

## ANN ARBOR HISTORIC DISTRICT COMMISSION

### Staff Report

**ADDRESS:** 822 W Jefferson Street, Application Number HDC15-038

**DISTRICT:** Old West Side Historic District

**REPORT DATE:** April 7, 2015

**REPORT PREPARED BY:** Jill Thacher, Historic Preservation Coordinator

**REVIEW COMMITTEE DATE:** Monday, April 4, 2015

<b>OWNER</b>	<b>APPLICANT</b>
<b>Name:</b> Urban Energy Works LLC Panos Tharouniatis	Same
<b>Address:</b> 2847 Boardwalk Drive Ann Arbor, MI	
<b>Phone:</b> (734) 945-6154	

**BACKGROUND:** This vacant lot was formerly part of a larger lot that included the houses at 818 and 814 West Jefferson. It appears to have always been vacant.

**LOCATION:** The site is located on the northeast corner of West Jefferson and South Seventh Streets.

**APPLICATION:** The applicant seeks HDC approval to construct a new two-story home on the lot and remove a landmark tree.

#### APPLICABLE REGULATIONS

##### From the Secretary of the Interior's Standards for Rehabilitation:

- (9) New additions, exterior alterations, or related new construction shall not destroy historic materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
  
- (10) New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the



future, the essential form and integrity of the historic property and its environment would be unimpaired.

**From the Secretary of the Interior's Guidelines for Rehabilitating Historic Buildings (other SOI Guidelines may also apply):**

**District/Neighborhood**

*Not Recommended:* Introducing new construction into historic districts that is visually incompatible or that destroys historic relationships within the district or neighborhood.

**From the Ann Arbor Historic District Design Guidelines (other Guidelines may apply):**

**Guidelines for All New Construction**

**Appropriate**

- Retaining site features that are important to the overall historic character
- Retaining the historic relationship between buildings, landscape features and open space
- Designing new features so they are compatible with the historic character of the site, district, and neighborhood
- Basing the site location of new buildings on existing district setbacks, orientation, spacing and distance between adjacent buildings
- Designing new sidewalks, entrances, steps, porches and canopies to be consistent with the historic rhythm established in the district
- Designing new buildings to be compatible with, but discernible from, surrounding buildings that contribute to the overall character of the historic district in terms of height, form, size, scale, massing, proportions, and roof shape

**Not Appropriate**

- Introducing any new building that is out of scale or otherwise inappropriate to the setting's historic character
- Introducing a new feature that is visually incompatible with or that destroys the patterns of the site or the district
- Introducing new construction onto a site or in a district, which is visually incompatible in terms of size, scale, design, materials, and texture or which destroys relationships on the site or the district

## New Construction in Historic Residential Settings

### Appropriate

- Maintaining the existing spacing of front and side yard setbacks along a block as seen from the street
- Orienting the front of a house towards the street and clearly identifying the front door
- Designing a new front façade that is similar in scale and proportion to surrounding buildings that contribute to the overall character of the historic district
- Designing the spacing, placement, scale, orientation, proportion, pattern and size of window and door openings in new buildings to be compatible with surrounding historic buildings
- Selecting materials and finishes that are compatible with historic materials and finishes found in surrounding buildings that contribute to their historic character
- Placing utility connections at the rear or other locations that minimize visibility from the street

### Not Appropriate

- Paving a high percentage of a front yard area or otherwise disrupting the landscape pattern within front yard setbacks
- Placing a structure outside of the existing pattern of front yard setbacks along a historic residential block

## STAFF FINDINGS

1. The site is currently vacant and has been used as a garden and landscaped area for the home as 818 next door. On the center of the lot is a landmark spruce tree that would have to be removed to allow construction of a house.
2. The proposed house's front setback along West Jefferson is consistent with those of other homes on the block, as is the gable-front orientation and height of the roof ridge. To make the building discernible from surrounding houses that contribute to the historic character of the Old West Side, the design incorporates an offset roof ridge and two-story stair enclosure on the east side that reflect modern architectural practices.
3. The front façade reflects the proportions and features of contributing structures on the block in its height, fenestration, and inset front porch. The triple-glazed windows are casements throughout the house, with deeply inset glazing that will cast strong shadow lines.
4. The west side elevation (facing South Seventh), is more modern in appearance, mainly because of the irregular size and spacing of the second floor windows. The lot slopes and is about seven feet higher in the front than at the back, This allows a driveway off South

Seventh and a garage partially underneath the house. On top of the other part of the garage is a deck accessed from the main floor of the house, and a stairway leading down to the backyard.

5. Materials include cladding of smooth cementitious lap siding on most of the house, with the exception of the east side of the stair enclosure which is clad in tongue-and-groove vertical wood. Window, soffit, and other trim is “engineered”. The front and rear porch railings and posts are wood, and the base of the front porch is clad in brick veneer. Front and rear doors are fiberglass with a single full light. Windows are triple-paned vinyl. A basement egress window and well are located near the front of the house on the west elevation. Staff feels the proposed materials are modern yet compatible in appearance with the surrounding district.
6. A landscape plan is provided that shows native plant materials and grapevine trellises along the rear property line. The landscaping is appropriate in layout and scale for the proposed house and surrounding district.
7. Both roof faces are proposed to be covered by solar panels. The panels are in three equally sized and spaced groups on the west-face. The larger east roof-face has more panels, also in three groups. Since the building is modern and the solar does not necessarily need to be hidden in a way that is appropriate on most historic homes, staff feels that silver-edged panels are acceptable (instead of black-on-black).
8. The building reflects the scale and massing of the adjacent properties, and modern materials reflect the historic materials used on the adjacent buildings. It is staff’s opinion that the proposed house is generally compatible in exterior design, arrangement, texture, material and relationship to the surrounding neighborhood and meets *The Secretary of the Interior’s Standards for Rehabilitation and Guidelines for Rehabilitation*, particularly numbers 9 and 10, and the *Ann Arbor Historic District Commission Guidelines* for new construction.

**POSSIBLE MOTIONS:** (Note that the motion supports staff findings and is only a suggestion. The Review Committee, consisting of staff and at least two Commissioners, will meet with the applicant on site and then make a recommendation at the meeting.)

I move that the Commission issue a certificate of appropriateness for the application at 822 West Jefferson Street, a contributing property in the Old West Side Historic District, to permit the construction of a 2 story residence as detailed on the submitted drawings. The proposed work is compatible in exterior design, arrangement, texture, material and relationship to the surrounding resources and meets *The Secretary of the Interior’s Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*, in particular standards 9 and 10, and the *Ann Arbor Historic District Design Guidelines*, particularly those for new construction.

#### **MOTION WORKSHEET:**

I move that the Commission issue a Certificate of Appropriateness for the work at 822 West Jefferson Street in the Old West Side Historic District

\_\_\_\_\_ Provided the following condition(S) is (ARE) met: 1) STATE CONDITION(s)

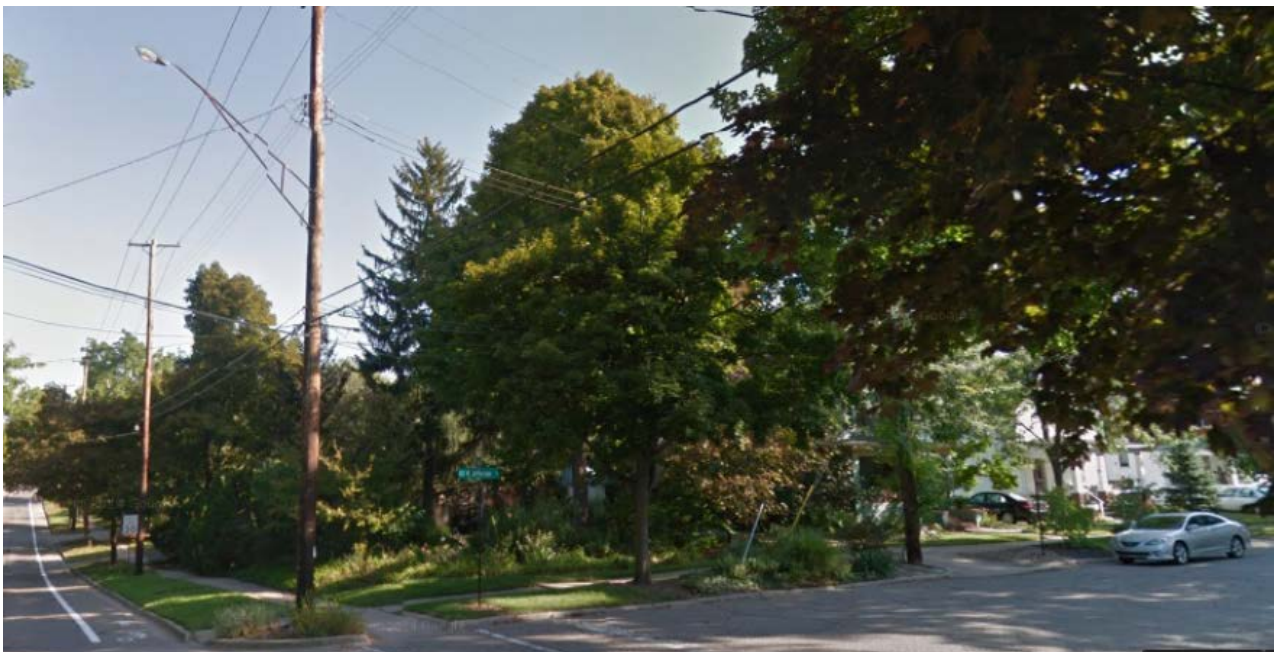
The work is generally compatible with the size, scale, massing, and materials and meets the Secretary of the Interior’s Standards for Rehabilitation, standard(S) number(S) (*circle all that apply*): 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

