CITY OF SAINT PAUL
HERITAGE PRESERVATION COMMISSION STAFF REPORT

FILE NAME: 720 Seventh Street East – The Cambric Senior Apartments
DATE OF APPLICATION:
APPLICANT: Cedar Creek Energy
ARCHITECT: Gary Vogel, BKV Group, Inc.
OWNER: Dominium Development – Patrick Ostrom
DATE OF HEARING: July 28, 2016
HPC SITE/DISTRICT: Dayton's Bluff Heritage Preservation District
CATEGORY: New Construction
CLASSIFICATION: Building Permit
STAFF INVESTIGATION AND REPORT: Allison Suhan
DATE: July 19, 2016

A. SITE DESCRIPTION:

The Cambric is a 113-unit, four- and five-story apartment building with a 32,000 sq. ft. footprint and parking in the interior and rear. Four stories are above grade at the eastern end of the site while five are exposed at the western end and Bates Avenue elevation. Exterior materials include: split-face concrete block at the base, brick veneer, fiber-cement siding, vinyl windows, and a standing-seam metal mansard at the upper floor.

The site was previously vacant lot bounded by East Seventh Street, Maple Street, Bates Avenue and residential properties to the south. The site formerly contained several residential buildings and one commercial building, all of which were demolished in 2008. The lot slopes downhill from northeast to southwest.

B. PROPOSED CHANGES:

The applicant proposes to install a 96 module, solar panel array on the rooftop. The proposed solar panels are tenK Solar, model Reflect 26. The modules are proposed to be set back 36" from the northwest roof line and 13'8" from the southwest roof line. A service meter will also be installed for the solar array at the rear of the building.

C. BACKGROUND:

In 2004, the HPC conditionally approved the demolition of the Hospital Linen Site and the buildings were razed in 2005. Also in 2005, the HPC held a pre-application review for a multi-family residential project that was never constructed. In 2008, the remaining commercial and residential buildings at the site were demolished in order to meet deadlines for environmental clean-up. On December 18, 2014, the HPC voted 6-2 to conditionally approve the application to construct the new housing development.

D. GUIDELINE CITATIONS:

Dayton's Bluff Heritage Preservation District Design Guidelines (1992)
Leg. Code § 74.87. General principles.

1. *All work should be of a character and quality that maintains the distinguishing features of the building and the environment. The removal or alteration of distinctive architectural features should be avoided as should alterations that have no historical basis and which seek to create an earlier appearance. The restoration of altered original features, if documentable, is encouraged.*
2. *Changes which may have taken place in the course of time are evidence of the history and development of a building, structure, or site and its environment. These changes may have acquired significance in their own right, and this significance shall be recognized and respected.*

3. *Deteriorated architectural features should be repaired rather than replaced whenever possible. In the event of replacement, new materials should match the original in composition, design (including consideration of proportion, texture and detail), color and overall appearance.*
4. *New additions or alterations to structures should be constructed in such a manner that if such additions or alterations were to be removed in the future, the form and integrity of the original structure would be unimpaired.*
5. *The impact of alterations or additions on individual buildings as well as on the surrounding streetscape will be considered; major alterations to buildings which occupy a corner lot or are otherwise prominently sited should be avoided.*
6. *New construction should be compatible with the historic and architectural character of the district.*

Sec. 74.90. - New construction and additions.

(b) General guidelines:

(2) General character. *New construction should reinforce the historic architectural and visual character of the area. Specifically, it should refer to the traditional two- and three-story dwelling and commercial building module and typical setbacks already established in the district and in the adjacent area.*

(4) Views and vistas. *Exceptional views of the city and river valley provided from the public way should not be obstructed by new buildings or structures.*

(c) Principal buildings; additions:

(1) Massing and scale. *New construction should conform to the massing, volume, height, facade proportions and scale of surrounding structures and also comply with existing zoning regulations. The gross volume of any new structure should be visually compatible with the buildings and elements within the surrounding area. New dwellings and commercial buildings should be compatible with the height of existing adjacent buildings.*

(2) Materials and details. *Materials and details should relate to those of existing nearby buildings. Wood or masonry construction is typical for existing residential buildings in the district, while masonry is typical of commercial buildings. These materials are preferable to vinyl, metal or hardboard siding. Imitative materials such as artificial stone or brick veneer should not be used. Materials will be reviewed to determine their appropriate use in relation to the overall design of the structure. The use of vinyl, metal or hardboard siding will be considered by the commission on a case-by-case basis. These materials may be permissible in new construction of principal buildings if appropriately detailed.*

(d) Building elements:

(1) Roofs. *The gable and hip roof or their variants are the primary historic roof forms in the district, with many variations and combinations. In new construction, the skyline or roof profile should relate to the predominant roof shape of nearby buildings. Highly visible secondary structure roofs should be compatible with the roof pitch, color and material of the main structure. The roofing materials used on new buildings should be appropriate to the design of the building and the visibility of the roof.*

Roof hardware such as skylights, vents and metal pipe chimneys should not be placed on the front roof plane.

(f) Site considerations:

(7) Views and vistas. *New buildings or other structures should not block key views and vistas of the river valley and the downtown skyline.*

(C.F. 92-900, § 2(I)(B), 7-23-92)

Storefront Guidelines

(g) East Seventh Street: Hope Street to Bates Street.

(1) General provisions: *The passerby can travel up or down East Seventh Street without much of a sense of the historic neighborhood on each side of the avenue. The four-lane street is a major artery and divides the Swede Hollow corner of the district from the rest of the bluff. East Seventh is visually dominated by the large institutional mass of the Wilder Residence. A scattering of historic and modern commercial buildings and a few residences constitute the other structures. Excellent views of downtown Saint Paul and the river valley are afforded from various points along the streets. Vacant parcels are found on both sides of the street, and there is a small public park triangle at the north side of the Maple Street intersection.*

This portion of East Seventh Street has been a mixture of residential, commercial and institutional uses since the late nineteenth century. In 1892, the corridor between Bates and Hope streets was occupied by several mansions and a number of double houses, as well as a variety of commercial buildings. The street was not lined with a continuous row of stores and shops, such as those still found along Payne Avenue or farther up the street at the Arcade Street intersection. However, existing historic commercial buildings are built out to the sidewalk with no setback from the property line. This creates a uniform alignment of facades that provides a visually strong streetscape. The Stutzman Block—with its wedge shape and corner turret—is the most architecturally significant.

(2) Building elements:

a. Roofs. *Flat roofs are more typical of commercial buildings while the gable and hip roof or their variants are the primary historic residential roof forms in the district. In new construction, the skyline or roof profile should relate to these predominant roof shapes.*

Roofing materials used on new buildings should be appropriate to the design of the building and the visibility of the roof.

Roof hardware such as skylights, vents and metal pipe chimneys should not be placed on the visible portion of the roof such as the front roof plane.

Secretary of the Interior's Guidelines on Sustainability for Rehabilitating Historic Buildings (2011)

Solar Technology

Recommended

- Considering on-site, solar technology only after implementing all appropriate treatments to improve energy efficiency of the building, which often have greater life-cycle cost benefit than on-site renewable energy.
- Analyzing whether solar technology can be used successfully and will benefit a historic building without compromising its character or the character of the site or the surrounding historic district.
- Installing a solar device in a compatible location on the site or on a non-historic building or addition where it will have minimal impact on the historic building and its site.
- Installing a solar device on the historic building only after other locations have been investigated and determined infeasible.
- Installing a low-profile solar device on the historic building so that it is not visible or only minimally visible from the public right of way: for example, on a flat roof and set back to take advantage of a parapet or other roof feature to screen solar panels from view; or on a secondary slope of a roof, out of view from the public right of way.

- Installing a solar device on the historic building in a manner that does not damage historic roofing material or negatively impact the building's historic character and is reversible.
- Installing solar roof panels horizontally—flat or parallel to the roof—to reduce visibility.
- Investigating off-site, renewable energy options when installing on-site solar devices would negatively impact the historic character of the building or site.

Not Recommended

- Installing on-site, solar technology without first implementing all appropriate treatments to the building to improve its energy efficiency.
- Installing a solar device without first analyzing its potential benefit or whether it will negatively impact the character of the historic building or site or the surrounding historic district.
- Placing a solar device in a highly-visible location where it will negatively impact the historic building and its site.
- Installing a solar device on the historic building without first considering other locations.
- Installing a solar device in a prominent location on the building where it will negatively impact its historic character.
- Installing a solar device on the historic building in a manner that damages historic roofing material or replaces it with an incompatible material and is not reversible.
- Removing historic roof features to install solar panels.
- Altering a historic, character-defining roof slope to install solar panels.
- Installing solar devices that are not reversible.
- Placing solar roof panels vertically where they are highly visible and will negatively impact the historic character of the building.

E. FINDINGS:

1. On July 23, 1992, the Dayton's Bluff Heritage Preservation District was established under Ordinance No. 17942 (Council File #92-900). The Heritage Preservation Commission shall protect the architectural character of heritage preservation sites through review and approval or denial of applications for city permits for exterior work within designated heritage preservation sites §73.04.(4).

2. The Cambric was constructed in 2016 and is classified as new construction within the Dayton's Bluff Heritage Preservation District.

3. **74.90(b)(4)** ***Views and vistas.*** *Exceptional views of the city and river valley provided from the public way should not be obstructed by new buildings or structures.* The view studies provided show that the solar array will not be visible from the public right of way from the northwest or southwest. However, view studies from the east, which are elevated from the property, were not provided.

4. **74.90(g)(2)a Roofs.** The building has a flat roof with a mansard roof-like detail at the top floor on the primary elevations and turning the corner to the secondary elevations; which serves to reduce the visual massing of the building. The building has a 2' tall parapet. *Roof hardware such as skylights, vents and metal pipe chimneys should not be placed on the visible portion of the roof* and should be setback from the roof edge so as not to be visible. The proposed solar array will be set back 36" from the northwest roof line and 13'8" from the

southwest roof line. The setback from the southwest roof line is appropriate; however, the northwest roof line set back is not appropriate given the 29" height of the solar panels.

5. The SOI Standards recommend *installing a low-profile solar device on the historic building so that it is not visible or only minimally visible from the public right of way: for example, on a flat roof and set back to take advantage of a parapet or other roof feature to screen solar panels from view; or on a secondary slope of a roof, out of view from the public right of way.* The proposed solar array is located on a flat roof and set back from the parapet.

6. The SOI Standards state that a solar device should be installed *in a compatible location on the site or on a non-historic building or addition where it will have minimal impact on the historic building and its site.* The building is classified as new construction to the district.

7. The SOI Standards recommend that solar roof panels should be installed *horizontally—flat or parallel to the roof—to reduce visibility.* The proposed solar panels are not flat, but are set back from and screened by the parapet.

8. The proposal to construct a 96 module solar panel array at 720 Seventh Street East will not have an adverse impact on the property and Program for Preservation and architectural control of the Dayton's Bluff Heritage Preservation District (Leg. Code §73.06 (e)) so long as the conditions are met.

F. STAFF RECOMMENDATION:

Based on the findings staff recommends approval of the permit application provided the following condition(s) are met:

1. The solar array shall be set back at least 5 feet from the northwest roof line.
2. All final materials, colors and details shall be submitted to the HPC and/or staff for final review and approval.
3. Any revisions to the approved plans shall be reviewed and approved by the HPC and/or staff.
4. A copy of the HPC stamped approved plans shall remain on site for the duration of the construction project.

G. ATTACHMENTS:

1. HPC Design Review Application
2. BKV View Studies
3. Photos

Saint Paul Heritage Preservation Commission
Department of Planning and Economic Development
25 Fourth Street West, Suite 1400
Saint Paul, MN 55102
Phone: (651) 266-9078
ApplyHPC@stpaul.gov

HERITAGE PRESERVATION COMMISSION
DESIGN REVIEW APPLICATION

This application must be completed in addition to the appropriate city permit application if the affected property is an individually designated landmark or located within an historic district. For applications that must be reviewed by the Heritage Preservation Commission refer to the HPC Meeting schedule for meeting dates and deadlines.

1. CATEGORY

Please check the category that best describes the proposed work

- ☐ Repair/Rehabilitation
- ☐ Moving
- ☐ Demolition
- ☐ Sign/Awning
- ☐ Fence/Retaining Wall
- ☒ Other Roof Solar PV
- ☐ New Construction/Addition/ Alteration
- ☐ Pre-Application Review Only

2. PROJECT ADDRESS

Street and number: 720 E 7th St, St. Paul, MN Zip Code: 55106

3. APPLICANT INFORMATION

Name of contact person: Alex Gast

Company: Cedar Creek Energy

Street and number: 1285 114th Ave NW

City: Coon Rapids State: MN Zip Code: 55448

Phone number: 763-450-9765 e-mail: Alex.Gast@cedarcreekenergy.com

4. PROPERTY OWNER(S) INFORMATION (If different from applicant)

Name: Dominium Development, Patrick Ostrom

Street and number: 2905 Northwest Blvd

City: Plymouth State: MN Zip Code: 55441

Phone number: 763-354-5644 e-mail: postrom@Dominiuminc.com

5. PROJECT ARCHITECT (If applicable)

Contact person: Gary Vogel

Company: BKV Group, Inc.

Street and number: 222 North Second Street

City: Minneapolis State: MN Zip Code: 55401

Phone number: 612-339-3752 e-mail: _____

6. PROJECT DESCRIPTION

Completely describe ALL exterior changes being proposed for the property. Include changes to architectural details such as windows, doors, siding, railings, steps, trim, roof, foundation or porches. Attach specifications for doors, windows, lighting and other features, if applicable, including color and material samples.

The scope of this project is to install a 39.36 KW (DC) ballasted roof mounted TenK Solar PV array. This array is to be installed at 720 E 7th St, St. Paul, MN on the central roof section of the new Cambric Senior Living Apartments. The height of the array is not to exceed 29" off the finished roof and is to be setback from the roof edged by 36". A 12" parapet wall surrounds the roof.

Attach additional sheets if necessary

7. ATTACHMENTS

Please list any attachments that are included in this application. Refer to the Design Review Application Process Checklist for required information or attachments.

- TenK Solar RAIS PV product specifications
- Proposed Solar Layout
- Encompass, Inc. stamped ballast loading design

Attach the above listed to this application or attach in an email to ApplyHPC@stpaul.gov

Will any federal money be used in this project? **YES** ☑ **NO** ☐

Are you applying for the Investment Tax Credits? **YES** ☑ **NO** ☐

I, the undersigned, understand that the Design Review Application is limited to the aforementioned work to the affected property. I further understand that any additional exterior work to be done under my ownership must be submitted by application to the St. Paul Heritage Preservation Commission. Any unauthorized work will be required to be removed.

Signature of applicant: Digitally signed by Alex Gast DN: cn=Alex Gast, o=Cedar Creek Energy, ou=Operations Manager, email=Alex.Gast@cedarcreekenergy.com, c=US Date: 2016.07.06 16:29:35 -05'00' **Date:** 7/6/2016

Signature of owner: **Date:** 7/6/16

Send completed application with the necessary attachments to ApplyHPC@stpaul.gov or to:

Saint Paul Heritage Preservation Commission
Department of Planning and Economic Development
25 Fourth Street West, Suite 1400
Saint Paul, MN 55102

FOR HPC OFFICE USE ONLY

Date received: _____ **FILE NO.** _____

Date complete: _____

District:_____/Individual Site:_____

Pivotal/Contributing/Non-contributing/New Construction/Parcel

☐ Requires staff review

Supporting data: **YES** **NO**
Complete application: **YES** **NO**

The following condition(s) must be met in order for application to conform to preservation program:

It has been determined that the work to be performed pursuant to the application does not adversely affect the program for preservation and architectural control of the heritage preservation district or site (Ch.73.06).

