

**Window project
125 Brattle Street
Ellen Williams and Larry Miller, owners**

Continued from meeting of February 6, 2024 of the Cambridge Historical Commission

Photographs of existing windows, photos of the home, drawings of the home, and descriptions of proposed replacement windows were provided in materials for the February 6th meeting.

We were asked at the last meeting to do further research into the options for our windows.

Proposed Project: Replacement of 24 windows with Marvin Elevate double-pane energy efficient windows. One door requires either the addition of a storm door or addition of a storm door plus revision or replacement of the door.

Problem: Excessively drafty, leaky windows with ice and condensation forming inside of home

Objective: Increased energy efficiency of home built in 1941 and resolution of the condensation and interior ice that is destroying paint and wood.

We believe that replacing the existing windows will result in a substantial energy savings and will have minimal impact on the appearance of the house from Brattle Street.

Background:

Window summary from Department of Energy study from Pacific Northwest National Laboratory

The U factor measuring energy loss for conventional storm windows mounted over double hung single pane windows is approx. 0.46-0.47. With the addition of low-e storm windows, the U factor is decreased to approx. 0.36. Modern double- or triple glazed coated windows have U-factors of 0.20-0.25. Thus, modern windows result in 30% to nearly 50% improvement in energy loss compared to single pane windows with the most efficient storm windows. Note that modern windows also reduce solar heat gain in the summer, with limited effect on visible light transmission, resulting in further energy savings.

Reference:

TD Culp, SH Widder, and KA Cort. 2015. *Thermal and Optical Properties of Low-E Storm Windows and Panels* PNNL-24444, Pacific Northwest National Laboratory, Richland, WA.

Possible solutions:

1. **Leaky door** may be partially ameliorated with installation of full glass storm door or fixed with both a storm door and a new custom-made wooden door. The cost for a new storm door alone with full glass is approximately \$2400.

2. Replace existing windows with Marvin Elevate identical to windows in the new addition. Each replacement window will mirror the divided light configuration of the current existing window.

Approximate cost \$60,000

U value with Marvin Elevate (Fiberglass/Wood) would be 0.28.

The screenshot shows a PowerPoint presentation titled "Window project 125 Brattle Street - PowerPoint" with a slide titled "Slide 3 of 4". The slide content is a web browser window displaying the NFRC Directory Search results for product MAR-N-272-01148-00001. The browser window has a search bar and a "New Search" button. The search results are displayed in a table format.

GENERAL INFORMATION

CPD #	U-factor	SHGC	VT	Condensation Resistance	Air Leakage	Ventilation Rating (Standard Screen)	Ventilation Rating (Enhanced Screen)
MAR-N-272-01148-00001	0.28	0.21	0.40	56			

RATINGS INFORMATION

Group ID	Manufacturer Product Code	Frame/Seal Type	Glazing Layers	Low-E	Gap Width	Spacer	Gap Fill	Grid	Divider	Tint
1	CCDCtprma0000000	WF-WF	2	0.02(2)	0.462	SS-D	Fill 1: ARG/ARG(00/10)	N	-	CL

Click to add notes

U value with Marvin Ultimate (wood/wood) 0.22

Window project 125 Brattle Street - PowerPoint

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e (8)