**ATTACHMENTS:** application, photos, drawings.

2010 Aerial Photo



822 W Jefferson (September 2014 photo, courtesy Google Streetview)





**City of Ann Arbor**  
**PLANNING & DEVELOPMENT SERVICES — PLANNING SERVICES**

301 E. Huron Street | P.O. Box 8647 | Ann Arbor, Michigan 48107-8647  
p. 734.794.6265 | f. 734.994.8312 | [planning@a2gov.org](mailto:planning@a2gov.org)

**ANN ARBOR HISTORIC DISTRICT COMMISSION APPLICATION**

<b>Section 1: Property Being Reviewed and Ownership Information</b>
Address of Property: <u>822 W. Jefferson St.</u>
Historic District: <u>Old West Side</u>
Name of Property Owner (If different than the applicant): _____
Address of Property Owner: _____
Daytime Phone and E-mail of Property Owner: _____
Signature of Property Owner: _____ Date: _____
<b>Section 2: Applicant Information</b>
Name of Applicant: <u>Urban Energy Works LLC / Panos Tharouniatis</u>
Address of Applicant: <u>2847 Boardwalk Dr.</u>
Daytime Phone: ( <u>734</u> ) <u>945 6154</u> Fax: ( _____ ) _____
E-mail: <u>panos@urbanenergyworks.com</u>
Applicant's Relationship to Property: <input checked="" type="checkbox"/> owner <input type="checkbox"/> architect <input type="checkbox"/> contractor <input type="checkbox"/> other
Signature of applicant: _____ Date: _____
<b>Section 3: Building Use (check all that apply)</b>
<input checked="" type="checkbox"/> Residential <input checked="" type="checkbox"/> Single Family <input type="checkbox"/> Multiple Family <input type="checkbox"/> Rental <input type="checkbox"/> Commercial <input type="checkbox"/> Institutional
<b>Section 4: Stille-DeRossett-Hale Single State Construction Code Act</b> (This item <b>MUST BE INITIALED</b> for your application to be <b>PROCESSED</b> )
Public Act 169, Michigan's Local Historic Districts Act, was amended April 2004 to include the following language: "...the applicant has certified in the application that the property where the work will be undertaken has, or will have before the proposed completion date, a fire alarm or smoke alarm complying with the requirements of the Stille-DeRossett-Hale Single State Construction Code Act, 1972 PA 230, MCL 125.1501 to 125.1531."
Please initial here: <u>PT</u>

**Section 5: Description of Proposed Changes (attach additional sheets as necessary)**

1. Provide a brief summary of proposed changes. see attached

2. Provide a description of existing conditions. see attached

3. What are the reasons for the proposed changes? see attached

4. Attach any additional information that will further explain or clarify the proposal, and indicate these attachments here. see attached

5. Attach photographs of the existing property, including at least one general photo and detailed photos of proposed work area.

**STAFF USE ONLY**

Date Submitted: \_\_\_\_\_ Application to \_\_\_\_\_ Staff or \_\_\_\_\_ HDC

Project No.: HDC Fee Paid: \_\_\_\_\_

Pre-filing Staff Reviewer & Date: \_\_\_\_\_ Date of Public Hearing: \_\_\_\_\_

Application Filing Date: \_\_\_\_\_ Action: \_\_\_\_\_ HDC COA \_\_\_\_\_ HDC Denial

Staff signature: \_\_\_\_\_ \_\_\_\_\_ HDC NTP \_\_\_\_\_ Staff COA

Comments:

Section 5: Description of Proposed Changes (attach additional sheets as necessary)

1. Provide a brief summary of proposed changes.

*We propose to build a new 2160 ft<sup>2</sup>, two-story, single-family spec home on an unbuilt lot.*

2. Provide a description of existing conditions.

*The lot was previously owned by the neighbor, 818 W. Jefferson St. It has no record of an occupied structure. The lot currently has vegetation consisting of grasses and other low plantings, bushes, a small garden tended by the previous owner, and trees of varying maturity.*

3. What are the reasons for the proposed changes?

*We want to build a home and sell it.*

UEW 3.20.15 HDC 822 W. Jefferson St

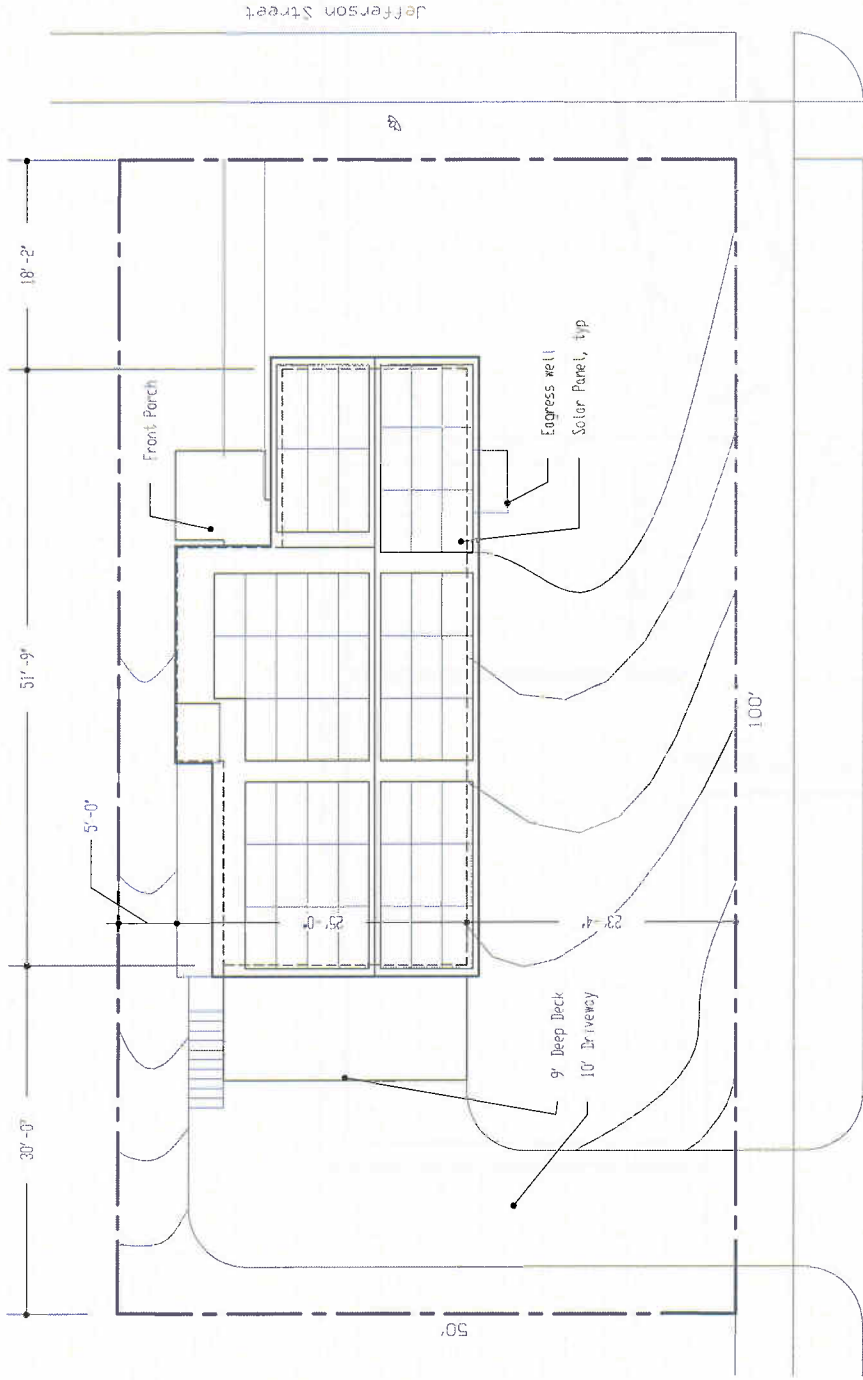




North East aerial view



North West street view



822 Jefferson  
 Lot size: 5000 sf  
 Zoning R2A  
 Setbacks: 25F, 30R, 5S  
 Height: 30

Setback determination  
 Jefferson Street  
 Ch55 5:57  
 818 Jefferson 15'7"  
 814 Jefferson 15'8"  
 810 Jefferson 22'10"  
 Avg Setback 18'0"