_____
HPC staff approval

Date _____

☐ Requires Commission review

Submitted:

- ☐ 3 Sets of Plans
- ☐ 15 Sets of Plans reduced to 8 ½" by 11" or 11" by 17"
- ☐ Photographs
- ☐ CD of Plans (pdf) & Photos (jpg)
- ☐ City Permit Application
- ☐ Complete HPC Design Review application

Hearing Date set for: _____

City Permit # ____ - _____

HPC Staff Notes

CITY OF ST PAUL

Department of Safety and Inspections
375 Jackson Street, Suite 220
St Paul, Minnesota 55101-1806

Copy

GENERAL BUILDING PERMIT APPLICATION

Visit our Web Site at www.stpaul.gov/dsi

PROJECT ADDRESS	Number	Street Name	St. Ave. Blvd. Etc.	N S E W	Suite/Apt	Building Name	Date
	720	E 7th st, St. Paul, MN	55106			The Cambric Senior Living	6/~~9~~21/2016

Contractor	(Include Contact Person)	Address / City / State, Zip + 4	Phone
Cedar Creek Energy State Building Contr. Lic. #	Alex Gast #20638279	1285 114th Ave NW Coon Rapids, MN 55448	763-450-9765

Contractor's Email: Alex.Gast@cedarcreekenergy.com

Architect/Designer:	Email:	Phone
Cedar Creek Energy	Alex.Gast@cedarcreekenergy.com	763-450-9765

Property Owner	(Include Contact Person)	Address / City / State, Zip + 4	Phone
Dominium Development - Patrick Ostrom		2905 Northwest Blvd Suite 150 Plymouth, MN 55441	763-354-5644

Select the Type of Work ▶ ☐ New Structure ☒ Addition ☐ Remodel/Alter ☐ Repair

Select Applicable Installation Below.

☐ **Windows: # of windows ▶** _____

☐ **Roofing: # of squares ▶** _____

☐ **Siding: # of squares ▶** _____

▶ Note: 1 Square = 100 Square Feet

Select Type of Use ▶

Mixed Commercial/ Residential buildings enter information for both the Residential and Commercial Use.

☐ **Residential:** # of Existing Dwelling Units ▶ _____
Final # of Dwelling Units ▶ _____
# of Dwelling Units Worked On ▶ _____

☒ **Commercial:** Value of Coml. Work ▶ $ 56,000.00

Est. Start Date ▶ 6/27/16 **Est. Finish Date ▶** 7/15/2016 **Total Value ▶** $ 56,000.00

Description of Project:
Roof Mounted TenK Solar 39.36 KW (DC)
Flat Roof Ballasted Solar Array

Applicant certifies that all information is correct and that all pertinent state regulations and city ordinances will be complied with in performing the work for which this permit is issued.

Digitally signed by Alex Gast
DN: cn=Alex Gast, o=Cedar Creek Energy, ou=Operations Manager, email=Alex.Gast@cedarcreekenergy.com, c=US
Date: 2016.06.09 12:17:16 -05'00'

Applicant's Signature

PLEASE COMPLETE THIS SECTION ONLY FOR NEW STRUCTURE OR ADDITION

Structure Dimensions (In Feet)

Width	Length	Height	Total Square Feet (include basement)	Basement	# of Stories
				Yes No	

Is a Fire Suppression System Available? (i.e. – Sprinklers) Yes ☐ No ☐

Lot Dimensions (In Feet)		Set Backs from Property Lines			
Lot Width	**Lot Depth**	**Front**	**Back**	**Side 1**	**Side 2**

For Office Use Only

Change/Expansion of Use? Yes / No

Existing Primary Use: MULTI-FAM	Occupancy Group: R2		
Proposed Primary Use: MULTI-FAM	Construction Type: III B		
Zoning District: RT1 (DB)	Plan Number		

PLAN REVIEW REMARKS

Orig. w/ Kari

S.A.C. #: Charge Credit	Reviewed By:	Date:	Warning Folder #

State Valuation : $

Vacant Bldg. Folder #

SUMMARY OF FEES	
Building Permit Fee	$
State Surcharge	$
Plan Check	$
SAC	$
SAC Processing Fee	$
Design Review Fee	$
Park Dedication Fee	$
Total Permit Fee	$

(For Office Use Only) **PERMIT # ▶** 16-049980

Signature of Cardholder (required for all charges):

☐ AMEX ☐ Discover ☐ MasterCard ☐ Visa **Security Code ▶** **Expiration Month/Year ▶**

Enter Account Number ▶ ▶

*CALL FOR PAYMENT

HPC Rec'd 6.22.16

Permit Applicant Checklist for Residential Solar Energy Installations

Before approval and issuance of permit(s) for Solar Thermal/Photovoltaic installations, applicant shall submit the following minimum information. Required drawings shall be scaled and dimensioned, readable, and legible. Additional information may be requested for a building permit. Other permits are also required.

Building integrated solar installations, where the solar collector replaces or substitutes for a component of a building or structure such as roof, shingle, or awning, do not require completion of this checklist separately from the building permit application for the building, structure, or building modification.

1. Fully completed application for a building permit, including the following information:
   a. Project address;
   b. Owner's name, address, phone number;
   c. Name, address and phone number of the person preparing the plans;
   d. Description of proposed work, including both solar equipment installation and all associated construction;
2. Contractor's license BC# 20638279, EA006457
3. Name of company conducting the installation Cedar Creek Energy
4. For *electric* (photovoltaic) systems:
   a. What is the system KW rating (DC)? 39.36 kW
   b. Is this an inter-tie or stand alone system? (Circle one)
   c. Does the system include battery backup or an uninterrupted power supply (UPS)?
   yes____ no_x_
   If yes, give the number, size and location of the batteries.
5. For *thermal* systems:
   a. What is the total size of the solar collectors (sq. ft.) ? _____
6. If rooftop mounted, identify the following:
   a. Roof type- ☒ Flat roof (nominal pitch) ☐ Sloped (identify pitch) _____
   b. The type of existing roofing (shingles, tile, metal, ballasted, membrane, etc).
   Built up roof
   c. The number of roofing layers that will be under the panels 1 (no more than 2 layers of roof shingles are allowed).
   d. Identify the condition of the roofing material and appropriate age.
   New, installed in 2016

Permit Applicant Checklist for Residential Solar Energy Installations

Required Drawings and Plans

7. Provide construction drawings that include a building section detail and complete notation of method of fastening equipment to the roof of the subject property, including the following details:

   a. Cross section that identifies rafter size, spacing and span dimension and approximate roof slope.

   b. Identify style, diameter, length of embedment of bolts (i.e., 5/16" lags with minimum 3" embedment into framing, blocking, or bracing).

   _____

   _____

   _____

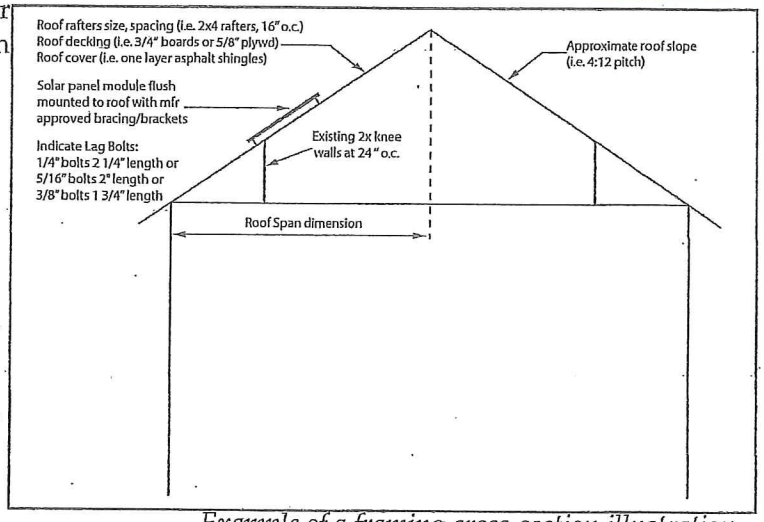
   c. Is system to be mounted according to panel and rack manufacturers' instructions?

   yes_X_ no____

   If no, please explain. Attach explanation if more space is needed.

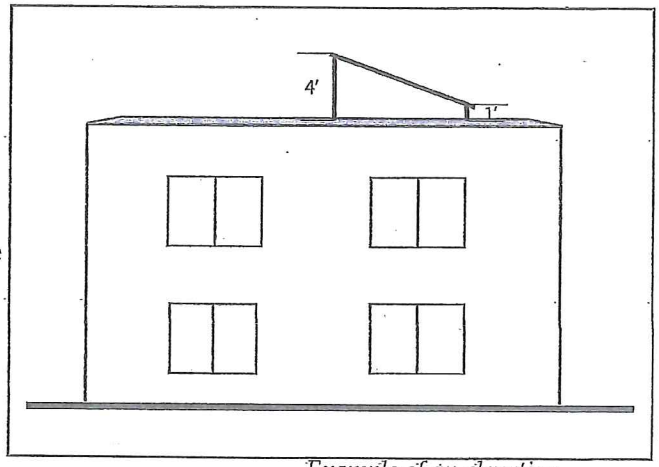
   _____

   _____



Example of a framing cross-section illustration

8. Provide an elevation of the structure indicating the appearance of the proposed solar installation (see example to the right). Note the finished height of the system above the roof or, if ground -mounted, above the ground.



Example of an elevation

9. Provide a site plan indicating the buildings and features of the property (see example on following page). The site plan shall show property line locations, approximate location of all structures, the location(s) of the panel installations, setback from property lines, the main service location, and, if applicable, the solar easement across adjoining properties. For roof-mounted systems identify the setback dimension from the peak and from all edges of the roof.

Rooftop Solar Installations

10. Is the equipment to be ***flush-mounted*** to the roof (mounted such that the collector surface is parallel to the roof)?

    yes____ no_X_ (If no, go to question 12)

Permit Applicant Checklist for Residential Solar Energy Installations

11. The minimum structural threshold for installing a *flush-mounted* PV system is a roof structure with at least 2 x 4 rafters no more than 24" on-center spacing.
    a. Does the roof structure use 2x4 or larger rafters, spaced no wider than 24 inches on center?

       yes____ no____

    b. If a *solar thermal* installation, is the collector/racking system fastened to each rafter passing under the collector?

       yes____ no____

12. *Non-flush-mounted installations* have different potential structural considerations. If the answer to question 10 (is the system flush-mounted?) is no, please provide the following additional information.
    a. Is the finished pitch of the collector at or less than a 12/12 pitch?

       yes_X_ no____

    b. Is the collector or racking fastened to the roof within one foot of the roof peak?

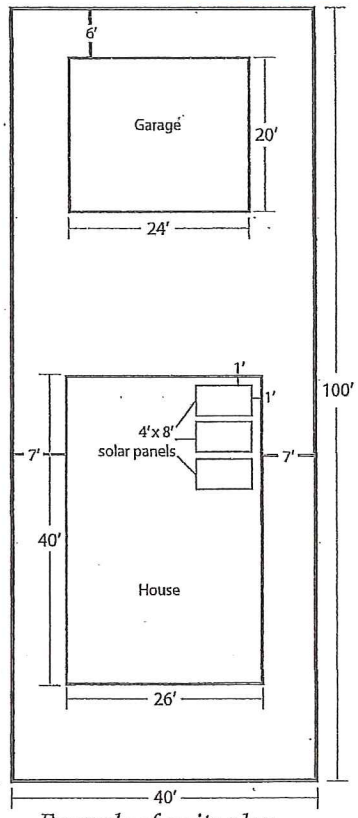
       yes____ no_X_

    c. Is the collector/racking system fastened to each rafter passing under the collector?

       yes____ no_X_

    d. Is the horizontal span (roof span dimension) of the rafter less than 7.75 feet for 2x4 rafters or 11.5 feet for 2x6 rafters?

       yes____ no_X_



Example of a site plan

13. Roof decking and structural supports should all be in good condition without visible roof sag/deflection. Is the roof structure in good condition, having no visible sag, cracking or splintering of rafters, or other potential structural defect? If roof structure is accessible, please provide a photo showing the condition of the roof. If roof structure is not accessible, provide an exterior photo, side view, of the roof.

    yes_X_ no____

14. If the answer is no to question 11, 12 a. - d., or 13 please provide a study or statement regarding the proposed solar installation and all proposed structural modifications stamped by a Minnesota licensed/certified structural engineer. Approval can come in the following forms:
    a. Construction plans denoting the roof structure and any modifications to the structure if required, as well as the method of installation of solar collector on the subject property.
    b. Letter from engineer accomplishing the same as above if the engineer feels that letter format will provide the necessary information.

Permit Applicant Checklist for Residential Solar Energy Installations

Ground Solar Installations

15. For *ground-mounted* solar energy systems, the installation must meet property line setback standards for accessory structures, as identified in the Saint Paul Zoning Code (Section 65.921, 65.501). Verification of the property line and appropriate setback is required, either through identification of property pins or completing a survey. Identify the method used to verify property lines and setbacks.

☐ Located property pins ☐ Completed survey (attach) ☐ Other (attach explanation)

Electrical Information

15. Specify the locations of all equipment and disconnects (on a separate page, if necessary) (e.g., AC disconnect located on exterior face of ____ wall of house, invertor and DC disconnect located in the interior within _____ room).
See Attached One Line

16. Provide a single line drawing of the electrical installation which includes the following information: PV panel layout, PV power source short circuit current rating, conductor size, type, locations and lengths of runs, wiring methods, grounding points, inverter location, disconnect locations, battery locations (if applicable), point of connection to the existing electrical system. Note the existing service size and number of meters. An example of a single line drawing is attached to this checklist.

17. Provide manufacturer's specification sheets on all components including but not limited to inverters and panels, which include the make, model, listing, size, weight, etc.