Marvin Windows and Doors : MAR-N-68

Series Name : **Ultimate Wood Double Hung / Single Hung**

Product Category : **Window**

Frame Material : **Wood**

ME U-Factor Min : **0.13**

ME U-Factor Max : **0.22**

ME Total ES Options Certified : **744**

ME Northern Zone Options : **0**

ME Southern Zone Options : **0**

Product Type : **Double Hung**

ME SHGC Min : **0.13**

ME SHGC Max : **0.41**

ME North-Central Zone Options : **0**

ME South-Central Zone Options : **0**

CLICK FOR MORE INFORMATION

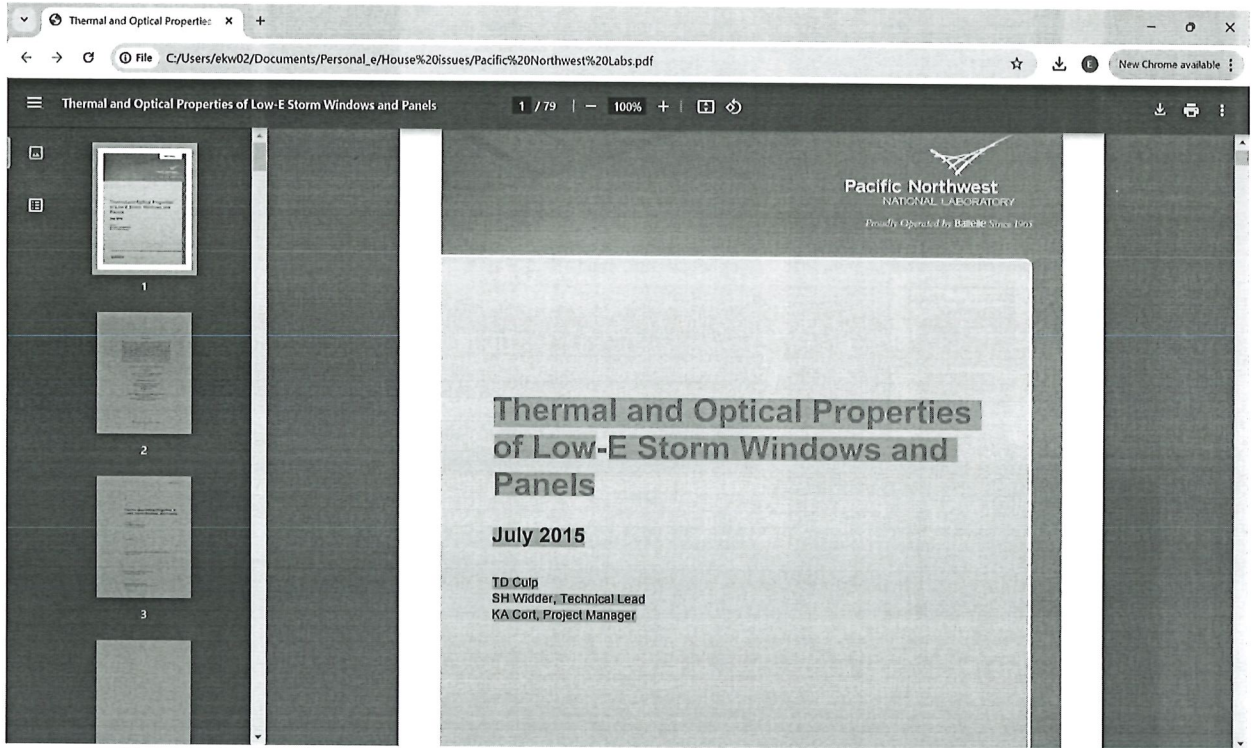
Marvin Windows and Doors : MAR-N-318

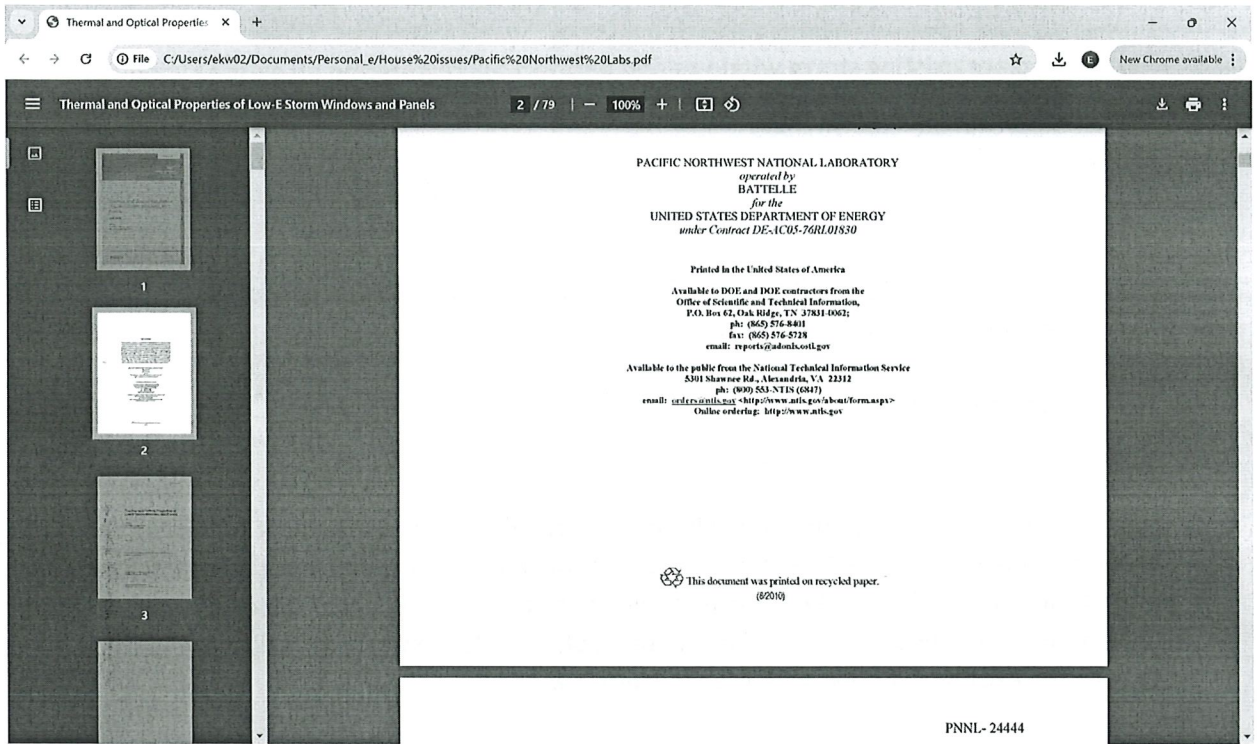
Click to add notes

Slide 4 of 4 Accessibility: Investigate

3. **Replace existing storm windows and perform mechanical restoration on existing windows**

Approximate cost \$30,000-\$33,850





Thermal and Optical Properties of Low-E Storm Windows and Panels

15 / 79 | 164% +

he occupant. Improved comfort also reduces the inclination for the occupant to increase the thermostat setting in response to feeling cold. Also, condensation of moisture on the window surface can form when the window surface temperature drops below the dew point of the room air. While the dew point and interior humidity depends strongly on the home and occupant lifestyle, increasing the window surface temperature will reduce the potential for condensation formation.