South Seventh Street  
 Ch55 5:58  
 Minimum building width 25'

Rear lot coverage  
 Ch55 5:59  
 Rear setback area: 30' \* 50' = 1500sf  
 Maximum coverage 35% \* 1500sf = 525sf  
 Actual 25' x 9' = 225' < 525sf

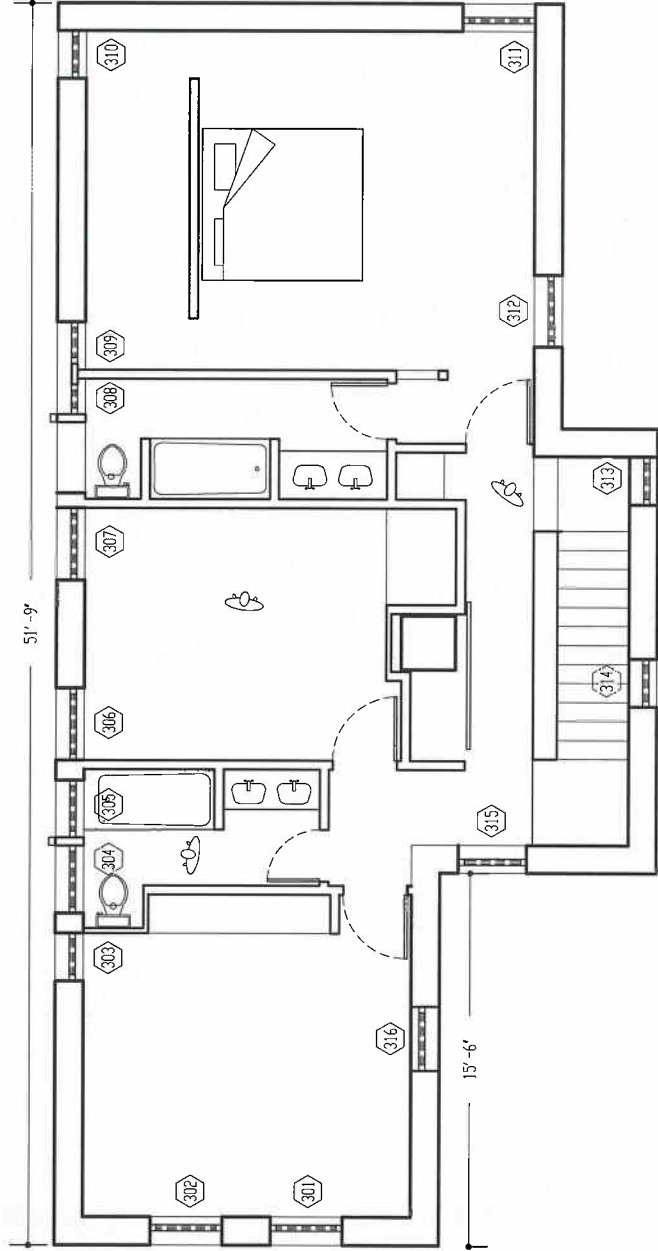
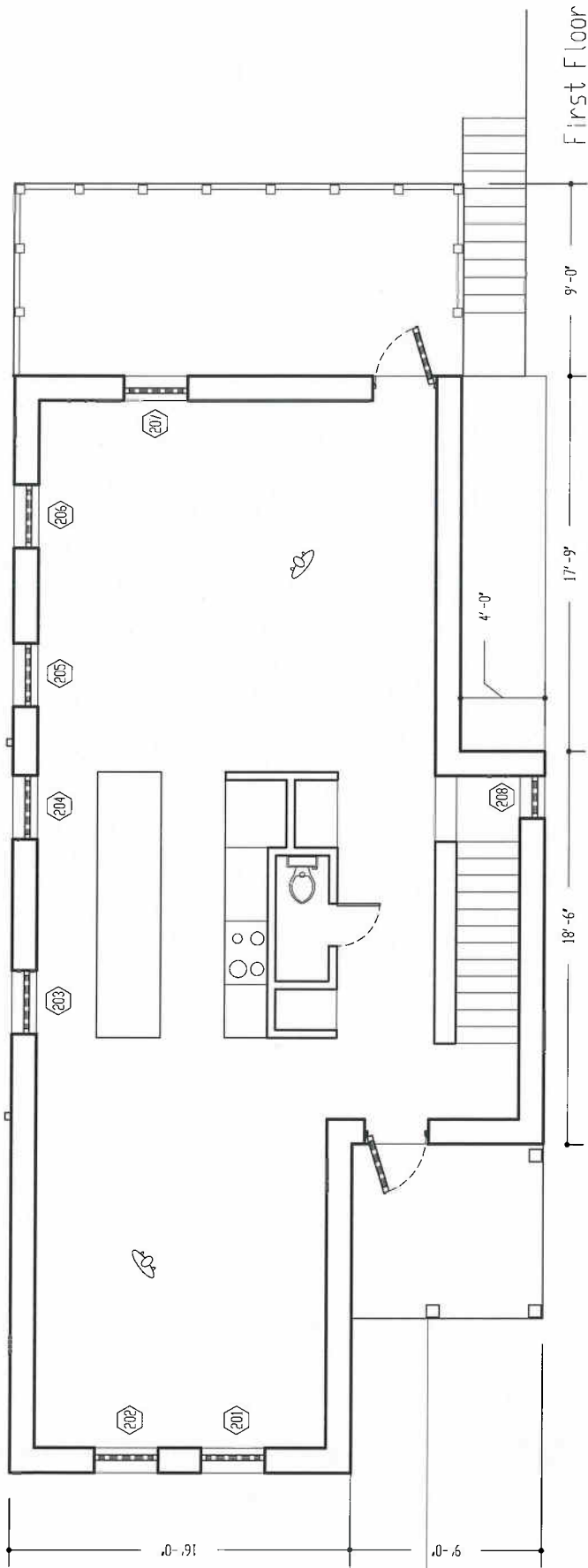


UEW

822 W. Jefferson

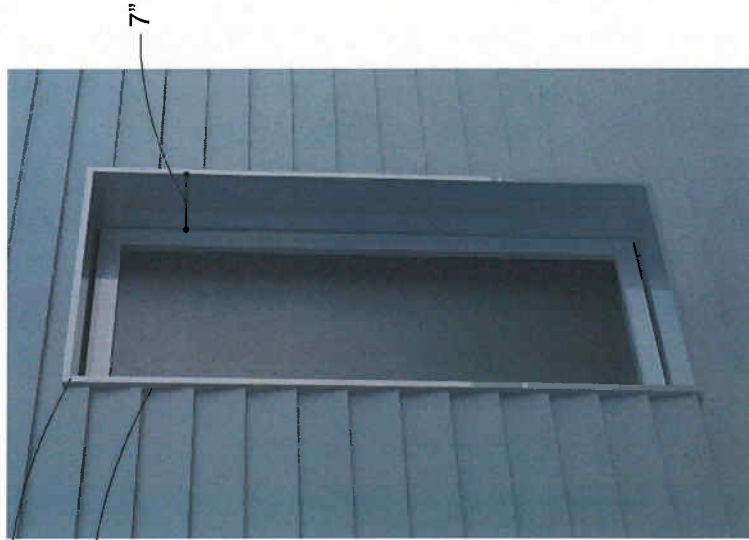
Site Plan scale 1' = 200'