Heritage Preservation

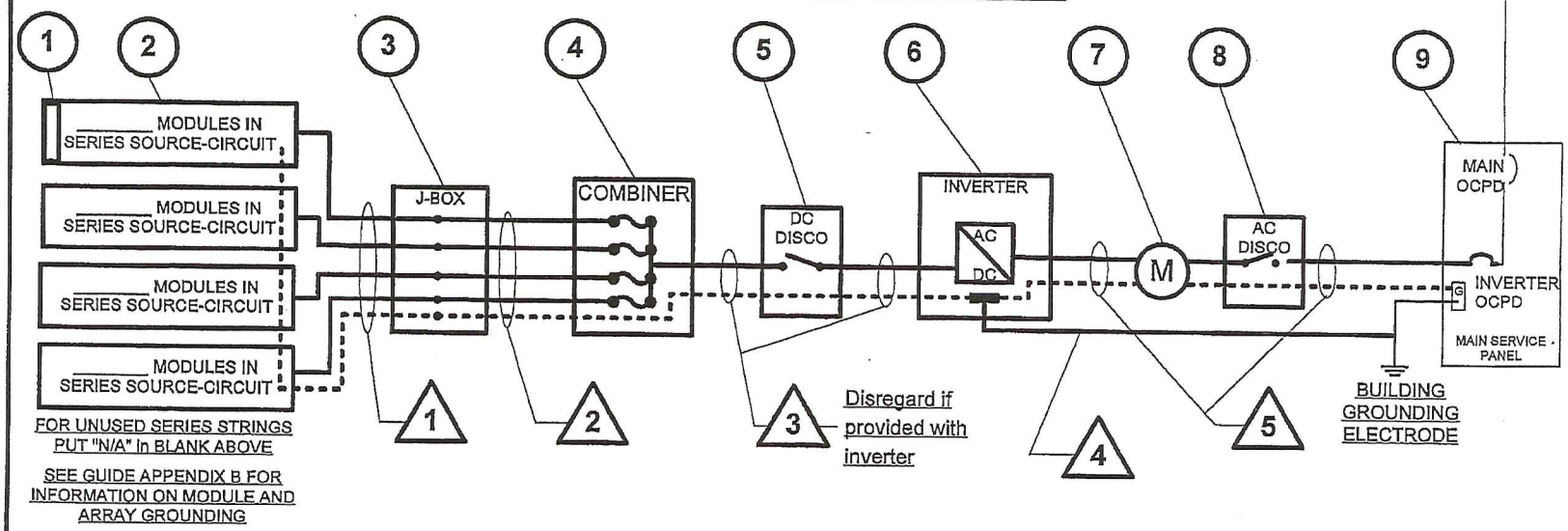
18. Legislative Code § 73.06 provides that exterior work, including installation of solar energy systems, within city designated heritage preservation sites and districts is subject to review and approval by the Heritage Preservation Commission (HPC) prior to the issuance of city permits. For a city map showing individual sites and district boundaries go to http://www.stpaul.gov/index.aspx?NID=4080. You may also search by a specific address by using "property look-up" at: https://www.stpaulonestop.com/AMANDA5/eNtraprise/StPaul/m3list/a_PickProperty.jsp?lid=ReadOnlystpaul.

    Is the installation address within a heritage preservation district, or on a landmark property or building?

    yes____ no X

    Solar installations on properties with heritage preservation considerations will require additional review, either administrative review by staff or review by the Heritage Preservation Commission.

EQUIPMENT SCHEDULE			
TAG	DESCRIPTION	PART NUMBER	NOTES
1	SOLAR PV MODULE		
2	PV ARRAY		
3	J-BOX (IF USED)		
4	COMBINER (IF USED)		
5	DC DISCONNECT		
6	DC/AC INVERTER		
7	GEN METER (IF USED)		
8	AC DISCONNECT (IF USED)		
9	SERVICE PANEL		_____VAC, _____A MAIN, _____A BUS, _____A INVERTER OCPD
			(SEE NOTE 5 FOR INVERTER OCPDs, ALSO SEE GUIDE SECTION 9)



FOR UNUSED SERIES STRINGS PUT "N/A" In BLANK ABOVE

SEE GUIDE APPENDIX B FOR INFORMATION ON MODULE AND ARRAY GROUNDING

CONDUIT AND CONDUCTOR SCHEDULE					
TAG	DESCRIPTION OR CONDUCTOR TYPE	COND. GAUGE	NUMBER OF CONDUCTORS	CONDUIT TYPE	CONDUIT SIZE
1	USE-2 ☐ or PV WIRE ☐			N/A	N/A
	BARE COPPER EQ. GRD. COND. (EGC)			N/A	N/A
2	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
3	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				
4	DC GROUNDING ELECTRODE COND.				
5	THWN-2 ☐ or XHHW-2 ☐ or RHW-2 ☐				
	INSULATED EGC				

Contractor Name, Address and Phone:

_____
_____
_____
_____

One-Line Standard Electrical Diagram for Small-Scale, Single-Phase PV Systems

Site Name: _____

Site Address: _____

System AC Size: _____

Drawn By:	SIZE	FSCM NO	DWG NO	REV
			E1.1	
Checked By:	SCALE	NTS	Date:	SHEET

PV MODULE RATINGS @ STC (Guide Section 5)

MODULE MAKE	
MODULE MODEL	
MAX POWER-POINT CURRENT (I_{MP})	A
MAX POWER-POINT VOLTAGE (V_{MP})	V
OPEN-CIRCUIT VOLTAGE (V_{OC})	V
SHORT-CIRCUIT CURRENT (I_{SC})	A
MAX SERIES FUSE (OCPD)	A
MAXIMUM POWER (P_{MAX})	W
MAX VOLTAGE (TYP 600V_{DC})	V
VOC TEMP COEFF (mV/°C☐ or %/°C☐)	
IF COEFF SUPPLIED, CIRCLE UNITS	

NOTES FOR ALL DRAWINGS:

OCPD = OVERCURRENT PROTECTION DEVICE

NATIONAL ELECTRICAL CODE® REFERENCES SHOWN AS *(NEC XXX.XX)*

INVERTER RATINGS (Guide Section 4)

INVERTER MAKE	
INVERTER MODEL	
MAX DC VOLT RATING	V
MAX POWER @ 40°C	W
NOMINAL AC VOLTAGE	V
MAX AC CURRENT	A
MAX OCPD RATING	A

SIGNS–SEE GUIDE SECTION 7

SIGN FOR DC DISCONNECT

PHOTOVOLTAIC POWER SOURCE	
RATED MPP CURRENT	A
RATED MPP VOLTAGE	V
MAX SYSTEM VOLTAGE	V
MAX CIRCUIT CURRENT	A

WARNING: ELECTRICAL SHOCK HAZARD–LINE AND LOAD MAY BE ENERGIZED IN OPEN POSITION

SIGN FOR INVERTER OCPD AND AC DISCONNECT (IF USED)

SOLAR PV SYSTEM AC POINT OF CONNECTION	
AC OUTPUT CURRENT	A
NOMINAL AC VOLTAGE	V

THIS PANEL FED BY MULTIPLE SOURCES (UTILITY AND SOLAR)

NOTES FOR ARRAY CIRCUIT WIRING (Guide Section 6 and 8 and Appendix D):

1.) LOWEST EXPECT AMBIENT TEMPERATURE BASED ON ASHRAE MINIMUM MEAN EXTREME DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. LOWEST EXPECTED AMBIENT TEMP _____°C

2.) HIGHEST CONTINUOUS AMBIENT TEMPERATURE BASED ON ASHRAE HIGHEST MONTH 2% DRY BULB TEMPERATURE FOR ASHRAE LOCATION MOST SIMILAR TO INSTALLATION LOCATION. HIGHEST CONTINUOUS TEMPERATURE _____°C

2.) 2005 ASHRAE FUNDEMENTALS 2% DESIGN TEMPERATURES DO NOT EXCEED 47°C IN THE UNITED STATES (PALM SPRINGS, CA IS 44.1°C). FOR LESS THAN 9 CURRENT-CARRYING CONDUCTORS IN ROOF-MOUNTED SUNLIT CONDUIT AT LEAST 0.5" ABOVE ROOF AND USING THE OUTDOOR DESIGN TEMPERATURE OF 47°C OR LESS (ALL OF UNITED STATES),

a) 12 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 7.68 AMPS OR LESS WHEN PROTECTED BY A 12-AMP OR SMALLER FUSE.

b) 10 AWG, 90°C CONDUCTORS ARE GENERALLY ACCEPTABLE FOR MODULES WITH Isc OF 9.6 AMPS OR LESS WHEN PROTECTED BY A 15-AMP OR SMALLER FUSE.

NOTES FOR INVERTER CIRCUITS (Guide Section 8 and 9):

1) IF UTILITY REQUIRES A VISIBLE-BREAK SWITCH, DOES THIS SWITCH MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

2) IF GENERATION METER REQUIRED, DOES THIS METER SOCKET MEET THE REQUIREMENT? YES ☐ NO ☐ N/A ☐

3) SIZE PHOTOVOLTAIC POWER SOURCE (DC) CONDUCTORS BASED ON MAX CURRENT ON NEC 690.53 SIGN OR OCPD RATING AT DISCONNECT

4) SIZE INVERTER OUTPUT CIRCUIT (AC) CONDUCTORS ACCORDING TO INVERTER OCPD AMPERE RATING. (See Guide Section 9)

5) TOTAL OF _____ INVERTER OCPD(s), ONE FOR EACH INVERTER. DOES TOTAL SUPPLY BREAKERS COMPLY WITH 120% BUSBAR EXCEPTION IN 690.64(B)(2)(a)? YES ☐ NO ☐

Contractor Name, Address and Phone: _____	Notes for One-Line Standard Electrical Diagram for Single-Phase PV Systems Site Name: _____ Site Address: _____ System AC Size: _____			
Drawn By:	SIZE	FSCM NO	DWG NO E1.2	REV
Checked By:	SCALE NTS	Date:	SHEET	

Encompass
engineering consultants
forensic analysis

June 10, 2016

Alex Gast
Cedar Creek Energy
1285 114th Avenue NW
Coon Rapids, Minnesota

Re: The Cambric Senior Apartments – Solar Ballast Design
Encompass, Inc. Project # 16-6230-000

Dear Mr. Gast:

At your request, Encompass has performed a wind analysis on the solar array layout that was provided to us by Cedar Creek Energy. Our analysis was based off wind tunnel data provided to us by tenKsolar, as well as according to ASCE 7-10. Our analysis was performed to ensure we maintain a factor of safety of at least 1.5 against sliding and uplift. Our analysis did not verify the existing structure of the building or if the existing structure can support the additional load placed on the structure by the solar array, ballast and snow drifting.

1. PROJECT INFORMATION:

1.1. Encompass understands that the Titan RAIS XT26 410W Wave system will be used on this project. Our analysis is based on this system and any changes to the system will require further analysis.

1.2. Encompass assumes the original structure can support the additional load placed on it by the solar array. We also assume the original structure was designed to consider ponding options and the additional load placed on the structure will not affect this parameter.

1.3. Our analysis was for ballast requirements for the solar array only. Encompass did not review the existing structure or any non-structural items as part of our review.

1.4. The following design information was used in our design:

Building height .....42 Feet
Roofing Surface .....Built-up
Basic Wind Speed, V .....115 MPH
Design Wind Speed, V .....107 MPH*
Exposure Category.....B
Risk Category II

14850 Martin Drive
Eden Prairie, Minnesota 55344
Phone 952-854-4511 fax 952-854-3126

Height and Exposure Category Factor, K_z.....1.0

Design Wind Speed Factor, K_v.....1.41

ASD Basic Load Combination Factor, W.....0.6

Sliding Friction Value, μ.....0.8 (tenKsolar**)

*Wind speed for ballast design is based on 25-year mean recurrence interval due to the 25-year warranty of the solar array system.

**The Sliding Friction Value between the roofing material and the solar array is based on information provided to Encompass by tenKsolar which utilizes their composite bearing pads.

1.5. The ballast that is depicted on the array, in Table 1 of the Appendix B, is design to restrain the movement of the array. Encompass does not take any responsibility for the impact this may have on the roofing material or warranty of the existing roofing material.

1.6. Refer to Appendix B for the layout and ballast weight required. The layout of the array was not designed by Encompass and Encompass should take no responsibility for the layout of the array.

I hereby certify that this plan, specification or report was prepared by me under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

ENCOMPASS, INC.

Prepared by:

Patrick Lewis, P.E.
Project Engineer

Kent Jones, P.E.
Principal

Attachments:

Appendix A	Array Layout – Provided by Cedar Creek Energy
Appendix B	Ballast Requirements – Performed by Encompass
Appendix C	Typical Array Information – Provided by tenKsolar

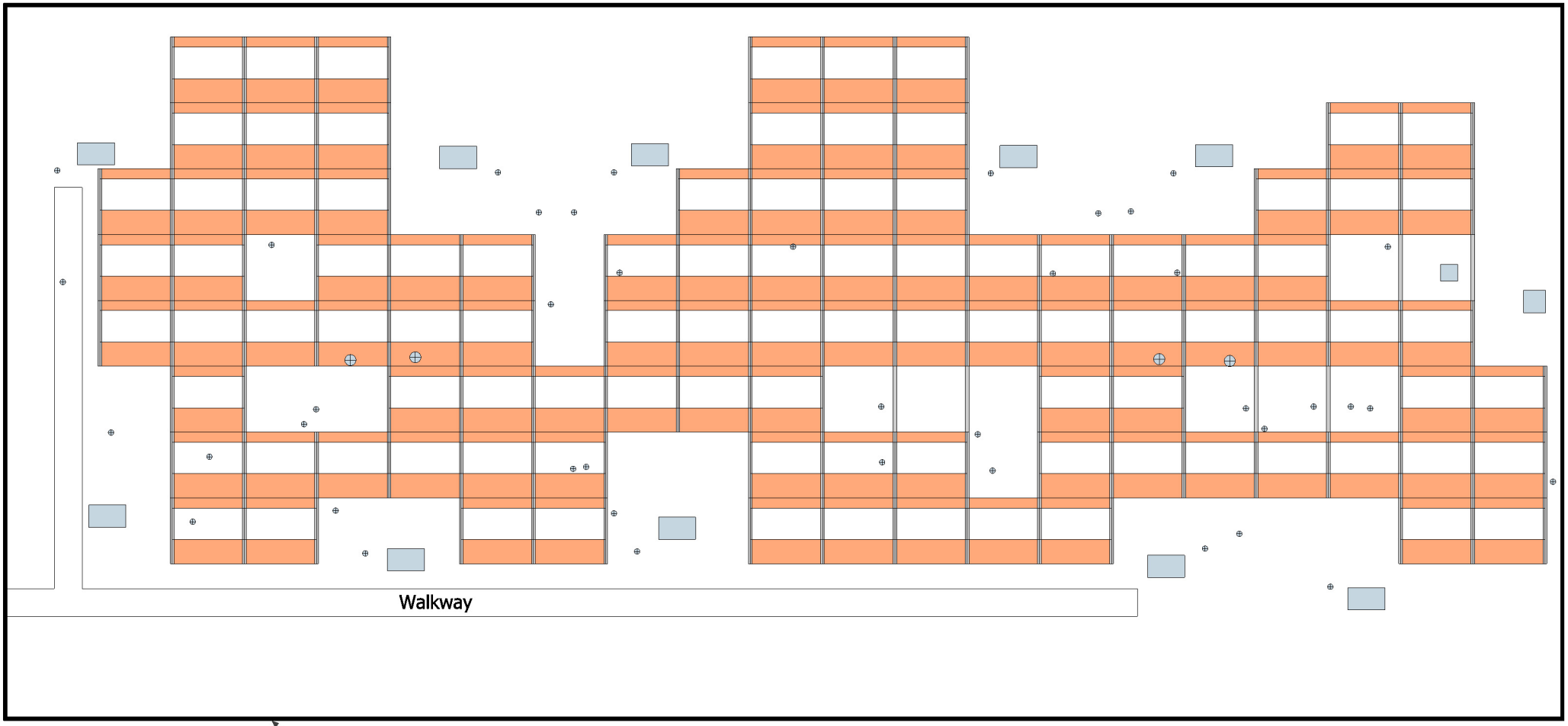
I hereby certify that this plan, specification or, report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the STATE OF MINNESOTA

Print Name: Patrick Lewis

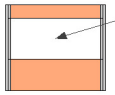
Signature:

Date: 06/16/2016 License #: 50914

Appendix A



Roof Perimeter

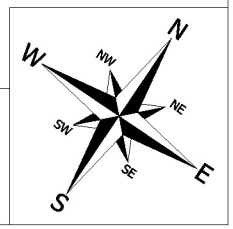


Area in white shows location where roof vents will fit under solar wavelet

The Cambric Senior Apartments
East 7th & Bates Avenue
St. Paul, MN 55106
39.36 (DC) KW Ten K Solar 410 XTA Module
32.40 (AC) KW Ten K Solar RAIS Inverter

CEDAR CREEK energy

(800) 834-3378 Toll Free
Info@CedarCreekEnergy.com
MN General License # BC 20638279
MN Electrical License # EA 06457



Encompass
engineering consultants
forensic analysis

Project Name:	The Cambric Senior Apartments
Project Location:	East 7th and Bates Avenue, St. Paul, MN 55106
Solar System:	Titan 410W XT26 RAIS Solar Array
Encompass Project No.:	16-6230-000

Total Ballast Weight (lbs.) = 8019 lbs.