Table 1. U-Factor, SHGC, VT of Storm Windows and Panels over Nonmetal Framed Primary Windows

Base Window	Storm Type	U-Factor (Btu/hr ft ² F)	SHGC	VT
Wood Double Hung, Single Glazed	--	0.88	0.61	0.66
	Clear, Exterior	0.47	0.54	0.57
	Clear, Interior	0.46	0.54	0.59
	Low-E, Exterior	0.36	0.46	0.52
	Low-E, Interior	0.34	0.50	0.54
Wood Double Hung, Double Glazed	--	0.51	0.57	0.61
	Clear, Exterior	0.34	0.49	0.53
	Clear, Interior	0.32	0.51	0.55
	Low-E, Exterior	0.28	0.42	0.48
	Low-E, Interior	0.26	0.47	0.50
Wood Fixed, Single Glazed	--	0.87	0.64	0.69
	Clear, Exterior	0.46	0.58	0.62
	Clear, Interior	0.45	0.56	0.62
	Low-E, Exterior	0.34	0.50	0.56
	Low-E, Interior	0.34	0.52	0.57
Wood Fixed, Double Glazed	--	0.47	0.60	0.64

Result would improve energy efficiency but theoretically only to a U value of 0.47 with regular glass or 0.36 with low-emissivity glass. The actual U value would likely be greater since the estimates above are based on new windows. This is roughly half of the energy savings compared to the replacement option. The U value is not a linear scale.