3.18.2015

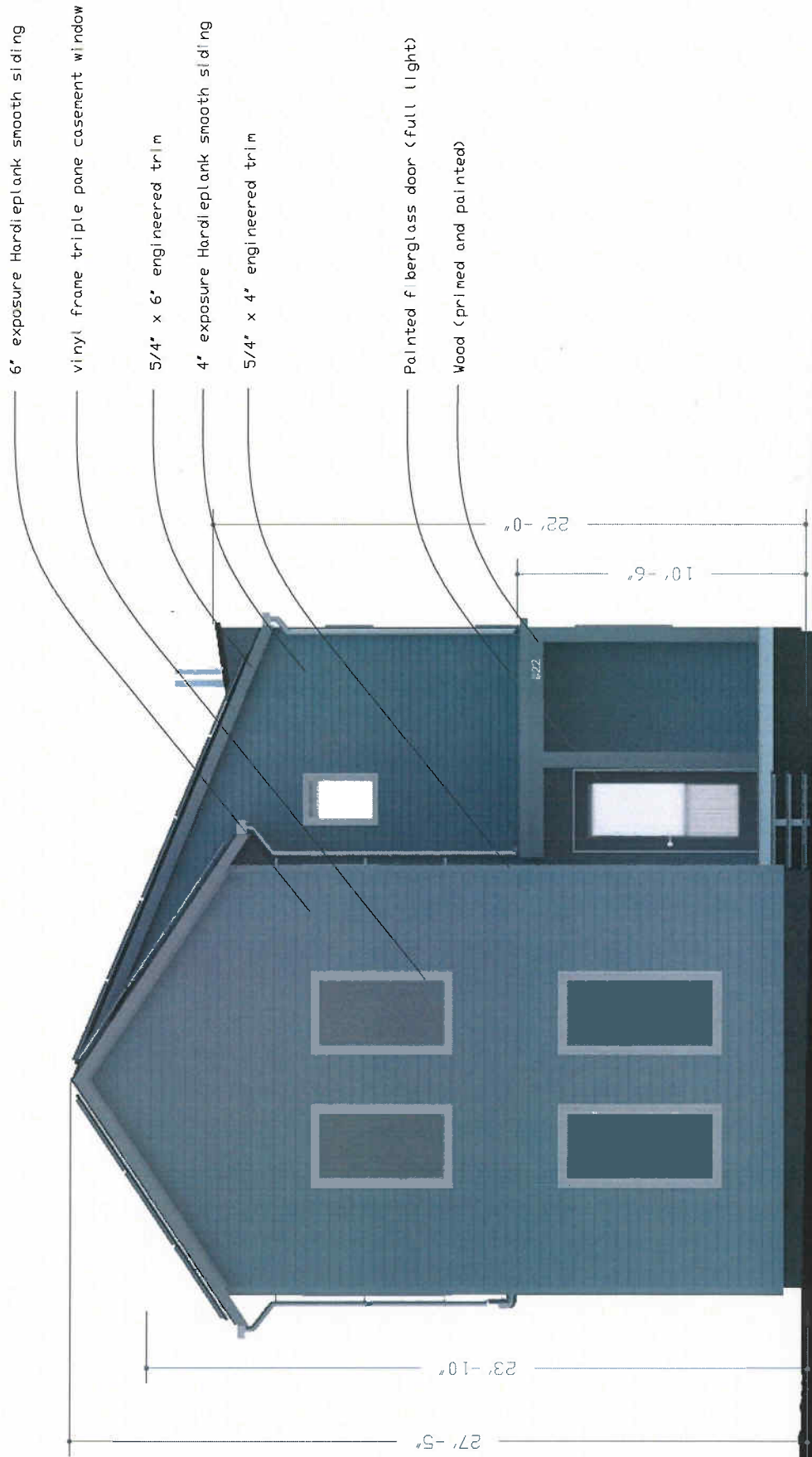


3/4" trim

3/4" depth



No.	Style	Width	Height	Material	Manufacturer	Model
101	Triple glazed casement	24"	54"	Vinyl	Kensington	Williamsport
102	Triple glazed casement	24"	54"	Vinyl	Kensington	Williamsport
201	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
202	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
203	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
204	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
205	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
206	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
207	Triple glazed casement	36"	72"	Vinyl	Kensington	Williamsport
208	Triple glazed casement	42"	42"	Vinyl	Kensington	Williamsport
301	Triple glazed casement	36"	62"	Vinyl	Kensington	Williamsport
302	Triple glazed casement	36"	62"	Vinyl	Kensington	Williamsport
303	Triple glazed casement	24"	66"	Vinyl	Kensington	Williamsport
304	Triple glazed casement	34"	24"	Vinyl	Kensington	Williamsport
305	Triple glazed casement	34"	24"	Vinyl	Kensington	Williamsport
306	Triple glazed casement	36"	58"	Vinyl	Kensington	Williamsport
307	Triple glazed casement	36"	58"	Vinyl	Kensington	Williamsport
308	Triple glazed casement	60"	72"	Vinyl	Kensington	Williamsport
309	Triple glazed casement	24"	72"	Vinyl	Kensington	Williamsport
310	Triple glazed casement	24"	72"	Vinyl	Kensington	Williamsport
311	Triple glazed casement	36"	63"	Vinyl	Kensington	Williamsport
312	Triple glazed casement	36"	84"	Vinyl	Kensington	Williamsport
313	Triple glazed casement	22"	20"	Vinyl	Kensington	Williamsport
314	Triple glazed casement	24"	20"	Vinyl	Kensington	Williamsport
315	Triple glazed casement	22"	32"	Vinyl	Kensington	Williamsport
316	Triple glazed casement	32"	32"	Vinyl	Kensington	Williamsport



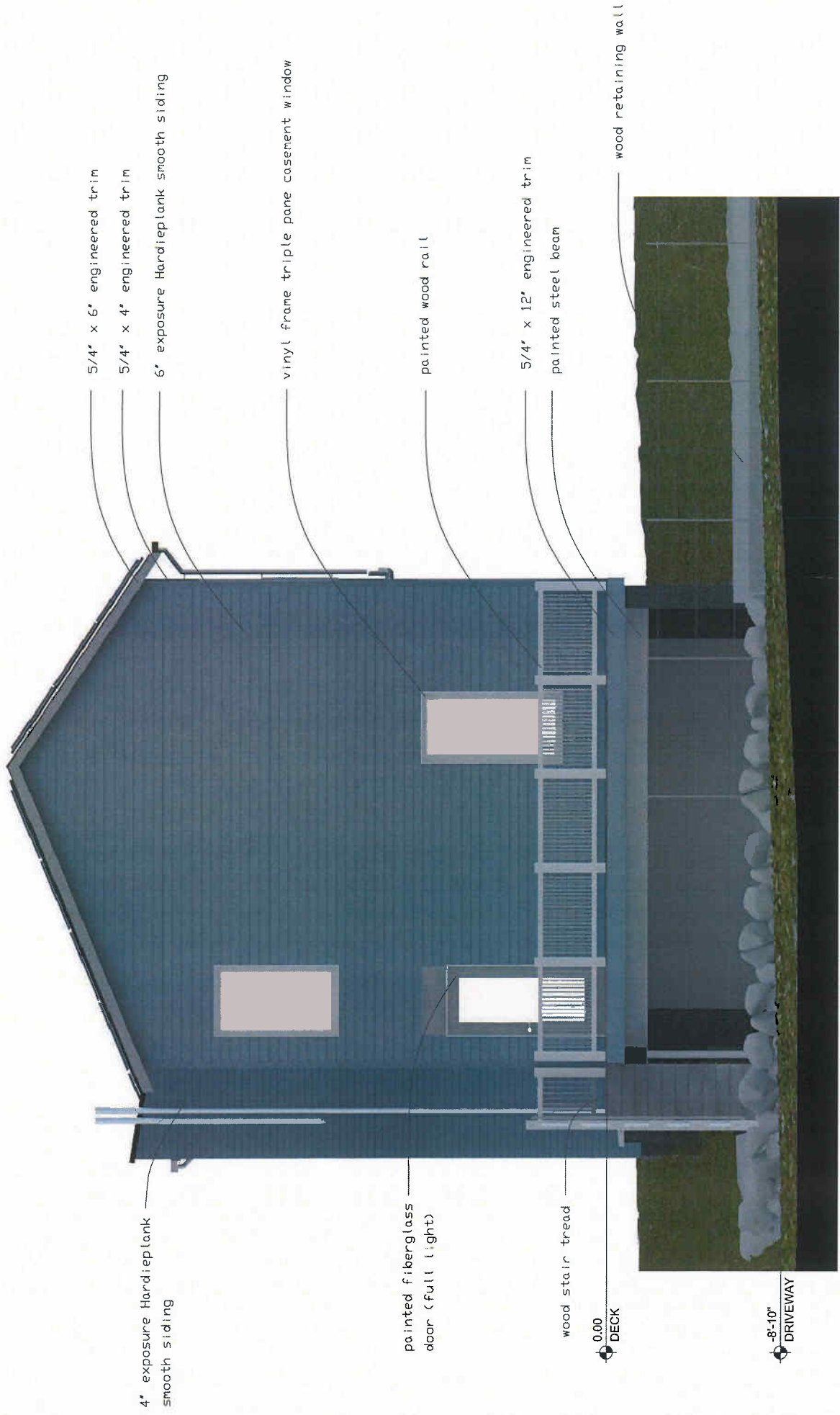
UEW

822 W. Jefferson

South Elevation

scale 2" = 1'-0"