Equivalent Uniform Load = 5.55

Row #	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
8	132	132	132	132					132	66	66	132								
7	132	99	99	132					132	66	66	132					99	99	132	
6	132 132	99	99	132				99	66			99					99	99	132	
5	132 132	99				99	99					66	66			66	99	99	99	
4	132 132	99				99	99											99	99	
3	132	99	X	X		99	99											99	132	132
2	132	132	132				99										99	99	132	132
1	132	132	132		99	66	99		132	66	66	66	66	132				99	132	132

Col #

Table 1: Solar Panel Layout and Ballast Weights

Height (ft.):	42 ft.	Sliding Friction Value:	0.8
Design Wind Speed, V (MPH):	107 MPH	Height and Exposure Category Factor, K_z:	0.8
Exposure Category:	B	Design Wind Speed Factor, K_v:	1.41
Risk Category:	II	ASD Basic Load Combination Factor, W:	0.6
Self Weight of Panels (lbs.):	68 lbs.	WIK_zK_v:	0.68

Design Parameters

= One wavelet (one panel and one reflector) (79.3" x 49.5")

99 = Ballast weight to be placed on the rails.

1.7 PSF = Ballast weight to be placed in trays between rails.

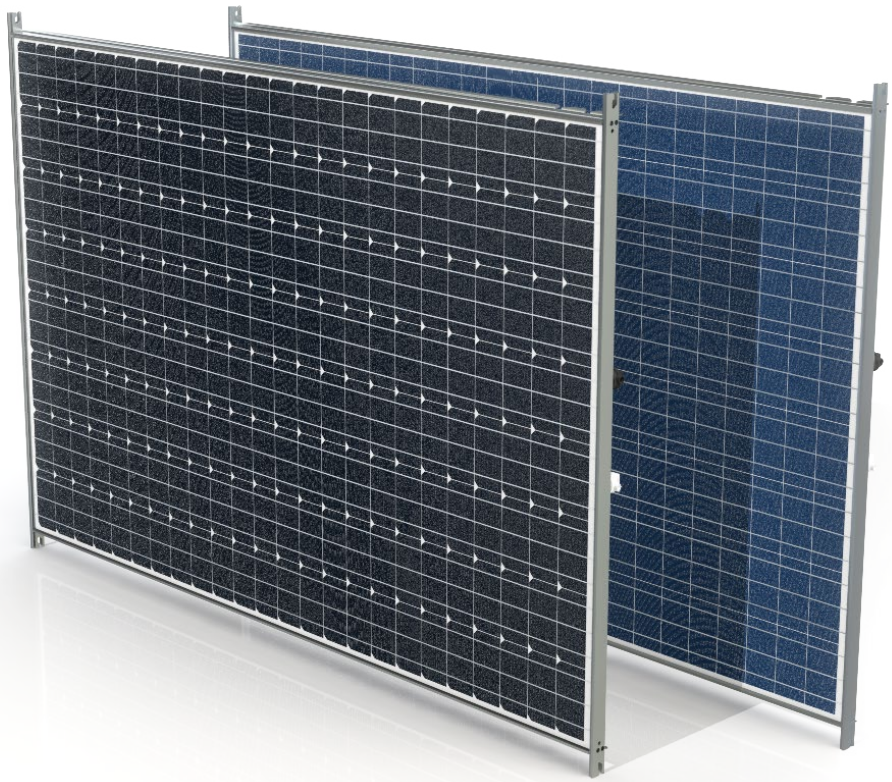
= Cross bracing shall be installed at this location.

Notes:

1. The results incorporate a 1.5 factor of safety against uplift and sliding.
2. The design is based on wind tunnel testing provided to Encompass by tenKsolar.
3. The value listed in each box above represents the total ballast weight per area of one solar panel and one reflector. The weight of each ballast block is 33 lbs.
4. At the locations where the inverters are installed, the added ballast blocks and the weight of the inverter must be greater than or equal to the weights for each panel described in Table 1.

TITAN™ PV Module

PRODUCT DATA SHEET



Built-in MPPT

Cell Independent Parallel Architecture

Power Warranted 92.2% of Max-25yrs

Integrated Racking Option Available

Cell-Independent

Ten K Solar® cells are connected in a matrix (serial and parallel connections) that allows current to flow through multiple pathways within a module, eliminating any single failure point. Combined with integrated power electronics, this architecture allows optimization of cell level performance.

Smart Module

Because of the cell level control, partial shading or soiling won't cripple module production. Ten K's Titan Module performance characteristics are fundamentally superior to yesterday's PV modules which can see output decline to zero with just limited shading, and can develop dangerous hotspots when exposed to reflection. The Titan Module is designed to outperform yesterday's PV modules in all conditions, period.

Applications

COMMERCIAL

GROUND MOUNT

CARPORT

STORAGE READY

TITAN™ PV Module

PRODUCT DATA SHEET

Mechanical Specifications

Module Size	1966 × 1298 mm
Extension Length	48.5 mm
Weight	68 lb
Cells	192 Half Cells
Bypass Diode	None
Front Glass	3.2 mm Tempered
Backsheet Material	PET-covered Aluminum
Frame Material	Aluminum
Load Capacity	50 PSF / 2400 Pa
Connector Type	Utility-Grade Tap
Wire Type	#2 AWG USE-2
Hail Impact	1.8″ direct at 68 mph

Warranty

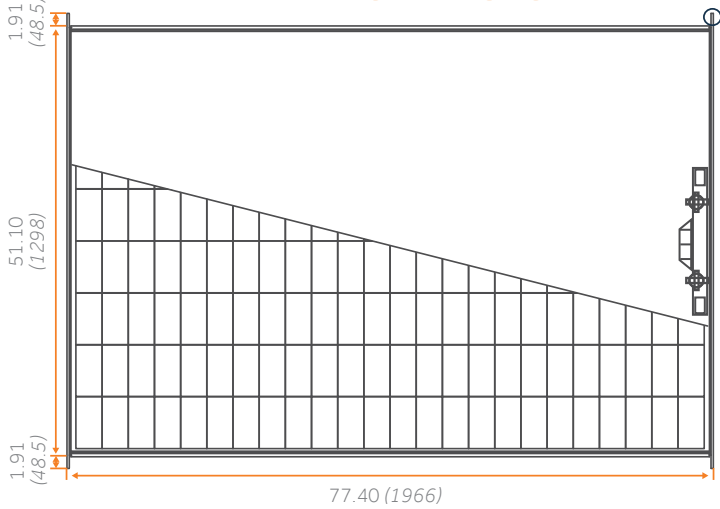
Product	25-Year
Power	3% First Year. 0.2% Linear Degradation per year after; 92.2% year-25 minimum.

Shipping Information

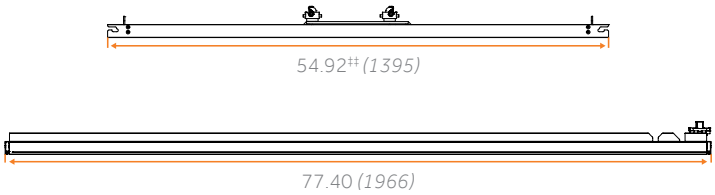
Max per Pallet	32
Pallet Size	86.25″ × 55″
Pallet Weight	2270 lb

Module Type	Titan 410	Titan 440
Performance Specifications (with integrated electronics)		
Peak Power (PMAX)	410 W	440 W
Cell Type	Poly-Crystalline	Mono-Crystalline
Power Tolerance	± 3%	± 3%
Module Efficiency	16.1%	17.1%
Max Current Output (Imp)	7.5 A	7.5 A
Operating DC Voltage (Vmp)	35 – 59 V	35 – 59 V
Temperature Characteristics (before electronics)		
Operating Temperature Range	⁻40 to 85 °C	⁻40 to 85 °C
Module NOCT	47.34 °C	46.73 °C
Temperature Coefficient (Pmp)	⁻0.42% / °C	⁻0.42% / °C
Safety Characteristics		
Ground-Fault Detect	Integrated (Compatible w/Inverter GFDI)	
Arc-Fault Detect	Integrated	
Internal Ground Fault Limit	500 mA	
NEC 2014 690.12	Integrated Rapid Shutdown	
UL 1703 Fire Rating	Type 1 Module	
Certifications and Listings		
Model Listing Name	XT-A	XT-M 440
UL 1741, UL 1703	Certified	Certified
IEC 61215, EN 61730	Certified	

N-Frame Integrated Racking‡



Module Extension



Partner Information

Measurements in inches *(mm)*
‡Integrated N-Frame optimized for Ten K racking solutions
‡‡N-Frame extension length

Patents Pending. Specifications subject to change without notice.
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REFLECT PV System

PRODUCT DATA SHEET

More Energy per DC Watt

System produces up to 20% more energy/DC Watt

Best Financial Return

More energy produced in capped DC projects

Shade Tolerant

Cell-Independence minimizes impact of partial module coverage

Better Safety

Low voltage reduces risk of electrical arcs and lethal shock

Storage Ready

Integrated charge controller supports battery storage options

Maximized Energy Yield

tenK Modules are paired with a static reflector to increase the amount of light received, maximizing the energy produced by each installed nameplate watt.

The Complete System

The REFLECT System combines modules, racking, and inversion into one completely integrated product, improving performance by eliminating compatibility issues of traditional panel solutions.

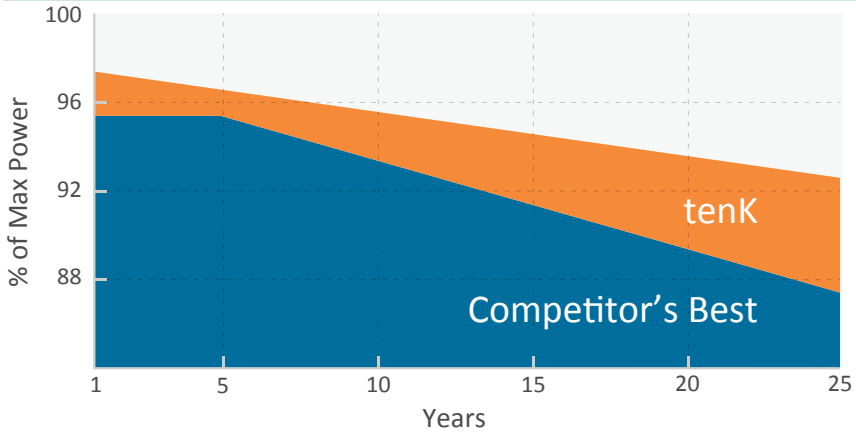
Reliable Architecture

The REFLECT System incorporates a parallel architecture from cells through inversion. The components are completely redundant, resulting in more energy production and significantly lower maintenance costs.

Solar's Best Warranty

tenK's Module Power Warranty guarantees 92.2% of max power after 25 years, offering the best return on your investment.

The Industry's Best Power Warranty



tenKsolar
9231 Penn Avenue South
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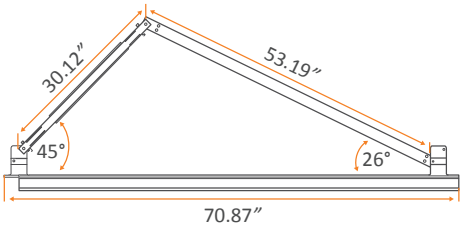
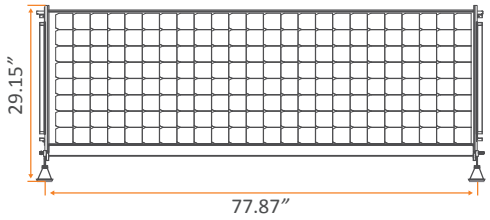
Simply More Energy

REFLECT 26

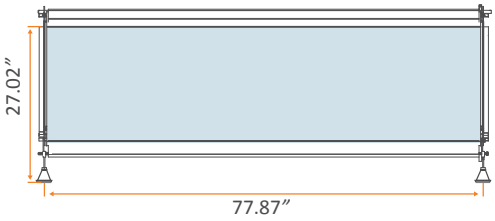
Side View
(Interior Row Shown)



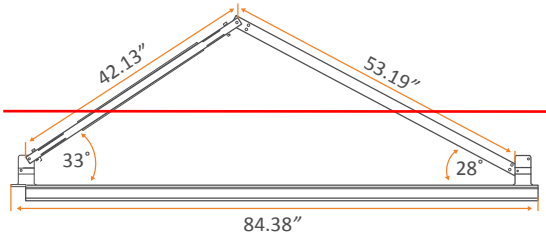
Front View
(Module)

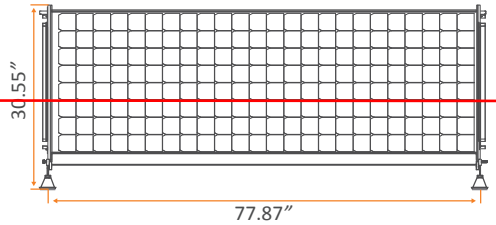


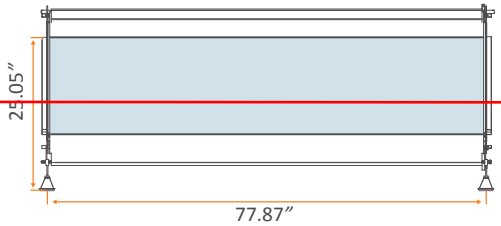
Back View
(Reflector)



~~REFLECT 28~~







Specifications		REFLECT 26	~~REFLECT 28~~
Module Tilt		26°	~~28°~~
Module + Reflector Dimensions		70.87″ × 77.87″	~~84.38″ × 77.87″~~
Front & Back Row Dimensions		74.65″ × 77.87″	~~88.15″ × 77.87″~~
System Weight		2.9 lb/ft²	~~2.5 lb/ft²~~
Peak Watts/Area (By Module Type)	XT-A 400W$_P$	~~10.4 W$_p$/ft²~~	~~8.8 W$_p$/ft²~~
	XT-A 410W$_P$	10.7 W$_p$/ft²	~~9.0 W$_p$/ft²~~
	XT-M 450W$_P$	~~12.0 W$_p$/ft²~~	~~10.1 W$_p$/ft²~~
Applications		Flat Rooftop, ~~Carport, Ground Mount~~	~~Ground Mount, latitudes > 35°~~
Wind Resistance		Up to 120 mph	
Reflector Materials		3M™ Cool Mirror Film	
Racking Materials		High Strength Structural-Grade Aluminum Alloys	
Conductor		#2 USE-2 90C Rated (Included)	

Warranties and Certifications	
Module Certifications	UL 1703/UL 1741, IEC 61215 EN 61730
Module Power Warranty	12 Year Limited Product Warranty, 25 Year Linear Power Warranty: 3% Power Degradation First Year, 0.2% Linear Degradation per year after First Year

Specifications and design are subject to change without notice. Read operating instructions carefully before using this product.

