for potential products.



- (H) Sash locks were missing from a couple of windows. Replace. Will reduce air leakage.



- (H) Make sure that all windows are shut and locked during the heating months (including on upper floor). Also make sure storm windows are shut.

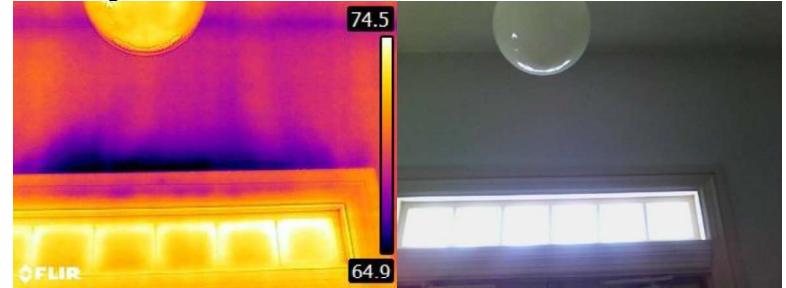
- (H) Replace worn sweepers and weather-stripping at the original exterior wood doors to reduce air leakage.



- (H) Insulation was missing from between roof rafters beneath flat roof section of the addition. Replace.



- (M) Air leakage was observed above the transom window at the southeast entrance. Air seal the wall/trim juncture using caulking.



- (M) Air seal receptacles and switches by caulking between electrical box and drywall. Install gaskets behind receptacle and switch plates and use plug covers when receptacles are not in use.
- (L) Air leakage was likely occurring through each fireplace. Reduce heat loss through each fireplace by installing inflatable flue sealers or consider installing a top-mount damper that can be operated from the fireplace opening.

Basement

- (M) Consider insulating the heating supply and return pipes, and domestic hot water pipes where exposed in the basement using fiberglass pipe insulation. Make sure there are no gaps in the insulation and that the splits face downward.

Exterior

- (H) Make sure that the exterior of the building is kept in good repair. Repoint mortar joints as needed. Consider applying a siloxane sealer to the exterior to reduce moisture intrusion into the masonry.
- (H) The use of roof de-icing equipment may not be needed or at least diminished if roof insulation is installed.

Other Important Recommendations

Safety/Durability It is strongly recommended that a carbon monoxide (CO) detector be installed to ensure timely warning of a boiler or furnace vent malfunction.

Safety/Durability Lastly, if improvements are made on the building, we recommend having a radon in air test performed since making a building tighter may change radon concentrations within the structure.



Estimated Savings

Roof insulation upgrade

Assumptions

R-value of existing roof deck: 3.46

R-value of roof deck with proposed insulation upgrade
(Hunter H-Sheild NB 4 inch): 24.46

Average heating degree days for Brunswick, ME: 7,353

Approximate area of roof deck: 4,300 square feet

Average cost per therm of natural gas: \$1.83 (excluding service charge)

Anticipated cost (not including roofing materials): \$52,000

Anticipated cost (including roofing materials): \$77,400

Estimated savings

1,882 therms/year

\$3,430/year

Simple payback excluding roofing: ~15 years

Simple payback including roofing: ~22.5 years

Savings to investment ratio (not including roofing materials and assuming a 40-year service life for the insulation panels): 2.64



SOLAR'S MOST TRUSTED



REC ALPH α [®] PURE-RX SERIES

DATASHEET

470 W_P

22.6% EFFICIENCY

21 W/FT²



EXPERIENCE



PERFORMANCE

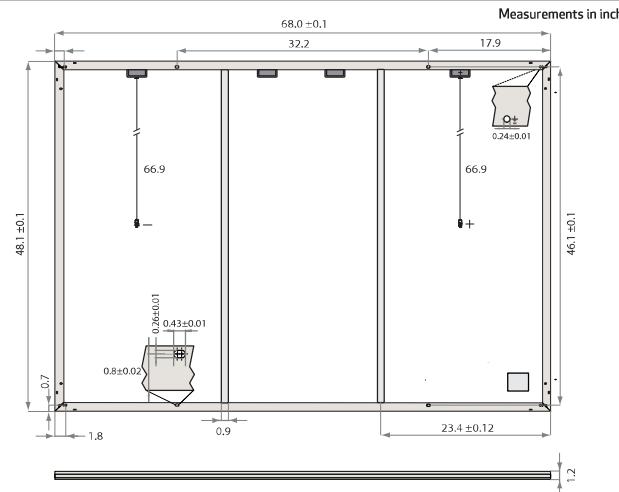
REC ALPHA® PURE-RX SERIES

DATASHEET



GENERAL DATA

Cell Type	88 half-cut bifacial REC heterojunction cells, with lead-free, gapless technology
Glass	0.13 in. solar glass with anti-reflective surface treatment in accordance with EN12150
Backsheet	Highly resistant polymer (Black)
Frame	Anodized aluminum (Black)
Junction Box	4-part, 4 bypass diodes, lead-free IP68 rated, in accordance with IEC 62790
Connectors	Stäubli MC4 PV-KBT4/KST4 (12AWG) in accordance with IEC 62852, IP68 only when connected
Cable	12 AWG solar cable, 66.9 in. + 66.9 in. in accordance with EN50618
Dimensions	68 x 47.4 x 1.2 in. (22.4 ft ²)
Weight	51.6 lbs
Origin	Made in Singapore