3.18.2015



5/4' x 6' engineered trim

5/4' x 4' engineered trim

6' exposure Hardieplank smooth siding

vinyl frame triple pane casement window

5/4' x 12' engineered trim

5/4' x 6' engineered trim

6' exposure Hardieplank smooth siding

wood retaining wall

4' exposure Hardieplank smooth siding

painter fiberglass door (full light)

wood stair tread

0.00 DECK

-8'-10" DRIVEWAY

UEW

822 W. Jefferson

North Elevation

scale 2" = 1'-0"

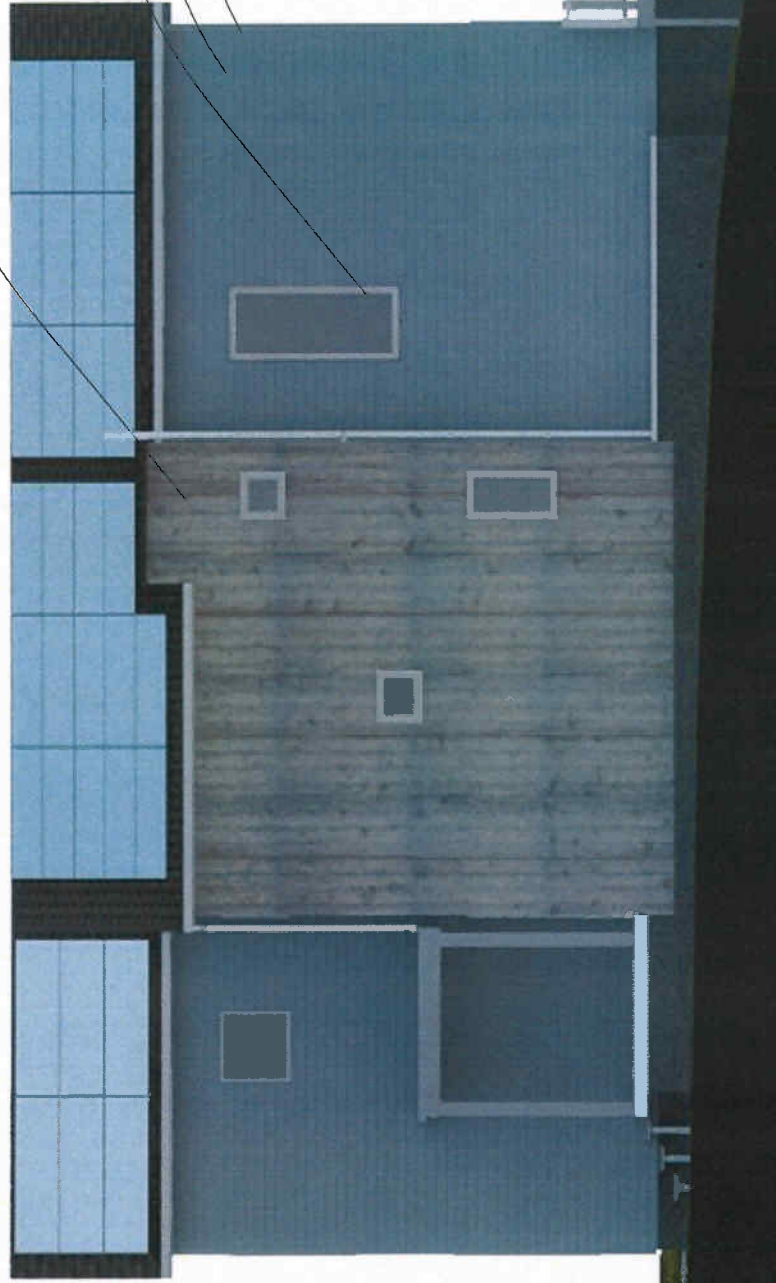
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t&g wood siding

vinyl frame triple pane casement window

6" exposure Hardieplank smooth siding

5/4" x 4" eng neered trim



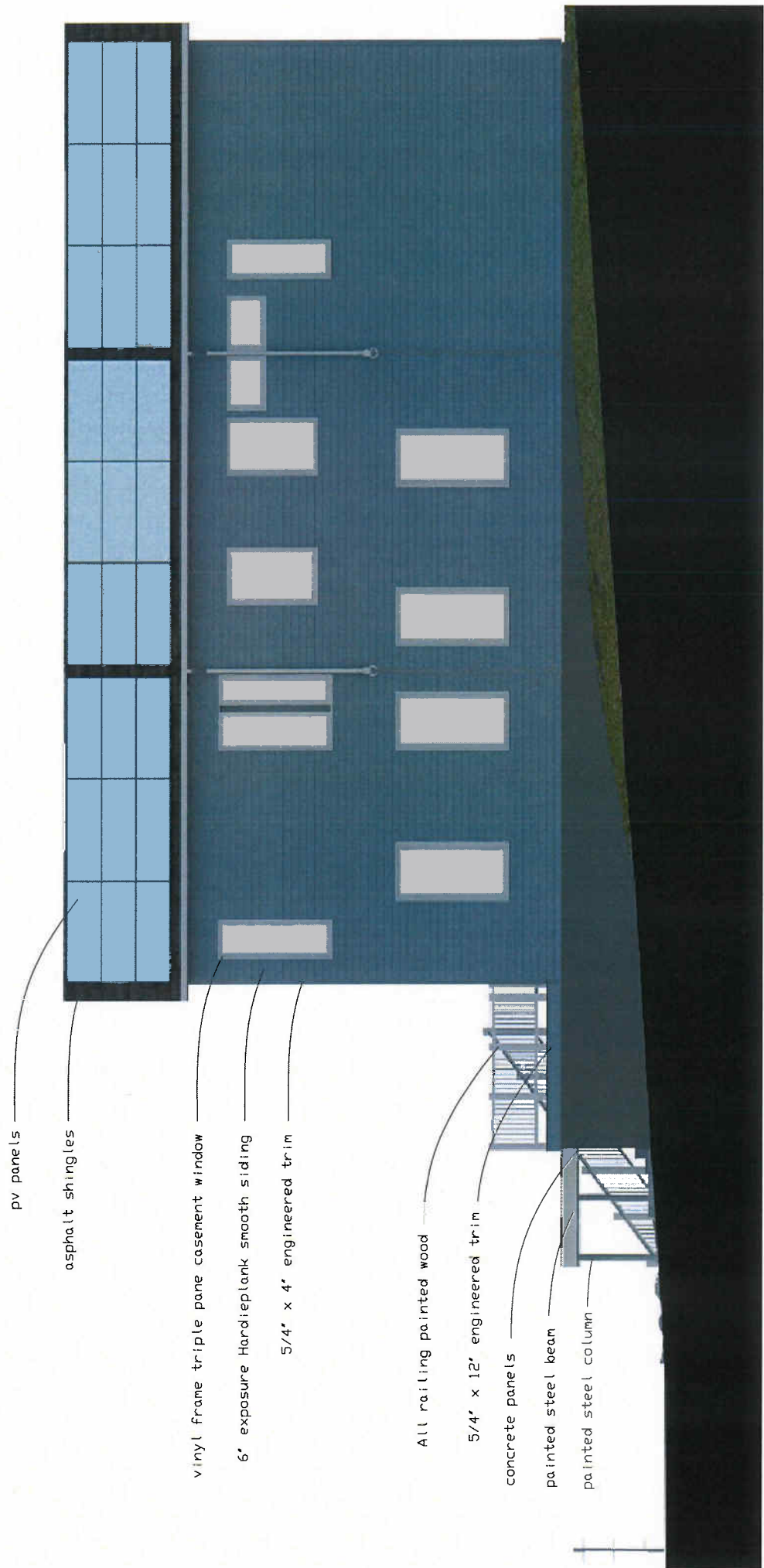
UEW

822 W. Jefferson

East Elevation

scale 1-1/2" = 1'-0"

3.18.2015



UEW

822 W. Jefferson

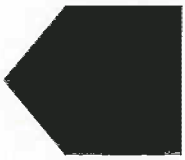
West Elevation

scale 1-1/2" = 1'-0"

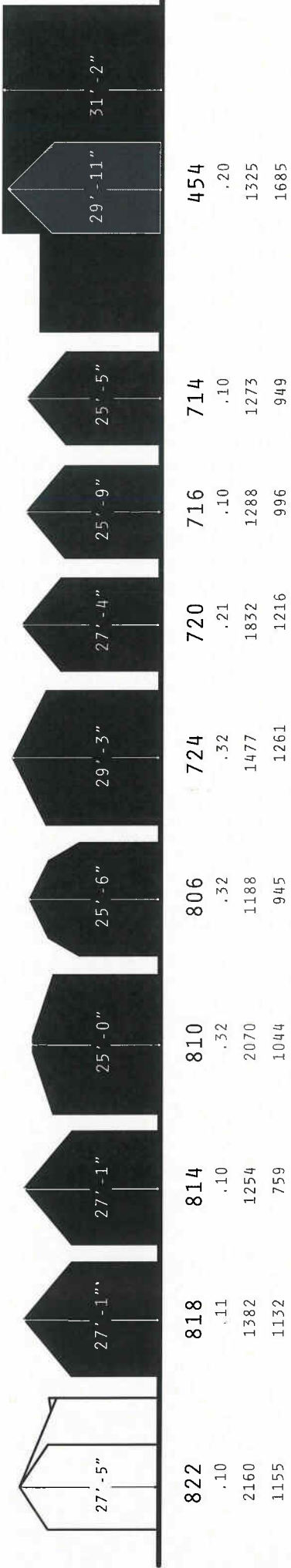
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KEY