Patents Pending
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TKS MKT 40204.01

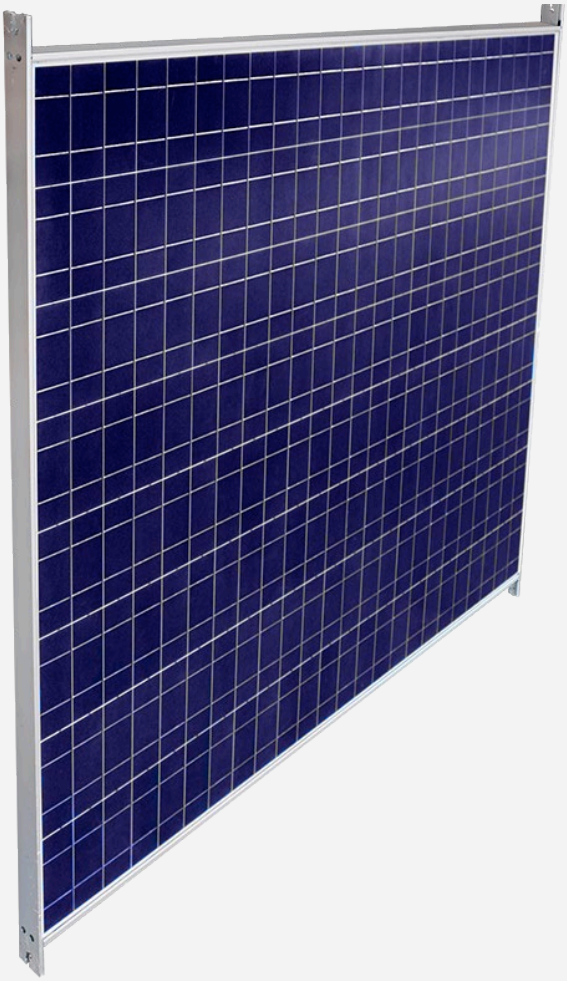
C US

XT-A Module 410 W_P

410 Watt Polysilicon PV Module

PRODUCT DATA SHEET

Smart Module for tenK PV Systems



Cell-Independent

Parallel architecture enables cell-independent energy production. Multiple pathways mitigate the impact of shading and soiling and eliminate the single point of failure issues found in traditional solar panels.

Smarter Modules

Integrated power converters optimize energy harvest, and ground-fault detect circuits provide module-level shut downs for superior safety.

Low-Voltage Safe

Module operates below the internal arc threshold of 18V DC, to ensure your solar investment never becomes a fire risk.

Lowest Real Cost of Energy

More energy/rated-watt and best available reliability drive the lowest real energy cost available.

Solar's Best Warranty.

Power warranted for 92.2% of max after 25 years, guaranteeing the best return on your investment.

Better Safety

Low voltage prevents risk of electrical arcs and lethal shock

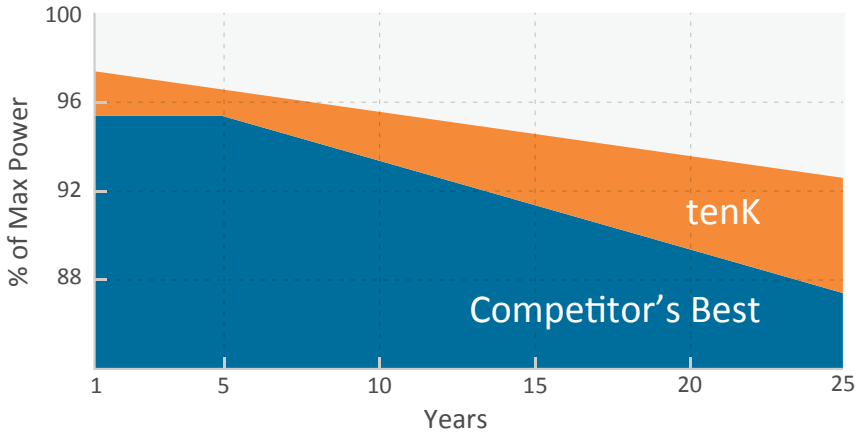
Storage Ready

Integrated charge controller supports battery storage options

Made in Minnesota

Every Panel is certified Made in Minnesota

The Industry's Best Power Warranty



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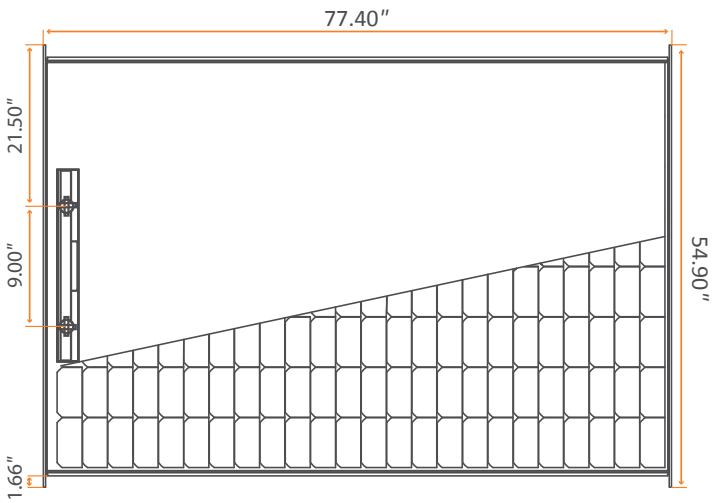
Simply More Energy

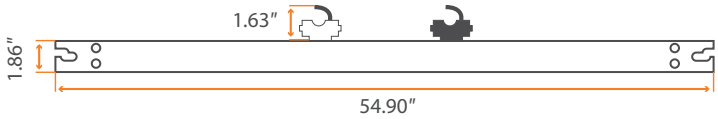
410 W Module

Module Dimensions

Landscape



Side



Specifications	
Power Output at STC (Pmax)	410 W_P
Power Tolerance	+/– 3%
Cell Type	Polycrystalline Silicon
Number of Cells	192 Half Cells
Glass	3.2 mm Tempered Glass
Max Current Output	7.5 A
Operating DC Voltage	35 – 57 V
Ground Fault Detect	Integrated (Compatible w/Inverter GFDI)
Internal Ground Fault Limit	500 mA
Frame Size	77.40″ × 54.90″
Frame / Background	Silver / White
Backsheet Material	PET Covered Aluminum
Bypass Diodes	None
Operating Temperature Range	¯40 to 185 °F *(¯40 to 85 °C)*
Module Nominal Operating Cell Temperature	109 °F *(43 °C)*
Temperature Coefficient	¯0.46% / °C
Static Load Capacity	50 PSF / 2400 Pa
Hail Resistance	Direct 1″ impact at 52 mph
Weight	71 lb
Certifications	UL 1703 (Type 1 Module Fire Rating) / UL 1741 IEC 61215 EN 61730
Product Warranty	12-Year Limited
Power Warranty	3% First Year LID; 0.2% Linear Degradation per year after; 92.2% minimum at 25 years.

Shipping Information	
Max Quantity per Pallet	25
Pallet Dimensions	83.69″ × 58.44″
Fully Loaded Pallet Weight	1775 lb

Specifications and design are subject to change without notice.
Read operating instructions carefully before using this product.

Patents Pending
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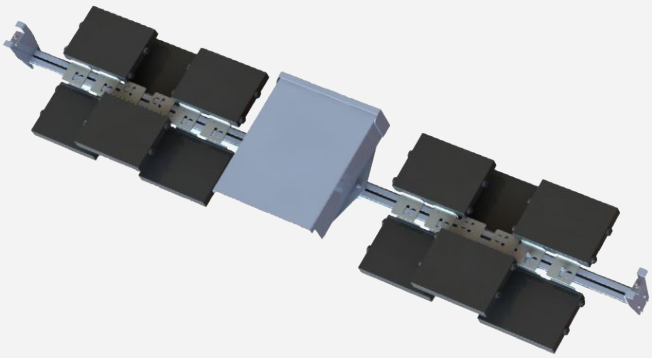
TKS MKT 40001.05

Redundant Inverter Bus

208 V – 600

PRODUCT DATA SHEET

DC:AC Inversion Solution for the tenKsolar PV Systems



Seamless Integration

Installs on tenK System without need for additional supports

No Single Points of Failure

Redundancies assure higher lifetime energy production than competition

Load Sharing

Workload distributed between inverters, increasing performance

Made in Minnesota

Every Inversion Package is Made in Minnesota

More Energy

Micro-inverters optimize the DC-AC conversion, eliminating losses typically seen in set inverters.

Smart Load Sharing

Energy from modules is combined before inversion, allowing load-sharing software to distribute the workload while preventing any inversion capacity from going unused during peak hours.

Maximize AC System Utilization

Complete flexibility in sizing of DC plant relative to AC system made possible by the embedded charge controller on each tenK Module feeding the Inverter Bus.

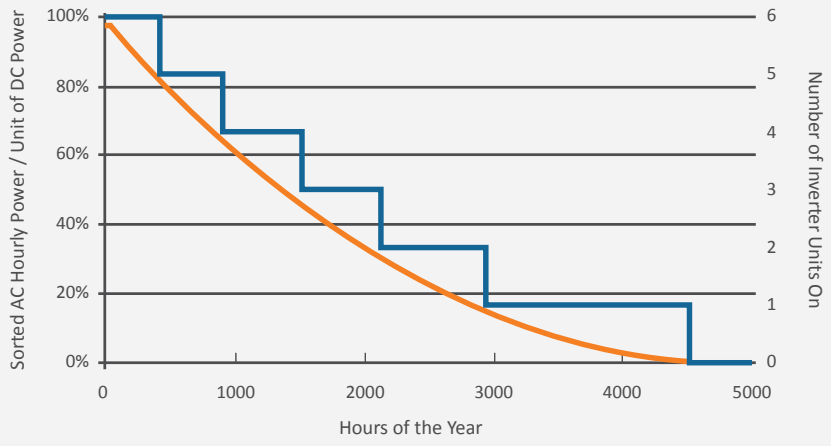
Simple Installation

Module branches are connected in parallel to one Inverter Bus, simplifying the installation process for large scale projects.

No Downtime

Inherent redundancies limit the impact of inverter failures to keep energy production high and eliminate the need for emergency maintenance.

Load Sharing Technology



tenKsolar
9231 Penn Avenue South
Minneapolis, MN 55431

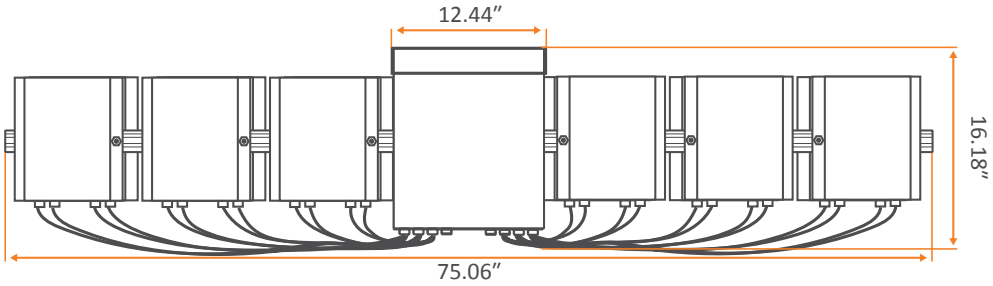
Toll free: 877-432-1010
www.tenKsolar.com
info@tenKsolar.com
@tenKsolar

Simply More Energy

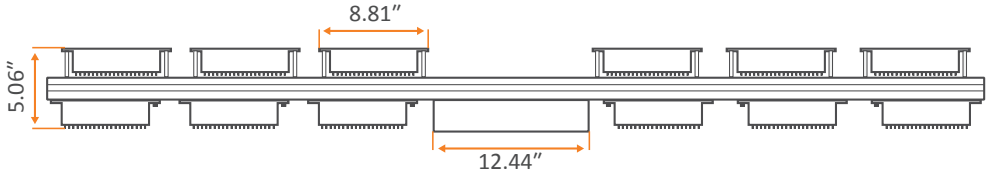
Redundant Inverter Bus – 208 V 3Φ Configurations				
kW	~~3.6~~	~~7.2~~	10.8	~~21.6~~
# of Inverter Buses	~~½~~	~~1~~	1 ½	~~3~~
# of Inverters	~~6~~	~~12~~	18	~~36~~

Inverter Bus Dimensions

Front View



Top View



Redundant Inverter Bus Specifications			
AC Output Voltage	208 V 3Φ	**DC Input Conductor**	#2 USE-2
DC Distribution/Disconnect	Included	**Mounting System**	Included
Distribution Box Model	MNPV12	**Full RIB Weight**	111 lb
Inverter Specifications			
Inverter Model	LS700TS–208	**Output Fault Current**	18.19 Apk, 0.86 ms
Inverter Max Continuous Power	600 W	**Total Harmonic Distortion**	<4%
Max System Input Voltage (DC)	60 V	**Standby Power (Night time power consumption)**	<300 mW *(per inverter)*
AC Output Frequency	60 Hz	**Enclosure Rating**	NEMA 4
Power Factor	>0.95	**Grid Connection**	IEEE 1547
Ambient Operating Temperature	-40 to 131 °F *(-40 to 55 °C)*	**Emissions & Immunity (EMC)**	FCC PART 15; ANSI C63.4 2003, ICES-003
Storage Temperature	-40 to 185 °F *(-40 to 85 °C)*	**Safety Class**	UL 1741; CSA C22.2 No. 107.1-01

Shipping Information	
Max Quantity/Pallet	8 Inverter Buses
Pallet Dimensions	82″ × 55″ × 30″
Fully Loaded Pallet Weight	984 lb

Specifications and design are subject to change without notice.
Read operating instructions carefully before using this product.