4. **Replace existing storm windows and perform full restoration** on existing windows

Approximate cost \$67,500

We expect that this would yield a U value of close to 0.34, given that the fully restored windows would be similar in energy efficiency to new single pane windows.

5. **Replace existing windows with double-pane replica windows** custom made to look as close as possible to existing windows.

Approximate cost: \$108,000

Summary:

Having evaluated these options, we believe the best solution for our home it to replace the existing windows with Marvin Elevate windows to give us the most energy efficiency and a long-term maintenance free solution. We believe this would be an almost imperceptible difference in the appearance of the house as viewed from Brattle Street. We therefore are asking for permission to replace the existing windows with Marvin Elevate windows.

DOE Window Study

File Edit View History Bookmarks Tools Help

storm window comp X CLA 1040 Exchange X Thermal and Optical Prop X ENERGY STAR Certi X print screen on wind X

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Summary

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PNNL 24444

Pacific Northwest

Thermal and Optical Properties of Low-E Storm Windows and Panels

July 2015

TD Gulp
SH Wulder, Technical Lead
KJ Cort, Project Manager

U.S. DEPARTMENT OF ENERGY

Search

6:05 PM 2/10/2025

DOE Window data

File Edit View History Bookmarks Tools Help

Inbox (289) - lgm81581@gmail X

Inbox - Mail - lgmiller@comcast X

file:///C:/Users/lmiller/OneDrive - Apnimed/Documents/Other/PNNL_24444_Thermal_and_Optical_Properties of 1 X

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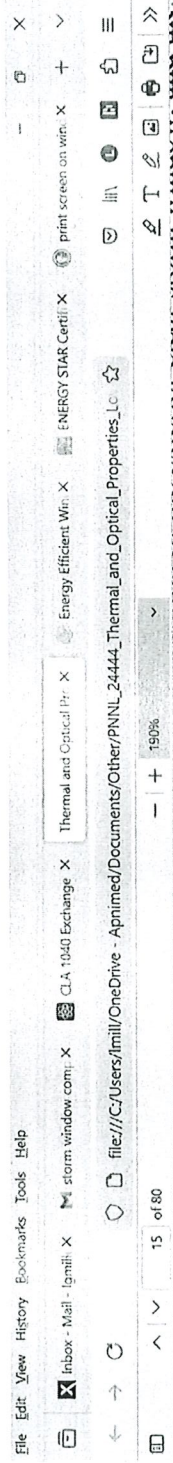
interior humidity depends strongly on the home and occupant lifestyle, increasing the window surface temperature will reduce the potential for condensation formation.

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	Low-E, Interior	0.34	0.52	0.57
	--	0.47	0.60	0.64
Wood Fixed, Double Glazed	Clear, Exterior	0.32	0.53	0.57
	Clear, Interior	0.32	0.54	0.58
	Low-E, Exterior	0.27	0.46	0.52
	Low-E, Interior	0.25	0.50	0.53

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DOE Window data



the addition of low-E glass. This warmer interior surface temperature not only reflects the significant reduced heat loss through the window, but also the improved thermal comfort and resistance to condensation formation. The human body interprets temperature disparities in its surroundings as discomfort, so increasing the window surface temperature closer to its surroundings improves comfort for the occupant. Improved comfort also reduces the inclination for the occupant to increase the thermostat setting in response to feeling cold. Also, condensation of moisture on the window surface can reduce the window surface temperature drops below the dew point of the room air. While the dew point interior humidity depends strongly on the home and occupant lifestyle, increasing the window surface temperature will reduce the potential for condensation formation.