ADDRESS  
LOT ACREAGE  
SQUARE FEET  
TOTAL FOOTPRINT

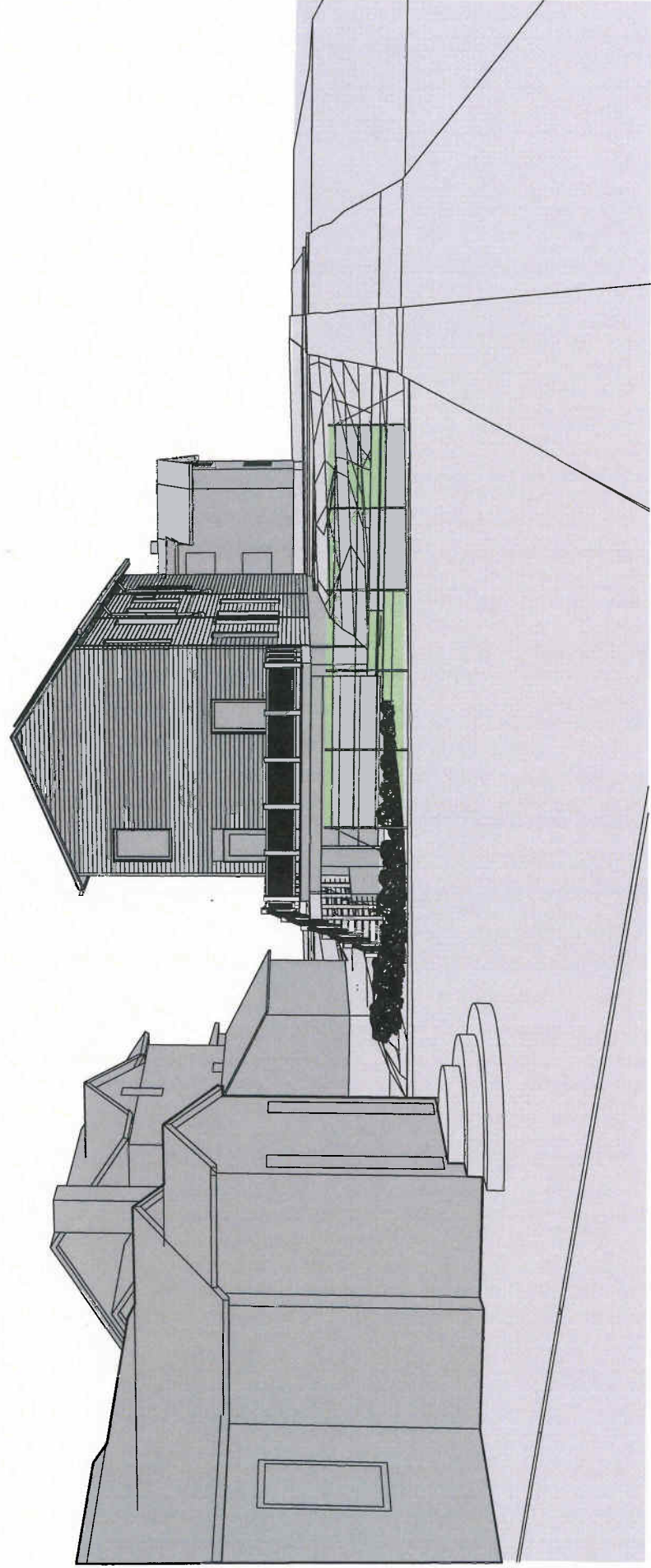


UEW

822 W. Jefferson

Height Comparison

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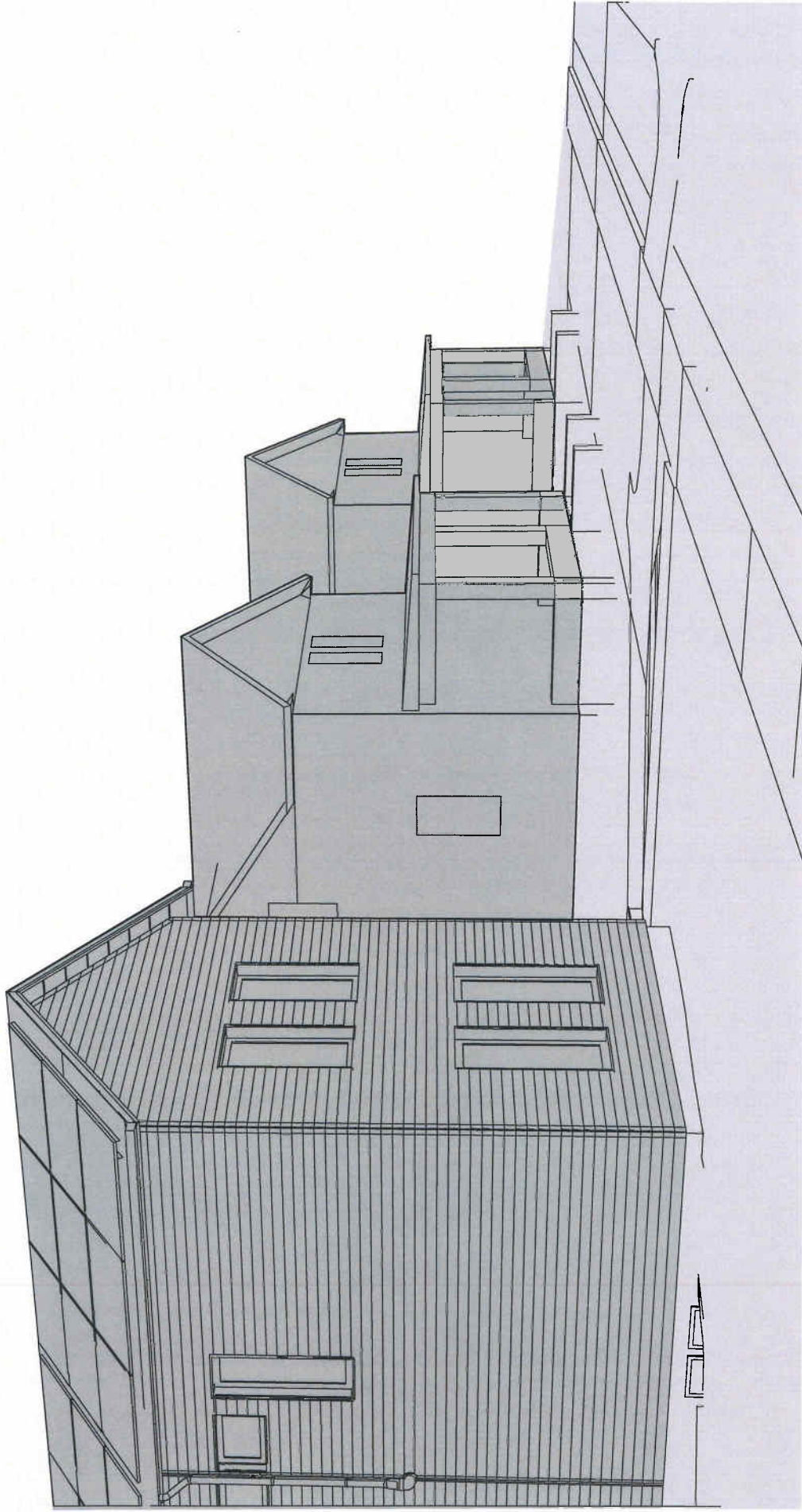