Patents Pending
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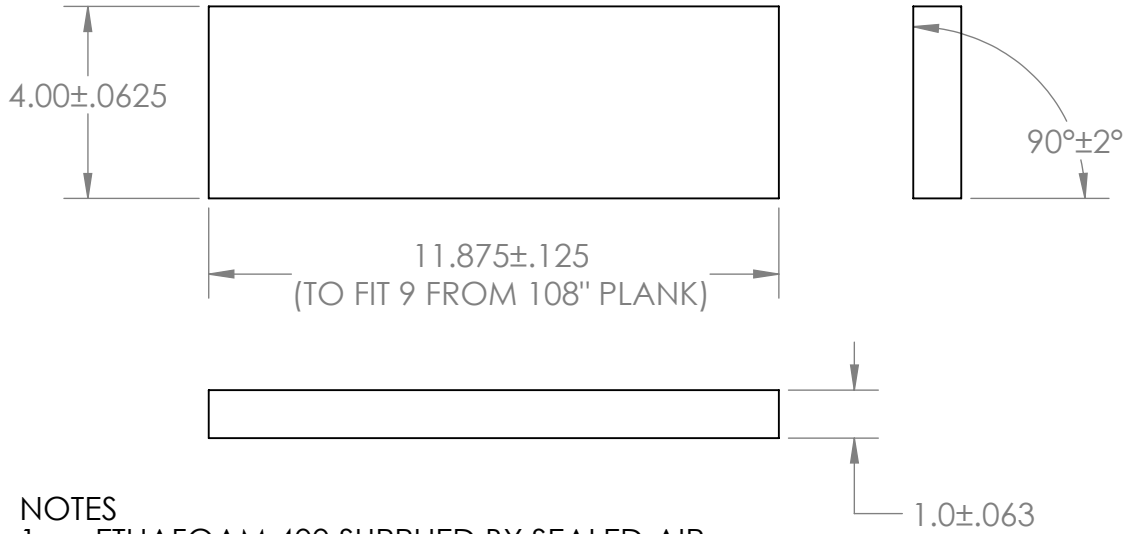
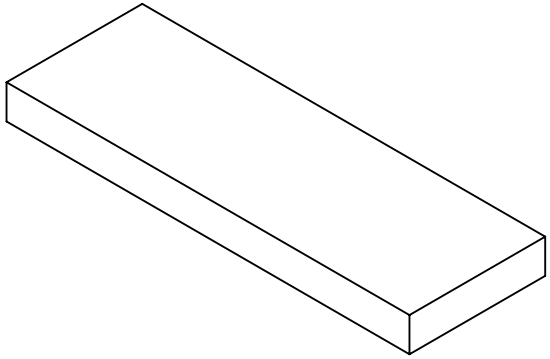
TKS MKT 40110.04

Snap-in foam roof pad Gen 3

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVAL
1	Initial release	4/10/2012	LB
A	Production Release	6/4/2012	LB





NOTES
1. ETHAFOAM 400 SUPPLIED BY SEALED-AIR
2. MAKE NO MATERIAL SUBSTITUTIONS
3. ANGLES NOT SPECIFIED ±3 DEG.
4. LENGTH TOLERANCES TO NEAREST SIXTEENTH
5. ALL FACES SAWED, NONE AS-EXTRUDED
6. PARTS TO BE FREE OF ANY OIL AND GREASE
7. PACKAGING TO BE AGREED-TO BY tenKsolar PRIOR TO INITIAL SHIPMENT

3RD ANGLE PROJECTION

DRAFTER	DATE
LB	4-10-12

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UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE INCHES

TOLERANCES:
ONE PLACE DECIMAL ±.05
TWO PLACE DECIMAL ±.02
THREE PLACE DECIMAL ±.005

INTERPRET GEOMETRIC TOLERANCING PER:

MATERIAL
Ethafoam 400 Black

FINISH
Sawed all around

DO NOT SCALE DRAWING

tenKsolar

TITLE:
Snap-in foam roof pad Gen 3 Racking

SIZE	DWG. NO.	REV
A	3601291	A

SCALE: 1:4 | SHEET 1 OF 1

5 4 3 2 1

Density	4.0 pcf (64.1 kg/m³)
Maximum Loading	5.0 psi (34.5 kPa)
Color	Black, Natural

ETHAFOAM™ packaging products

ETHAFOAM™ 400 Polyethylene Foam

ETHAFOAM™ 400 polyethylene foam (same as ETHAFOAM™ HS-45) is a strong, resilient, high-density 4.0 pcf (64.1 kg/m³), closed-cell foam. It is ideally suited as a component material in products requiring a shock absorbing, vibration dampening, insulating, barrier and/or buoyancy component, and as a material for cushioning components in packaging applications for loadings up to 5.0 psi (34.5 kPa).

ETHAFOAM 400 has outstanding dimensional stability and recovery characteristics that provide optimal cushioning protection against repeated impacts. It is ideal for cushion packaging and is used in many applications, including computer, automotive, construction and recreation. To achieve optimum performance, Dow recommends that qualified packaging engineers design the total packaging solution.

Sizes Available in Black (Planks):
2" x 24" x 108"
4" x 24" x 108"

Sizes Available in Natural (Planks):
2" x 24" x 108"
3" x 24" x 108"

Product Features

ETHAFOAM™ 400 polyethylene foam is a durable, lightweight, flexible, solid extruded product. As the properties listed on the reverse suggest, ETHAFOAM 400 offers excellent strength, resistance to creep under load, vibration and shock absorbency, and water resistance characteristics.

ETHAFOAM 400 is produced with Dow's patented *RapidRelease* manufacturing process. *RapidRelease* technology delivers a higher quality product with improved dimensional stability and safety. This process technology incorporates a patented CFC- and HCFC-free blowing agent system and an accelerated curing system that reduces residual blowing agents in ETHAFOAM products to trace amounts.

ETHAFOAM 400 meets the requirements of the U.S. Clean Air Act Amendments. It is easily fabricated, impervious to most chemicals, non-abrasive and performs consistently over a wide range of temperatures.

ETHAFOAM 400 is also reusable and completely recyclable because it is made of non-crosslinked polyethylene.

Flammability

ETHAFOAM™ 400 polyethylene foam has successfully passed FMVSS 302 flammability testing, conducted according to the U.S. Code of Federal Regulations, CFR 49.

ETHAFOAM Product Information

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See reverse for properties.

Physical Properties of ETHAFOAM™ 400 Polyethylene Foam

Physical Properties†	Test Method	Direction	Value
Density	ASTM D3575, Suffix W, Method B; ISO 845		**pcf (kg/m³)** 4.0 (64.1)
Compression Set	ASTM D3575, Suffix B (50% compr.)	Vertical	< 15%
Compressive Creep (1000 hrs @ 73°F [23°C])	ASTM D3575, Suffix BB	Vertical	< 10% @ 5.0 psi (34.5 kPa)
Compressive Deflection @ 10% @ 25% @ 50%	ASTM D3575, Suffix D	Average	**psi (kPa)** 17 (117) 19 (131) 32 (221)
Thermal Stability	ASTM D3575, Suffix S		< 1%
Thermal Conductivity @ 75°F (24°C) @ 23°F (-5°C)	ASTM D3575, Suffix V; EN 28301; ISO 2581	Vertical	**BTU•in/hr•ft²•°F (W/m°K)** 0.42 (0.06) 0.37 (0.05)
Water Absorption	ASTM D3575, Suffix L; ISO 2896; ASTM C272		**lb/ft² (kg/m²)** 0.2 (1.0) < 1% by volume
Buoyancy	ASTM D3575, Suffix AA		**pcf (kg/m³)** 58 (930)
Tensile Strength @ peak	ASTM D3575, Suffix T; ISO 1798	Average	**psi (kPa)** 50 (345)
Tensile Elongation	ASTM D3575, Suffix T; ISO 1798	Average	70%
Tear Strength	ASTM D3575, Suffix G	Average	**lb/in (N/mm)** 19 (3.7)

†The data presented for this product are for unfabricated ETHAFOAM polyethylene foam products. While values shown are typical of the product, they should not be construed as specification limits.

For information on products, design assistance and testing services available from Dow, contact us at: 1-866-PKG-FOAMS (754-3626) or www.ethafoam.com

NOTICE: No freedom from any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. Dow assumes no obligation or liability for the information in this document. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

WARNING: ETHAFOAM polyethylene foam products are combustible and may constitute a fire hazard if improperly used or installed. During transportation, storage, installation and use, these products should not be exposed to open flame or other ignition sources.

ETHAFOAM PACKAGING PRODUCTS
THE DOW CHEMICAL COMPANY
P.O. Box 1206 • Midland, MI 48641-1206 • USA
www.ethafoam.com

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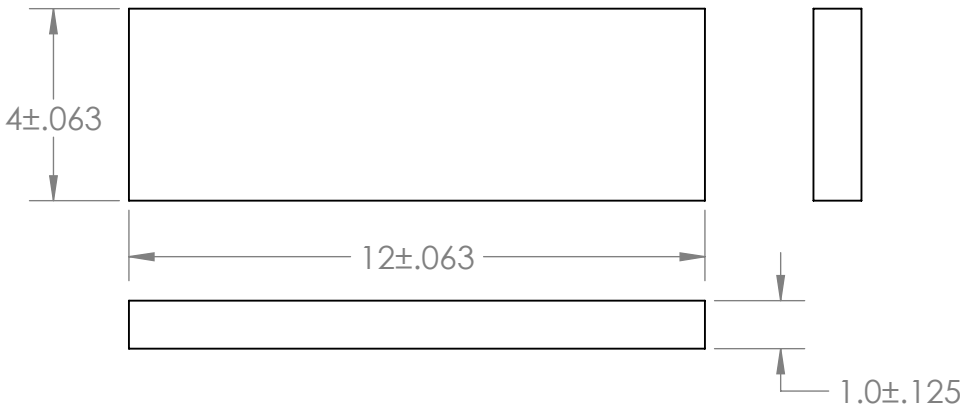
Printed in U.S.A.

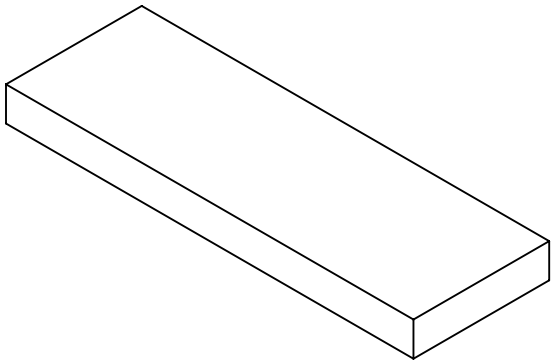
Form No. 172-01386X-0506P&M

ETHAFOAM
Product Information

Composite pad for snap-in Gen 3

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVAL
1	Initial release	4/10/2012	LB
2	Converted to composite rubber	5/1/2012	LB
A	Production release	6/4/2012	LB





NOTES
1. MATERIAL IS COMPOSITE BLEND OF NEOPRENE/SBR/EPDM WITH EPDM BINDER
2. COLOR IS MOSTLY BLACK WITH MULTI-COLORED SPECKLES
3. ANGLES NOT SPECIFIED ARE ±3 DEG.
4. LENGTH TOLERANCES ARE TO NEAREST 1/16"
5. PARTS TO BE FREE OF ANY WATER, OIL, OR GREASE
6. PACKAGING TO BE AGREED TO BY tenKsolar PRIOR TO INITIAL SHIPMENT

3RD ANGLE PROJECTION

DRAFTER	DATE
LB	5-1-2012

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UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE INCHES
TOLERANCES:
ONE PLACE DECIMAL ±.05
TWO PLACE DECIMAL ±.02
THREE PLACE DECIMAL ±.005
INTERPRET GEOMETRIC TOLERANCING PER:
MATERIAL See Notes
FINISH NA
DO NOT SCALE DRAWING

tenKsolar

TITLE:
Composite pad for snap-in Gen 3
Racking

SIZE	DWG. NO.	REV
A	3601293	A

SCALE: 1:4 SHEET 1 OF 1

5 4 3 2 1

Limited System Warranty

Version 3.4, effective January 12, 2015

tenKsolar, Inc. ("tenKsolar") warrants that for twenty five (25) years from the date of delivery, its photovoltaic (PV) modules shall be free from defects in materials and workmanship under normal application, installation, service and use conditions, and the power output of the PV Modules will be at least 97% of the Minimum Peak Power* rating for the first year, and declining by no more than 0.2% per year for the following 24 years, so that the power output at the end of the final year of the 25 year warranty period will be at least 92% of the Minimum Peak Power rating.

If a PV module fails to conform to this warranty, then for a period ending twenty five (25) years from date of delivery to the original end customer ("the Customer"), tenKsolar will, at its option, repair or replace sufficient product, or refund the pro-rated portion of the purchase price as paid by the Customer ("Purchase Price"). The repair, replacement or refund remedy shall be the sole and exclusive remedy provided under the Limited Product Warranty and shall not extend beyond the twenty five (25) year period set forth herein.

Limited Warranty for Other Equipment

tenKsolar, Inc. ("tenKsolar") warrants that for twenty five (25) years from the date of delivery any equipment, goods or materials manufactured by tenKsolar other than PV Modules (Other Equipment) and furnished to the Customer in connection with the Customer's purchase of PV modules shall be free from defects in materials and workmanship under normal application, installation, use and service conditions. If the Other Equipment fails to conform to this warranty, then for a period ending twenty five (25) years from date of delivery to the original end customer ("the Customer"), tenKsolar will, at its option, either repair or replace the product, or refund a pro-rated portion of the Purchase Price. The repair, replacement or refund remedy shall be the sole and exclusive remedy provided under the Limited Warranty for Other equipment and shall not extend beyond the twenty five (25) year period set forth herein.

Equipment not Manufactured by tenKsolar

For any equipment, goods or materials not manufactured by tenKsolar, the warranty shall be the manufacturer's transferable warranty only.

Exclusions and limitations

a) Limited Warranty claims must be filed within the applicable Limited Warranty period set forth above, and any delivery of additional PV modules, or Other Equipment or the repair or replacement thereof shall not extend the original terms of the Limited Warranties set forth herein [and no further or additional warranty shall be provided in connection with any such additional PV Modules, Wave Reflectors or Other Equipment or the repair or replacement thereof].

b) Limited Warranty claims may only be made by, or on the behalf of, the original end customer or a subsequent owner if they remain installed at the original location.

c) The Limited Warranties do not apply to any of the following:

   i. PV modules or Other Equipment which in tenKsolar's sole and absolute judgment have been subjected to: misuse, abuse, neglect or accident; alteration, improper installation, application or removal (including without limitation, application or removal by any party other than a tenKsolar authorized dealer); non-observance of tenKsolar's installation, users' and/or maintenance instructions; repair or modifications by someone other than an approved service technician of tenKsolar; power surges, lightning, flood, fire, accidental breakage, actions by third parties or other events outside tenKsolar's control.

   ii. Cosmetic defects stemming from normal wear and tear of PV module materials.

   iii. PV modules installed in locations, which in tenKsolar's sole and absolute judgment may be subject to direct contact with salt water or other corrosive substance.

d) The Limited Warranties do not cover any transportation costs for return of the PV modules, or for reshipment of any repaired or replaced PV modules, or cost associated with installation, removal or reinstallation of the PV modules.

e) When the PV Modules are used on a mobile platform of any type, this entire Limited Warranty shall be void.

f) Limited Warranty claims will not apply if the type or serial number of the PV modules is altered, removed or made illegible.

Making a Warranty Claim

If you feel you have a justified claim covered by this Limited Warranty, immediately notify (a) the seller and installer of the PV modules or contact tenKsolar, Inc. directly at the contacts shown below. Your installer, or tenK will give advice on handling the claim, which shall include, without limitation, the provision of the original invoice, and/or evidence of the date of delivery of the PV module, serial number and product number of affected modules, and evidence of claim. The return of any PV modules will not be accepted unless prior written authorization has been given by tenK. In the case of any warranty claim addressed by replacement, ownership of the replaced equipment shall pass to tenK.