Table 1. U-Factor, SHGC, VT of Storm Windows and Panels over Nonmetal Framed Primary V

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		(Btu/hr ft ² F)	SHGC
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Directory Search

New Search

NPRC Codes

Detailed Product Ratings

GENERAL INFORMATION
Manufacturer:
Series Name:
Operator Type:
Air Leakage:
Ventilation Rating (Standard)
Ventilation Rating (Enhanced)

CFD #	U-factor	SHGC	VT	Condensation Resistance	Air Leakage	Ventilation Rating (Standard Screen)	Ventilation Rating (Enhanced Screen)
IMAR-N-277-01148-00001	0.28	0.21	0.49	56			

Group ID	Manufacturer Product Code	Frame/Sash Type	Glazing Layers	Low-E	Gap Widths	Spacer	Gap Fill	Grid	Divider	Tint
1	CCDCorona0000000	WFWF	2	0.02(2)	0.462	SS-D	Fill 1: ARG/ARG(90/10)	N	-	CL

PATENTS INFORMATION

Request Export

CPD #	Manufacturer/Product Code	U-factor	SHGC	VT	Condensation Resistance	Product Description
MAR: N-272-07145-00001	CCDCbnaa0000000	0.45	0.59	0.62	42	Fiberglass/Wood Combination Fiberglass/Wood Combination, Fill 1: AIR(100), CL, No Grid
MAR: N-272-07144-00001	CCDCbjze0000000	0.43	0.59	0.62	44	Fiberglass/Wood Combination Fiberglass/Wood Combination, Fill 1: ARG/AIR(90/10), CL, No Grid
MAR: N-272-07145-00001	CCDCbnda0000000	0.32	0.32	0.54	52	Fiberglass/Wood Combination Fiberglass/Wood Combination, Fill 1: AIR(100), LowE, CL, No Grid
MAR: N-272-07145-00002	CCDCbnda0000000	0.32	0.32	0.54	52	Fiberglass/Wood Combination Fiberglass/Wood Combination, Fill 1: AIR(100), LowE, CL, No Grid
MAR: N-272-07145-00001	CCDCbnaa0000000	0.28	0.32	0.54	55	Fiberglass/Wood Combination Fiberglass/Wood Combination, Fill 1: ARG/AIR(90/10), LowE, CL, No Grid

Marvin Ultimate (wood)

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storm window comparisc: X CLA 1040 Exchange X Thermal and Optical Properties X Energy Efficient Windows X ENERGY STAR Certified V X

https://www.energystar.gov/most-efficient/me-certified-windows/results?formid=59451--466-1-02635018&cr

Picture Window (481)
Sidelite (32)
Show more

ENERGY STAR Partner
A Window Inc. (4)
ABI Windows LLC (3)
Advanced Window Corp. (16)
All American Window Company, LLC (2)
Alpen High Performance Products (11)
American Window Alliance (8)
Amsco Windows (20)
Show more

Frame Material
Aluminum (55)
Composite Material (31)
Fiberglass (60)
Other (1068)
Steel (12)
Vinyl (or other plastic) (1032)
Wood (470)

Series Name: Ultimate Wood Direct Glaze Rectangle / Polygon
Product Category: Window
Frame Material: Wood
ME U-Factor Min.: 0.13
ME U-Factor Max.: 0.22
ME Total ES Options Certified: 2,710
ME Northern Zone Options: 0
ME Southern Zone Options: 0
CLICK FOR MORE INFORMATION

Product Type: Picture Window
ME SHGC Min.: 0.16
ME SHGC Max.: 0.47
ME North-Central Zone Options: 0
ME South-Central Zone Options: 0
Most Efficient 2025

Series Name: Marvin Windows and Doors : MAR-N-68
Product Category: Window
Frame Material: Wood
ME U-Factor Min.: 0.13
ME U-Factor Max.: 0.22
ME Total ES Options Certified: 744
ME Northern Zone Options: 0
ME Southern Zone Options: 0
CLICK FOR MORE INFORMATION

Product Type: Double Hung
ME SHGC Min.: 0.13
ME SHGC Max.: 0.41
ME North-Central Zone Options: 0
ME South-Central Zone Options: 0
Most Efficient 2025

Series Name: Marvin Windows and Doors : MAR-N-318
Product Category: Window
Frame Material: Wood
ME U-Factor Min.: 0.13
CLICK FOR MORE INFORMATION

Product Type: Double Hung
ME SHGC Min.: 0.13

Search

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