ELECTRICAL DATA

PRODUCT CODE*: RECxxxAA Pure-RX

Power Output - P _{MAX} (W _p)	450	460	470
Watt Class Sorting - (W)	0/+10	0/+10	0/+10
Nominal Power Voltage - V _{MPP} (V)	54.3	54.9	55.4
Nominal Power Current - I _{MPP} (A)	8.29	8.38	8.49
Open Circuit Voltage - V _{OC} (V)	65.1	65.3	65.6
Short Circuit Current - I _{SC} (A)	8.81	8.88	8.95
Power Density (W/ft ²)	20.1	20.5	21
Panel Efficiency (%)	21.6	22.1	22.6

STC

Power Output - P _{MAX} (W _p)	343	350	358
Nominal Power Voltage - V _{MPP} (V)	51.2	51.7	52.2
Nominal Power Current - I _{MPP} (A)	6.70	6.77	6.86
Open Circuit Voltage - V _{OC} (V)	61.3	61.6	61.8
Short Circuit Current - I _{SC} (A)	7.11	7.17	7.23

NMOT

Values at standard test conditions (STC: air mass AM1.5, irradiance 1000 W/m², temperature 77°F (25°C)), based on a production spread with a tolerance of P_{MAX}, V_{OC} & I_{SC} ±3% within one watt class. Nominal module operating temperature (NMOT: air mass AM1.5, irradiance 800 W/m², temperature 68°F (20°C), windspeed 3.3 ft/s (1 m/s)). *Where xxx indicates the nominal power class (P_{MAX}) at STC above.

MAXIMUM RATINGS

Operational Temperature	-40 °F-185 °F
System Voltage	1000 V
Maximum Test Load (front)	+7000 Pa (146 lb/ft ²)
Maximum Test Load (rear)	-4000 Pa (83.4 lb/ft ²)
Max Series Fuse Rating	25 A
Max Reverse Current	25 A

*See installation manual for mounting instructions.
Design load = Test load / 1.5 (safety factor)

TEMPERATURE RATINGS*

Nominal Module Operating Temperature	44 °C ± 2 °C
Temperature coefficient of P _{max}	-0.24%/K
Temperature coefficient of V _{OC}	-0.24%/K
Temperature coefficient of I _{SC}	0.04%/K

*The temperature coefficients stated are linear values

DELIVERY INFORMATION

Panels per Pallet	33
Panels per 40 ft GP/high cube container	594 (18 Pallets)
Panels per 53 ft truck	792 (24 Pallets)

Available from:

CERTIFICATIONS

IEC 61215:2021; IEC 61730:2016; UL 61730	
IEC 62716	Ammonia Resistance
IEC 61701	Salt Mist (SM6)
IEC 61215:2016	Hailstone (35mm)
UL 61730	Fire Type 2
IEC 62321	Lead-free acc. to RoHS EU 863/2015
ISO 14001; ISO 9001; IEC 45001; IEC 62941	



Living building challenge compliant

Declare.

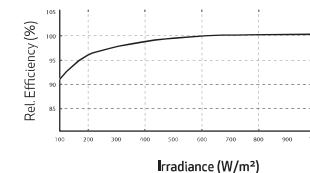
WARRANTY

	Standard	REC ProTrust
Installed by an REC Certified Professional	No	Yes
System Size	All	<25 kW 25-500 kW
Product Warranty (yrs)	20	25
Power Warranty (yrs)	25	25
Labor Warranty (yrs)	0	25
Power in Year 1	98%	98%
Annual Degradation	0.25%	0.25%
Power in Year 25	92%	92%

The REC ProTrust Warranty is only available on panels purchased through an REC Certified Solar Professional installer. Warranty conditions apply. See www.recgroup.com for more details.

LOW LIGHT BEHAVIOR

Typical low irradiance performance of module at STC:



Founded in 1996, REC Group is an international pioneering solar energy company dedicated to empowering consumers with clean, affordable solar power. As Solar's Most Trusted, REC is committed to high quality, innovation, and a low carbon footprint in the solar materials and solar panels it manufactures. Headquartered in Norway with operational headquarters in Singapore, REC also has regional hubs in North America, Europe, and Asia-Pacific.

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Document 7