Limitation of Limited Warranty Scope

SUBJECT TO THE LIMITATIONS UNDER APPLICABLE LAW, THE LIMITED WARRANTIES SET FORTH HEREIN ARE EXPRESSLY IN LIEU OF AND EXCLUDE ALL OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR PARTICULAR PURPOSE, USE, OR APPLICATION, AND ALL OTHER OBLIGATIONS OR LIABILITIES ON THE PART OF TENKSOLAR, UNLESS SUCH OTHER WARRANTIES, OBLIGATIONS OR LIABILITIES ARE EXPRESSLY AGREED TO IN WRITING SIGNED AND APPROVED BY TENKSOLAR. TENKSOLAR SHALL HAVE NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR DAMAGE OR INJURY TO PERSONS OR PROPERTY OR FOR OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR RELATED TO THE PRODUCT, INCLUDING, WITHOUT LIMITATION, ANY DEFECTS IN THE MODULE, OR FROM USE OR INSTALLATION OR FROM DAMAGE OR LOSS DUE TO WIND OR STORM NOR FROM ANY CAUSE RELATED TO THE ATTACHMENT OR FAILURE TO ATTACH THE SOLAR ARRAY TO A STRUCTURE. UNDER NO CIRCUMSTANCES SHALL TENKSOLAR BE LIABLE FOR PUNITIVE, INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES, HOWSOEVER CAUSED. LOSS OF USE, LOSS OF PROFITS, LOSS OF PRODUCTION, LOSS OF REVENUES ARE THEREFORE SPECIFICALLY BUT WITHOUT LIMITATION EXCLUDED.

TENKSOLAR'S AGGREGATE LIABILITY, IF ANY, IN DAMAGES OR OTHERWISE (INCLUDING WITHOUT LIMITATION ANY REPAIR AND REPLACEMENT COSTS UNDER THE LIMITED WARRANTIES SET FORTH HEREIN), SHALL NOT EXCEED THE PURCHASE PRICE PAID TO TENKSOLAR BY THE CUSTOMER, FOR THE UNIT OF PRODUCT OR SERVICE FURNISHED OR TO BE FURNISHED, AS THE CASE MAY BE, WHICH GAVE RISE TO THE LIMITED WARRANTY CLAIM.

No Warranty for Wind Loading, Weight and Structural Application

TENKSOLAR MAKES NO WARRANTY FOR THE FITNESS OF THE TENKSOLAR MODULE PRODUCT FOR ANY ROOFTOP INSTALLATION. ANY LABORATORY DATA OR EXAMPLES OF INSTALLATIONS PROVIDED BY TENKSOLAR TO AID IN STRUCTURAL DESIGNS DONE BY OTHERS ARE PURELY FOR REFERENCE AND MAKE NO CLAIM OR WARRANTY AS TO THE SUITABILITY OF THE RAIS WAVE IN ANY GIVEN INSTALLATION CONFIGURATION. STRUCTURAL DESIGNS FOR WIND, WEIGHT AND OTHER LOADINGS ARE WHOLLY THE RESPONSIBILITY OF PURCHASER, INCLUDING DECISIONS TO USE OR NOT USE BALLAST WEIGHTS, ROOF MODIFICATIONS, PENETRATIONS, TETHERS OR OTHER FASTENERS TO CONNECT THE SOLAR ARRAY TO THE GROUND OR TO A BUILDING STRUCTURE. TENKSOLAR SHALL HAVE NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR DAMAGE OR INJURY TO PERSONS OR PROPERTY OR FOR OTHER LOSS OR INJURY RESULTING FROM ANY CAUSE WHATSOEVER ARISING OUT OF OR RELATED TO THE PHYSICAL INSTALLATION, ATTACHMENT OR FAILURE TO ATTACH THE PRODUCT TO A ROOF, GROUND OR STRUCTURE.

**"Minimum Peak Power" = for the purposes of enforcement of this warranty, shall mean that the PV module nameplate output, minus published tolerance and minus allowed annual degradation and measured to Standard Test Conditions (STC) using methods, mounting and laboratory facilities approved by tenKsolar including an approved continuous light tester.*

About tenKsolar

tenKsolar, Inc., provides a photovoltaic solar solution that delivers on the promise of the lowest cost of solar electricity, while at the same time improving power density, safety, longevity and bankability of photovoltaic systems. Since its original founding in 2008, tenKsolar has been a leading innovator in the delivery and implementation of photovoltaic solar systems for commercial customers. More information about tenKsolar is available online at www.tenKsolar.com

LIMITED WARRANTY TERMS

LeadSolar Energy Extended Warranty Terms For tenK Solar systems

Limited Product Warranty – Ten (10) Year Repair, Replacement or Refund Remedy

Leadsolar Energy Co., Ltd. ("Leadsolar") has developed highly reliable micro-inverters, designated as the LS250, LS560, LS600, LS650, LS700 Series ("Microinverter"). Leadsolar inverters are packaged with solar systems designed and manufactured by tenK Solar, Inc. (" tenKsolar"). The Microinverter is designed to withstand normal operating conditions when used for its original intended purpose in compliance with the tenK solar system requirements. The Leadsolar Limited Product Warranty ("Limited Product Warranty") covers defects in workmanship and materials of the Leadsolar Microinverter ("Defective Product") for a period of twenty five (25) years from the date of the end customer receives the product (the "Limited Product Warranty Period").if the repair or replacement of the Defective Product is required to achieve average system operability (**"**Average System Operability**"**). Average System Operability is calculated by dividing the number of operational microinverters within the single connected system by the total number of microinverters installed within the single connected system, rounded to the nearest integer.

This Limited Warranty covers Defective Product only in as much as the defect in the Product reduces Average System Operability below 100% in the first ten years of the Warranty Period and, for the years thereafter, below an Average System Operability value calculated by reducing the Average System Operability by one percentage point each year starting at the end of the tenth year. For example, this Limited Warranty applies to Defective Product in the fifteenth year if, and only to the extent that, such Defective Product results in less than ninety-five percent of the warranted inverters on any single system being operational, and in the twentieth year if, and only to the extent that, such Defective Product results in less than ninety percent of the warranted inverters on any single system being operational.

Provided that such loss in Average System Operability is determined by LeadSolar (in its sole and absolute discretion) to be due to defects in material or workmanship of a LeadSolar Microinverter (also, a "Defective Product"), LeadSolar will replace such loss in power by, at its option, either (i) providing to the Customer additional LeadSolar Microinverters to make up such loss in power, (ii) providing monetary compensation equivalent to the cost of additional material required to make up such loss in power or (iii) repairing or replacing the defective material, at the sole option of LeadSolar, which shall be the Customer's sole and exclusive remedy therefore.

During the applicable Warranty Period, if Leadsolar establishes that the existence of a defect that is covered by the applicable Limited Warranty, Leadsolar will at its option either repair or replace the Defective Product free of charge, or issue a credit or refund for the Defective Product to the Customer in an amount up to its actual value at the time of the Customer notifies Leadsolar of the defect. If Leadsolar elects to repair or replace the Defective Product, Leadsolar will at its option, use new and/or reconditioned parts, and/or parts of the original or an improved design, in preparing or replacing the Defective Product. If Leadsolar replace or repairs a Defective Product, the applicable Limited Warranty continues on the replacement or repaired Product for the remainder of the applicable Warranty Period.

The Limited Warranties do not cover, and LeadSolar Energy will not be responsible for the following, which shall not be construed as an exhaustive list:

- Shipping damages or damages caused by mishandling by freight carrier which should be the responsibilities of the freight carrier
- Improper storage (including stored by the dealer, installer and the end user)
- Incorrect installation, commissioning, operated, handled, misused, neglected, tampered with, altered or otherwise damaged either internally or externally.
- Device modified, changed, or attempted repaired by companies or persons not authorized by Leadsolar Energy
- Labor costs related to uninstalling the Defective Product or re-installing a repaired or replacement product or trouble shooting of the customers' electrical system if applicable. (the Limited Warranty to the extend applicable covers the costs of shipping a repaired or replacement product from Leadsolar via a non-expedited freight carrier selected by Leadsolar to the approved locations.)
- Damage caused by defects of other components of the photovoltaic system
- Non-compliance with Leadsolar Energy user manual, installation guide and maintenance regulations
- Deface, alter, or remove original identification markings (including trademark or serial number)
- Force majeure (storm, lightning, overvoltage, fire, water, generalized corrosion, biological infestations, acts of God, or input voltage that creates operating conditions beyond the maximum or minimum limits listed in Leadsolar Microinverter Specifications including high input voltage from generators or lightning strikes etc.)
- Cosmetic, technical or design defects or shortcomings that do not materially influence or affect the energy production.

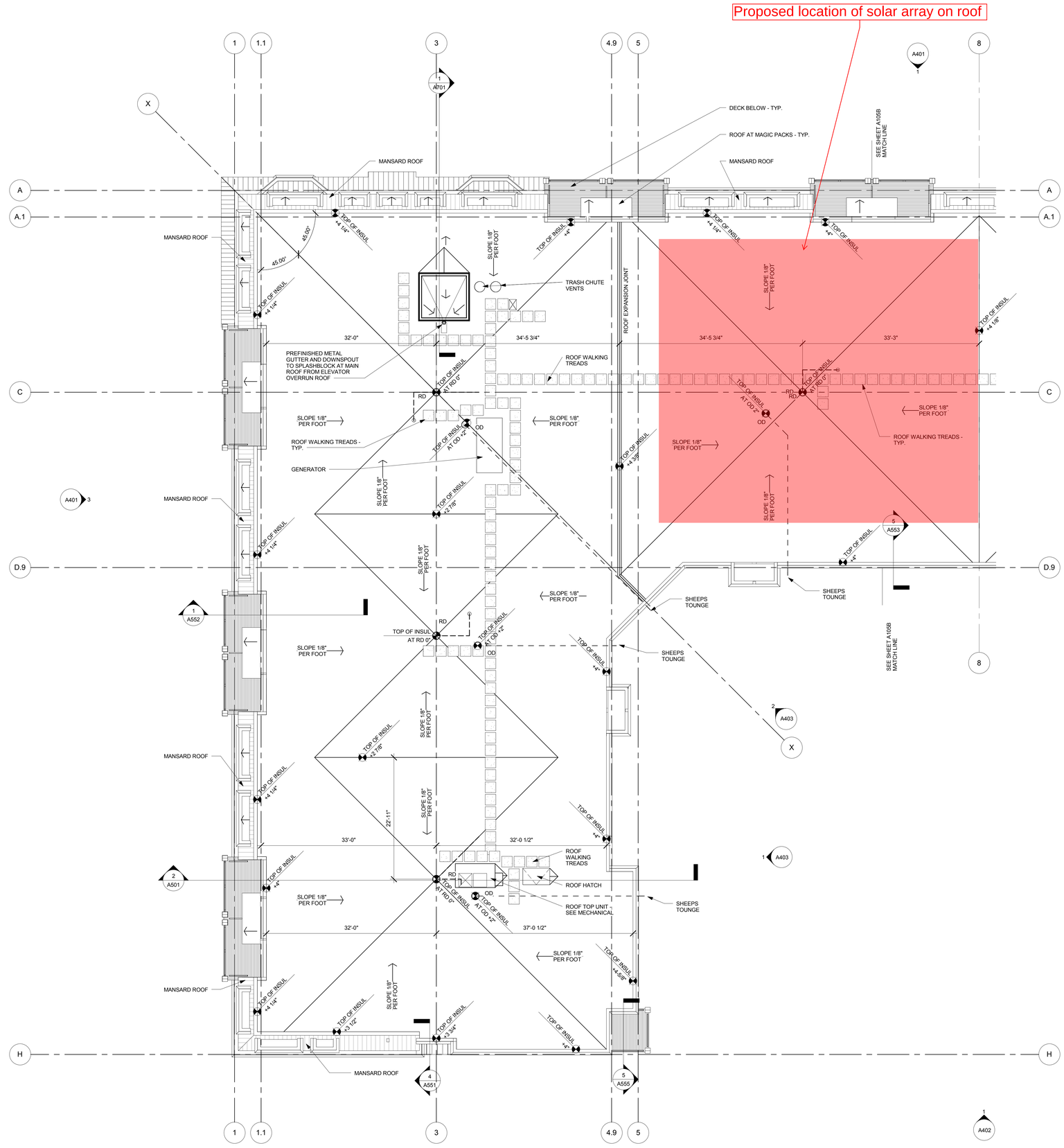
During the applicable Warranty Period, the applicable Limited Warranty is transferrable to a different owner ("Transferee") as long as the Microinverter remains installed at the originally-installed end user location ("Original Location") and the Transferee submits to Leadsolar a "Change of Microinverter Ownership Form" and applicable Transfer Fee within 45 days from the date of transfer to the Transferee. The submission is a requirement for

continued Limited Warranty coverage. Applicable Transfer fee is set forth in the Change of Microinverter Ownership Form which is subject to reasonable adjustment from time to time as determined at Leadsolar's discretion.

The Limited Warranty does not extend beyond the original cost of the Leadsolar Microinverter. To obtain service under these Limited Warranties, the Customer must comply with the Return Merchandise Authorization Number (RMA) policy and procedures (www.leadsolarenergy.com)

THE LIMITED WARRANTY IS THE SOLE AND EXCLUSIVE WARRANTY GIVEN BY LEADSOLAR AND, WHERE PERMITTED BY LAW, IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, STATUTORY OR OTHERWISE, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF TITLE, QUALITY, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OR WARRANTIES AS TO THE ACCURACY, SUFFICIENCY OR SUITABILITY OF OTHER INFORMATION PROVIDED IN MANUALS OR ANY TECHNICAL OR OTHER DOCUMENTATION. IN NO EVENT WILL LEADSOLAR BE LIABLE FOR ANY SPECIAL, DIRECT, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, COSTS OR EXPENSES HOWEVER ARISING, WHETHER IN CONTRACT OR TORT, INCLUDING WITHOUT LIMITATION ANY ECONOMIC LOSSES OF ANY KIND, ANY LOSS OR DAMAGE TO PROPERTY, OR ANY PERSONAL INJURY.

Leadsolar expressly reserves the right to novate or assign its rights and obligations under this warranty agreement to a third party with the demonstrated expertise and requisite resources needed to effectively discharge the obligations hereunder. To the extent any implied warranties are required under applicable law to apply to the Leadsolar Microinverter, such implied warranties shall be limited in duration to the Warranty Period, to the extent permitted by applicable law. Some regions do not allow limitations or exclusions on implied warranties or on the duration of an implied warranty or on the limitation or exclusion of incidental or consequential damages, so the above limitation(s) or exclusion(s) may not apply. This Limited Warranty gives the Warranty Holder specific legal rights, and the Warranty Holder may have other rights that may vary from region to region. The grant of this Limited Warranty by Leadsolar is conditioned upon agreement by the Warranty Holder and any permitted Transferee to the terms, conditions and requirements herein.



1 A105A Roof Level - Area A
1/8" = 1'-0"

TRUE NORTH PLAN

BKV GROUP

Architecture
Interior Design
Landscape Architecture
Engineering

Boarman Kroos Vogel Group Inc.