UEW

822 W. Jefferson

Comparison Perspective

3.18.2015



UEW

822 W. Jefferson

Comparison Perspective

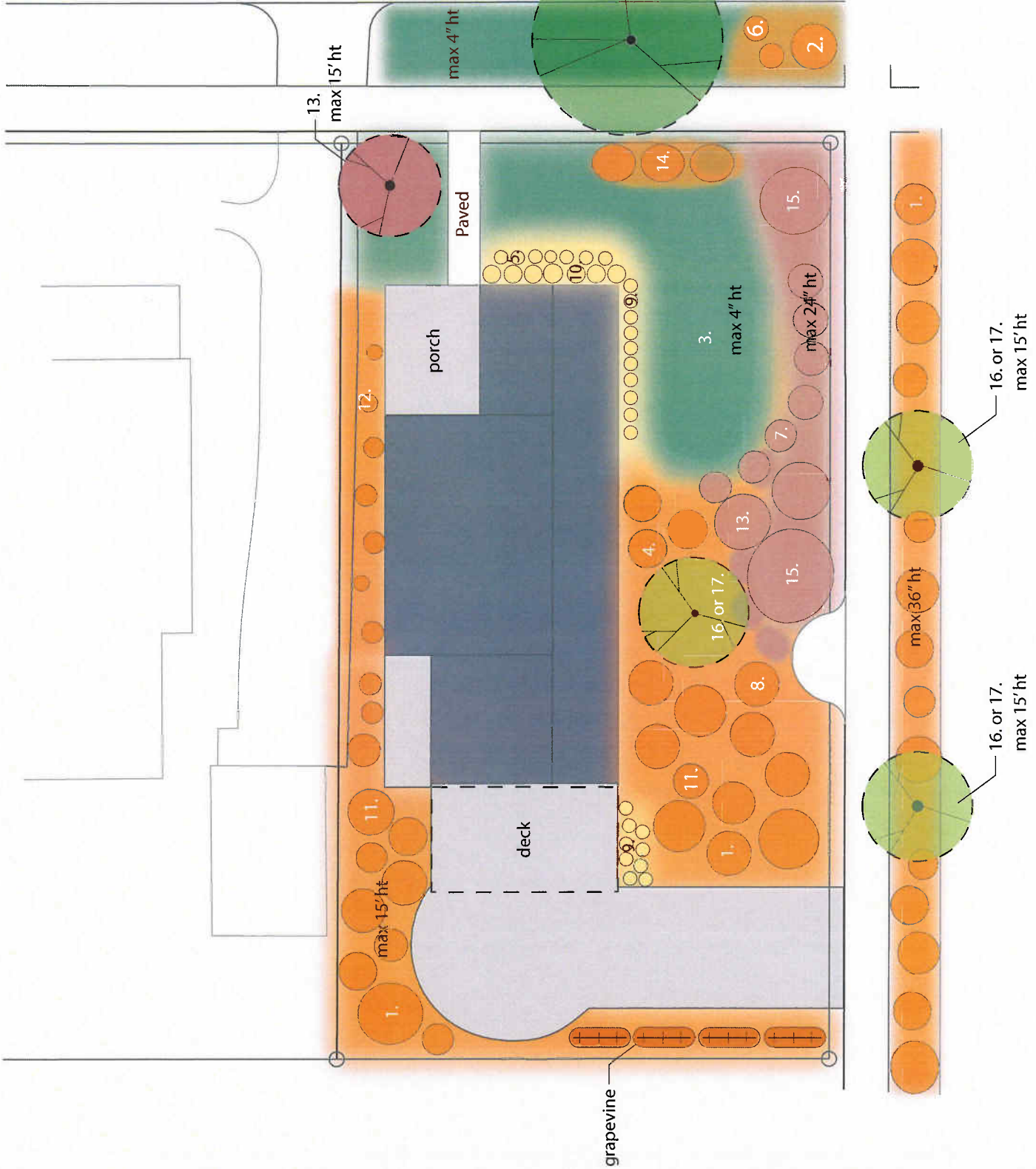
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KEY

- Edible
- Wild
- Manicured
- Walkable
- Impervious Surface

\* numbers refer to attached plant guide

\*\* all plantings are native species

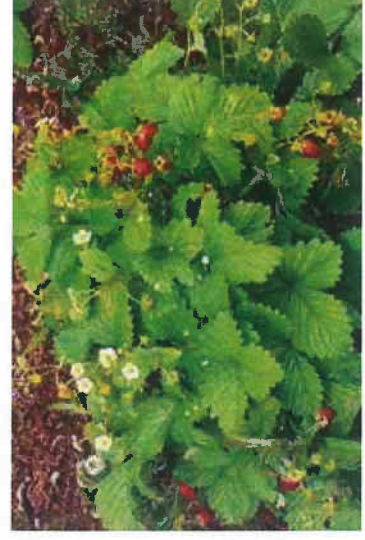




1.



4.



7.



2.



5.



8.



3.



6.



9.

KEY

- 1. Switch grass (*Panicum virgatum*)
- 2. Little bluestem (*Schizachyrium scoparium*)
- 3. Buffalo grass (*Bouteloua dactyloides*)

- 4. Prairie dropseed (*Sporobolus heterolepis*)
- 5. Nodding wild onion (*Allium cernuum*)
- 6. Wild geranium (*Geranium maculatum*)

- 7. Strawberry (*Fragaria ananassa*)
- 8. Purple coneflower (*Echinacea purpurea*)
- 9. Wild indigo (*Baptisia australis*)

10.

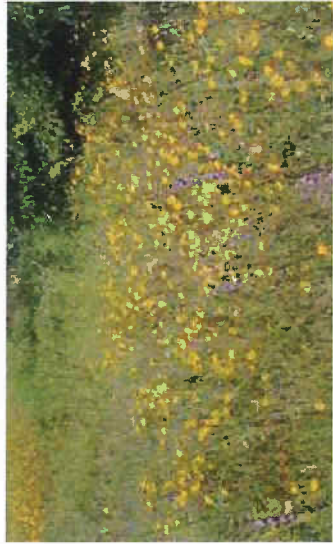


13.

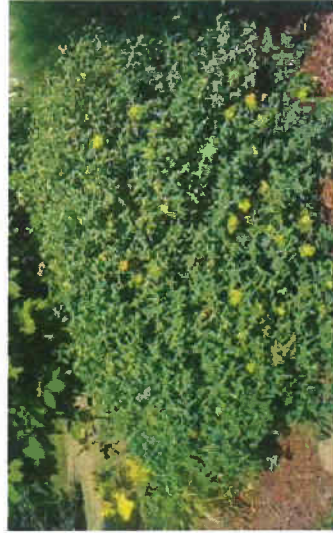


16.

11.



14.



17.



12.



15.



10. Butterflyweed (*Asclepias tuberosa*)

11. Western sunflower (*Helianthus occidentalis*)

12. Beebalm (*Monarda*)

13. Serviceberry (*Amelanchier*)

14. Shrubby St. John's wort (*Hypericum prolificum*)

15. Beach plum (*Prunus maritima*)

16. Ironwood (*Carpinus caroliniana*)

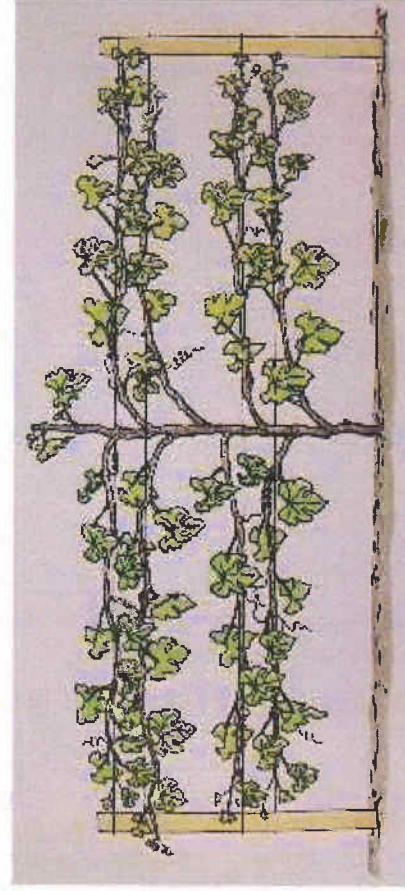
17. Black gum (*Nyssa sylvatica*)



712 Daniel St., Ann Arbor



Michigan Vineyard



grapevine



Trellis system

# Q.PRO-G3 245-260

## POLYCRYSTALLINE SOLAR MODULE

The new **Q.PRO-G3** is the reliable evergreen for all applications. The third module generation from Q CELLS has been optimised across the board: improved output yield, higher operating reliability and durability, quicker installation and more intelligent design.

### INNOVATIVE ALL-WEATHER TECHNOLOGY

- Maximum yields with excellent low-light and temperature behaviour.
- Certified fully resistant to level 5 salt fog

### ENDURING HIGH PERFORMANCE

- Long-term Yield Security due to Anti PID Technology<sup>1</sup>, Hot-Spot Protect, and Traceable Quality Tra.Q™.
- Long-term stability due to VDE Quality Tested – the strictest test program.

### SAFE ELECTRONICS

- Protection against short circuits and thermally induced power losses due to breathable junction box and welded cables.
- Increased flexibility due to MC4-intermateable connectors.the entire production process from cells to modules while making Q CELLS solar modules forgery proof.