222 North Second Street
Minneapolis MN 55401
Telephone: 612–339–3752
Facsimile: 612–339–6212
www.bkvgroup.com

CONSULTANTS

ISSUANCE
100% Construction Document Set
12/5/2014

PROJECT TITLE
East 7th & Bates Senior Apartments

KEY PLAN NORTH ARROW

CERTIFICATION
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Architect under the laws of the State of Minnesota.

Mike Krych

23555 12/8/2014
License Number Date

REVISION	DATE

DATE	12/5/2014
DRAWN BY	CKP
CHECKED BY	GSM
COMMISSION NO.	1393.67

SHEET TITLE
ROOF PLAN - AREA A

SHEET NUMBER
A105A

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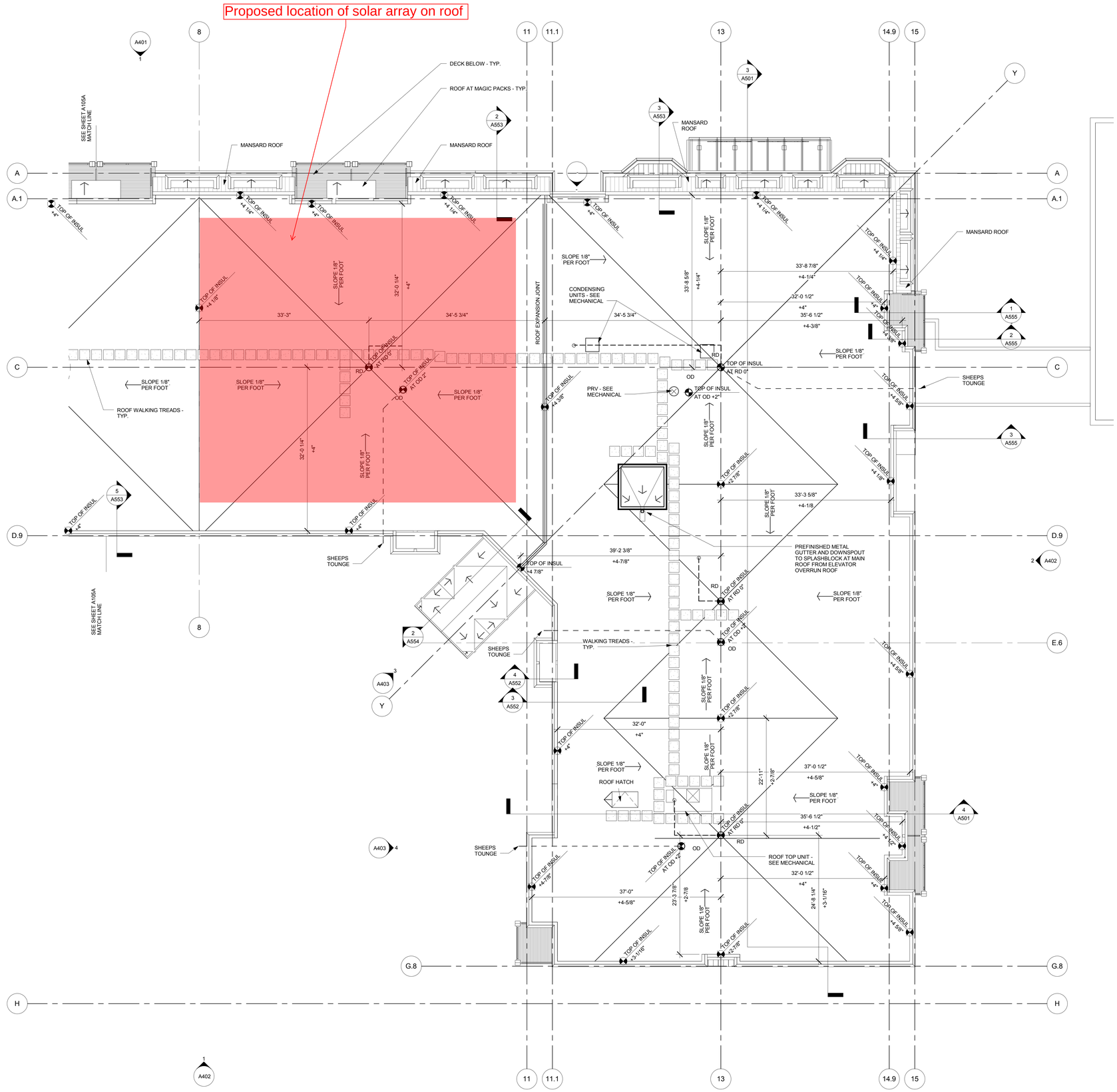
BKVTB-30x42 (2012)



1 A105B Roof Level - Area B
1/8" = 1'-0"

TRUE NORTH PLAN

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222 North Second Street
Minneapolis MN 55401
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CONSULTANTS

ISSUANCE
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PROJECT TITLE

East 7th & Bates Senior Apartments

KEY PLAN NORTH ARROW

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Mike Krych

23555 — License Number
12/8/2014 — Date

REVISION	DATE

DATE	12/5/2014
DRAWN BY	CKP
CHECKED BY	GSM
COMMISSION NO.	1393.67

SHEET TITLE

ROOF PLAN - AREA B

SHEET NUMBER

A105B

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BKVTB-30x42 (2012)

East 7th & Bates

7-11-2016

Perspective View - East 7th & Bates

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East 7th & Bates

7-11-2016

Perspective View - E. 7th & E. North Street

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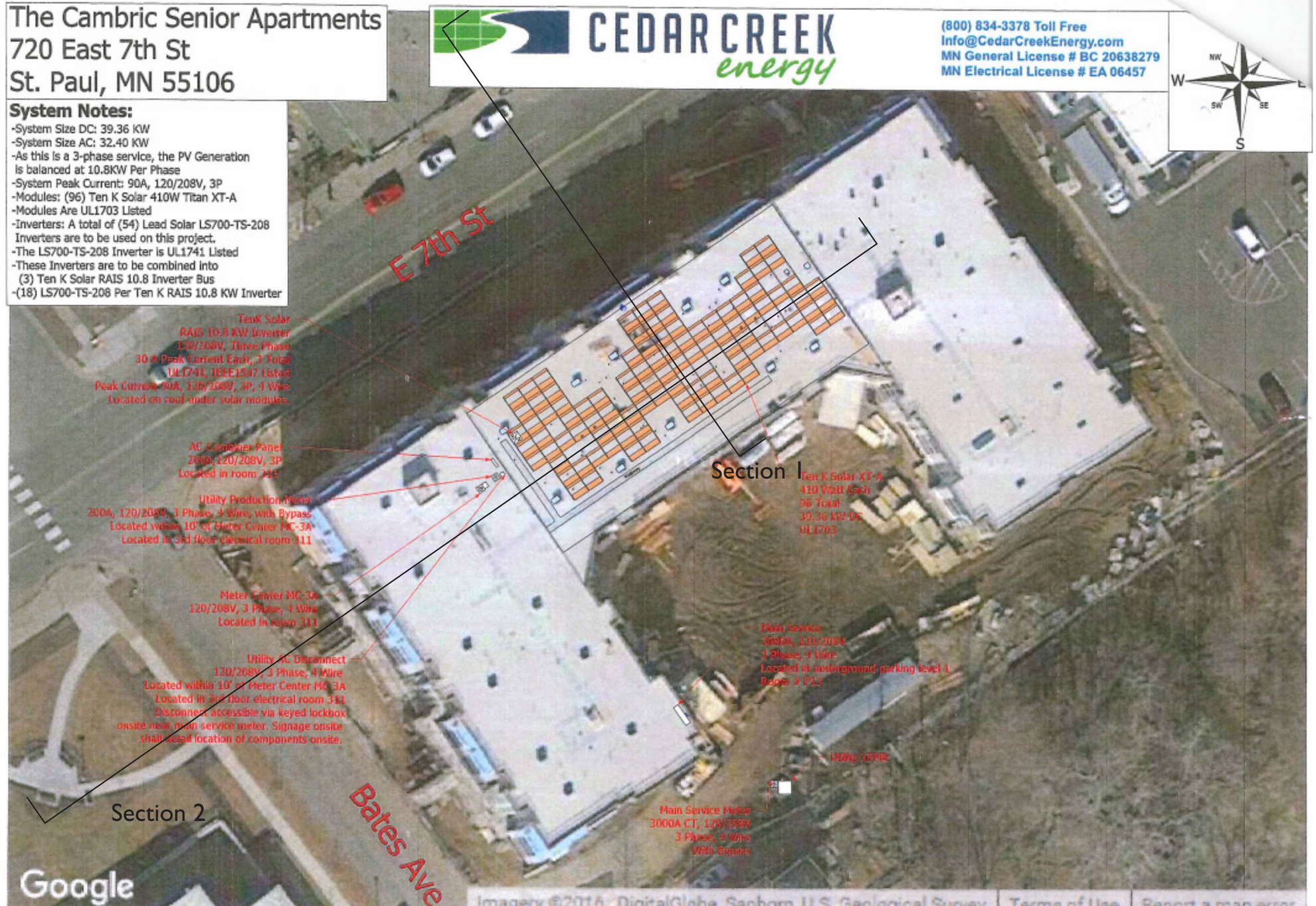
The Cambric Senior Apartments
720 East 7th St
St. Paul, MN 55106

CEDAR CREEK energy

(800) 834-3378 Toll Free
Info@CedarCreekEnergy.com
MN General License # BC 20638279
MN Electrical License # EA 06457

System Notes:

- -System Size DC: 39.36 KW
- -System Size AC: 32.40 KW
- -As this is a 3-phase service, the PV Generation is balanced at 10.8KW Per Phase
- -System Peak Current: 90A, 120/208V, 3P
- -Modules: (96) Ten K Solar 410W Titan XT-A
- -Modules Are UL1703 Listed
- -Inverters: A total of (54) Lead Solar LS700-TS-208 Inverters are to be used on this project.
- -The LS700-TS-208 Inverter is UL1741 Listed
- -These Inverters are to be combined into (3) Ten K Solar RAIS 10.8 Inverter Bus
- -(18) LS700-TS-208 Per Ten K RAIS 10.8 KW Inverter



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Solar Panel Layout

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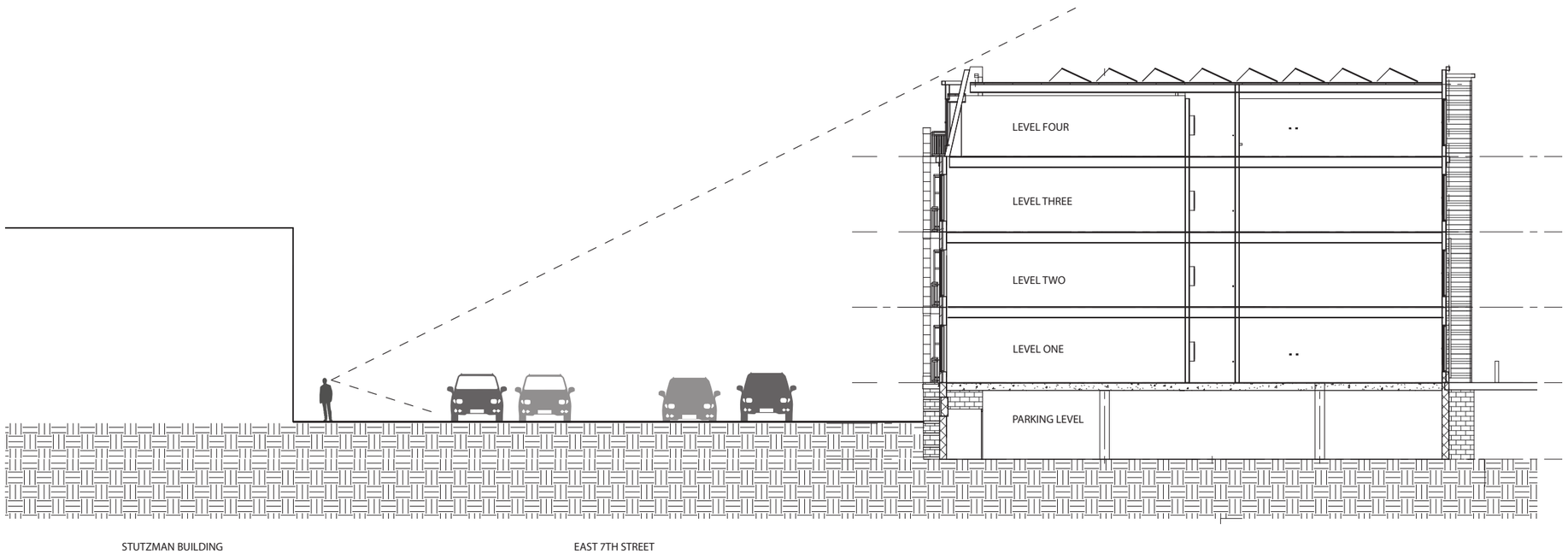

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View Study - Section1

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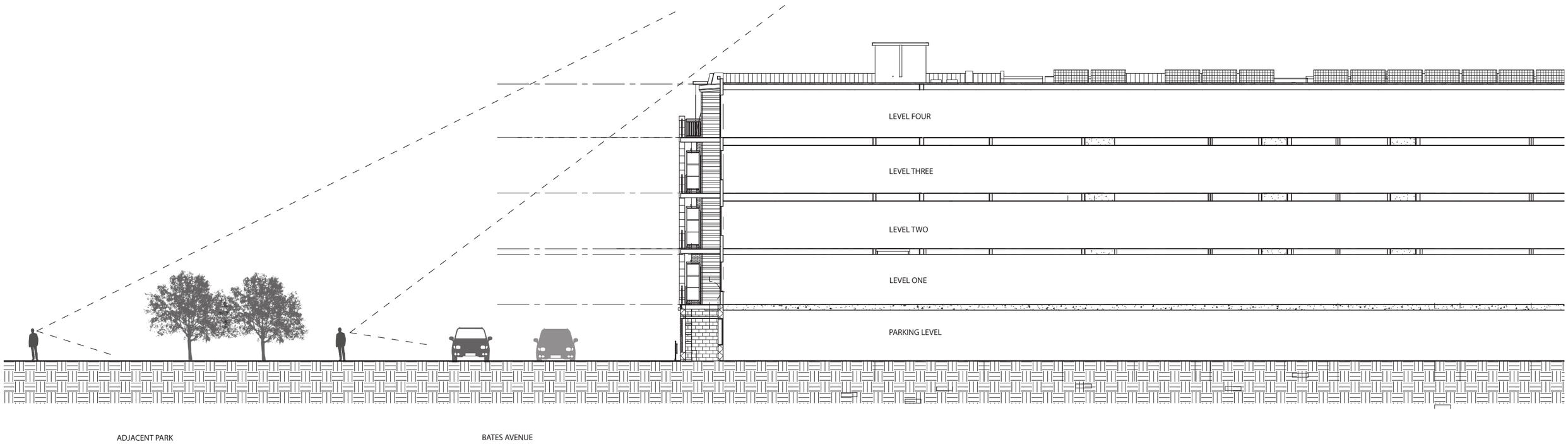

East 7th & Bates

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View Study - Section 2

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