### PROFIT-INCREASING GLASS TECHNOLOGY

- Reduction of light reflection by 50%, plus long-term corrosion resistance due to high-quality
- Sol-Gel roller coating processing.

### LIGHTWEIGHT QUALITY FRAME

- Stability at wind loads of up to 5400 Pa with a module weight of just 19 kg due to slim frame design with high-tech alloy.

### MAXIMUM COST REDUCTIONS

- Up to 31 % lower logistics costs due to higher module capacity per box.

### EXTENDED WARRANTIES

- Investment security due to 12-year product warranty and 25-year linear performance warranty<sup>2</sup>.



### THE IDEAL SOLUTION FOR:



Rooftop arrays on commercial/industrial buildings



Ground-mounted solar power plants



Rooftop arrays on residential buildings

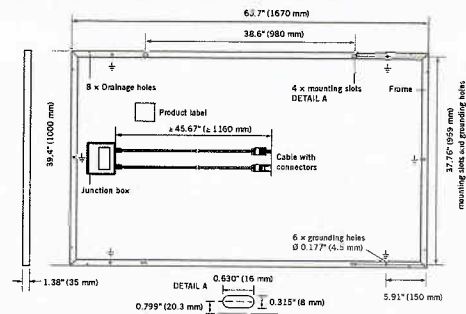
<sup>1</sup> APT test conditions: Cells at -1000V against grounded, with conductive metal foil covered module surface, 25°C, 168 h

<sup>2</sup> See data sheet on rear for further information.



## MECHANICAL SPECIFICATION

<b>Format</b>	65.7 in × 39.4 in × 1.38 in (including frame) (1670 mm × 1000 mm × 35 mm)
<b>Weight</b>	41.89 lb (19.0 kg)
<b>Front Cover</b>	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
<b>Back Cover</b>	Composite film
<b>Frame</b>	Anodized aluminum
<b>Cell</b>	6 × 10 polycrystalline solar cells
<b>Junction box</b>	Protection class IP67, with bypass diodes
<b>Cable</b>	4 mm <sup>2</sup> Solar cable; (+) ≥ 45.67 in (1160 mm), (-) ≥ 45.67 in (1160 mm)
<b>Connector</b>	SOLARLOK PV4, IP68



## ELECTRICAL CHARACTERISTICS

PERFORMANCE AT STANDARD TEST CONDITIONS (STC: 1000 W/m<sup>2</sup>, 25 °C, AM 1.5 G SPECTRUM)<sup>1</sup>

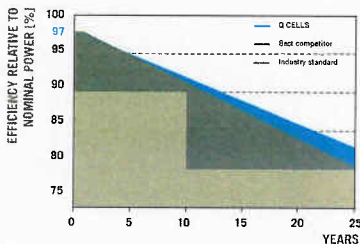
<b>NOMINAL POWER (+5 W/-0 W)</b>	[W]	245	250	255	260
<b>Average Power</b>	$P_{MPP}$ [W]	247.5	252.5	257.5	262.5
<b>Short Circuit Current</b>	$I_{SC}$ [A]	8.52	8.71	8.90	9.09
<b>Open Circuit Voltage</b>	$V_{OC}$ [V]	37.15	37.49	37.83	38.18
<b>Current at <math>P_{MPP}</math></b>	$I_{MPP}$ [A]	8.05	8.21	8.37	8.53
<b>Voltage at <math>P_{MPP}</math></b>	$V_{MPP}$ [V]	30.75	30.76	30.77	30.78
<b>Efficiency (Nominal Power)</b>	$\eta$ [%]	≥ 14.7	≥ 15.0	≥ 15.3	≥ 15.6

PERFORMANCE AT NORMAL OPERATING CELL TEMPERATURE (NOCT: 800 W/m<sup>2</sup>, 45 ± 3 °C, AM 1.5 G SPECTRUM)<sup>2</sup>

<b>NOMINAL POWER (+5 W/-0 W)</b>	[W]	245	250	255	260
<b>Average Power</b>	$P_{MPP}$ [W]	182.4	186.0	189.7	193.4
<b>Short Circuit Current</b>	$I_{SC}$ [A]	6.87	7.03	7.18	7.33
<b>Open Circuit Voltage</b>	$V_{OC}$ [V]	34.58	34.90	35.22	35.54
<b>Current at <math>P_{MPP}</math></b>	$I_{MPP}$ [A]	6.32	6.44	6.56	6.68
<b>Voltage at <math>P_{MPP}</math></b>	$V_{MPP}$ [V]	28.86	28.89	28.92	28.94

<sup>1</sup> Measurement tolerances STC: ± 3% ( $P_{MPP}$ ); ± 10% ( $I_{SC}$ ,  $V_{OC}$ ,  $I_{MPP}$ ,  $V_{MPP}$ )

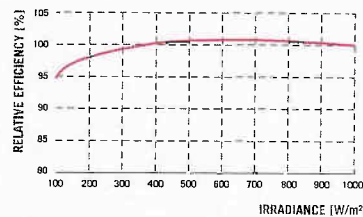
### Q CELLS PERFORMANCE WARRANTY



At least 97% of nominal power during first year. Thereafter max. 0.6% degradation per year.  
At least 92% of nominal power after 10 years.  
At least 83% of nominal power after 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

### PERFORMANCE AT LOW IRRADIANCE



The typical change in module efficiency at an irradiance of 200 W/m<sup>2</sup> in relation to 1000 W/m<sup>2</sup> (both at 25 °C and AM 1.5 G spectrum) is -2% (relative).

### TEMPERATURE COEFFICIENTS (AT 1000 W/m<sup>2</sup>, 25 °C, AM 1.5 G SPECTRUM)

<b>Temperature Coefficient of <math>I_{SC}</math></b>	$\alpha$ [%/K]	+0.04	<b>Temperature Coefficient of <math>V_{OC}</math></b>	$\beta$ [%/K]	-0.30
<b>Temperature Coefficient of <math>P_{MPP}</math></b>	$\gamma$ [%/K]	-0.42			

### PROPERTIES FOR SYSTEM DESIGN

<b>Maximum System Voltage <math>V_{SYS}</math></b>	[V]	1000	<b>Safety Class</b>	II
<b>Maximum Reverse Current <math>I_R</math></b>	[A]	20	<b>Fire Rating</b>	C
<b>Wind/Snow Load (in accordance with IEC 61215)</b>	[Pa]	5400	<b>Permitted module temperature on continuous duty</b>	-40 °C up to +85 °C

### QUALIFICATIONS AND CERTIFICATES

UL 1703; VDE Quality Tested; CE-compliant; IEC 61215 (Ed.2); IEC 61730 (Ed.1) application class A



### PARTNER

**NOTE:** Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

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Engineered in Germany





# Datasheet

## Crystalline PV Module

### NMC CHSM6610PR Series

\* NMC : Cell made in Non-Mainland China

250

255

260

EN

#### ELECTRICAL SPECIFICATIONS

	250	255	260
STC rated output ( $P_{mpp}$ )*	250 Wp	255 Wp	260 Wp
PTC rated output ( $P_{mpp}$ **)	229.01 Wp	233.8 Wp	238.5 Wp
Standard sorted output		-0/+5 Wp	
Warranted power output STC ( $P_{mpp\ min}$ )	250 Wp	255 Wp	260 Wp
Rated voltage ( $V_{mpp}$ ) at STC	30.10 V	30.40 V	30.50 V
Rated current ( $I_{mpp}$ ) at STC	8.31 A	8.39 A	8.53 A
Open circuit voltage ( $V_{oc}$ ) at STC	37.40 V	37.50 V	37.60 V
Short circuit current ( $I_{sc}$ ) at STC	8.83 A	8.86 A	8.95 A
Module efficiency	15.4%	15.7%	16.0%
Rated output ( $P_{mpp}$ ) at NOCT	185.0 Wp	189.0 Wp	193.0 Wp
Rated voltage ( $V_{mpp}$ ) at NOCT	28.20 V	28.50 V	28.60 V
Rated current ( $I_{mpp}$ ) at NOCT	6.57 A	6.63 A	6.74 A
Open circuit voltage ( $V_{oc}$ ) at NOCT	35.00 V	35.10 V	35.20 V
Short circuit current ( $I_{sc}$ ) at NOCT	7.12 A	7.20 A	7.27 A
Temperature coefficient ( $P_{mpp}$ )	-0.40%/K		
Temperature coefficient ( $I_{sc}$ )	+0.04%/K		
Temperature coefficient ( $V_{oc}$ )	-0.30%/K		
Normal operating cell temperature (NOCT)	45±2°C		
Maximum system voltage UL		600 Vdc	
Number of diodes		6	
Maximum series fuse rating		20 A	

\* Measurement tolerance +/- 3%

\*\* Estimated

