Structural Checksheet Response

Permit #: **12-176776-000-00-CO** **Date: 11/28/2012**

Customer name and phone number: Lite Solar Corporation 503-344-4225

Note: *Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write* **customer** *in the last column.*

#	Description of changes, revisions, additions, etc.	Checksheet and item #
1	The ballast load and assumed dead load have been added to page E1.6	Buellesbach #1
2	See the attached datasheet for Rainbuster 850. The adhesive will be used to positively attach the ballast pavers to the frame and prevent movement by future users or by accident. It will also prevent movement/sliding on the galvanized steel windscreen during a seismic event. See note on detail 8/E1.6. Additional wind screens may be installed under the module if additional ballast is required beyond the paver block limit on the rear windscreen. See 11/E3.2	Buellesbach #2
3	Duplicate information that was provided was due to confusion between old and newly revised plan sets. See most current plans for all pertinent information.	Buellesbach #3
4	All void calculation sheets have been eliminated. Reinforcing the typical 2x14 joists will not be necessary because support feet will be placed between joists and not directly on joists. See revised calculation packaged from RNS Consulting dated 11/28/2012.	Buellesbach #4
5	See the included letter and wind tunnel test report from Cermak, Peterka and Petersen. Please call Joel at Taylor & Syfan at 805-547-2000 Ext 127 with any questions.	Buellesbach #5
6	Please see the included letter from RNS Consulting. Actual ballast loads have been included in all beam calculations. Please see page 2 of 32 of the RNS Consulting calculation package.	Buellesbach #6
7	The existing 6x6 column has been added to the roof framing plan on page E1.4	Buellesbach #7
8	See detailed truss connection information on 4/E1.4 and calculations on pages 1-18 of the plan review checksheet response letter package from RNS consulting.	Buellesbach #8
9	See the included letter titled "Structural Plan Check Response" from Taylor & Syfan, call Joel at Taylor and Syfan at 805-547-2000 Ext 127 with any questions.	Buellesbach #9

Structural Checksheet Response

Permit #: 12-176776-000-00-CO **Date: 10/29/2012**

Customer name and phone number: Lite Solar Corp. 503-344-4225

Note: Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write **customer** *in the last column.*

#	Description of changes, revisions, additions, etc.	Checksheet and item #
1	The design loads have been added and are shown on page E1.5 of the drawings.	Buellesbach #1
2	The panels are held in place by both ballast and positive attachment. The locations of the positive attachment are shown on page E1.5 of the drawings and the details of this attachment are shown in detail 12/E1.5.	Buellesbach #2
3	The existing framing is shown everywhere that panels will be added on page E1.4. The sizes of all members are shown including the elements supporting the rafters west of and parallel to the bearing wall. The existing support beams where a flitch plate will be added are built-up members consisting of (4) 2x14 solid sawn members. No new 2x14 members are being added. A steel flitch plate, 0.5"x13" is being added to the existing (4) member beam.	Buellesbach #3
4	Analysis and adequacy check of the existing truss can be found on pages 21-32 of the RNS Consulting calculations.	Buellesbach #4
5	The loads being used can be found on page 2 of the RNS Consulting calculations. Explanation of the composite members can be found on pages 3-8 of the RNS Consulting calculations.	Buellesbach #5
6	A diagram has been added to page 5 of 32 and page 18 of 32 of the RNS Consulting calculations. The composite section properties are necessary to determine the shear flow at the interface of the two separate members. This calculation determines the size and quantity of fastener required to make the two members behave has a single member.	Buellesbach #6
7	Complete details for all panel connections and all structural information have been added to page E1.5.	Buellesbach #7
8	Calculations showing the lateral loads that the panel connections must resist are shown on pages 1.05-1.08 of the Taylor & Syfan structural calculations. Calculations showing the uplift loads that the panel connections must resist are determined using an Excel program and are shown on pages 1.01-1.04.	Buellesbach #8
9	The important panel details shown on the E3 sheets have been added to page E1.5 of the plan.	Buellesbach #9

Structural Checksheet Response

Permit #: **12-176776-000-00-CO** **Date: 12/17/2012**

Customer name and phone #: Lite Solar Corp (Jessica Kaplan) 503-344-4225

Note: *Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write* **customer** *in the last column.*

#	Description of changes, revisions, additions, etc.	Checksheet and item #
2	Please see the supplied document for the SnapNRack Series 450 Quick Install Guide. You can see the lip on the ballast trays on pages 5, 9 and 10.	2
10	Sheet E1.5 has been supplied.	10

(for office use only)

CITY OF PORTLAND, OREGON – BUREAU OF DEVELOPMENT SERVICES

1900 SW Fourth Avenue, Suite 5000 • Portland, Oregon 97201 • www.portlandonline.com/bds

MULTNOMAH COUNTY

STRUCTURAL CHECKSHEET

Application # : **12-176776-000-00-CO**
Review Date : **December 14, 2012**

Commercial Building Permit

To:	APPLICANT	KATIE CARLE LITE SOLAR CORPORATION 8811 SE HERBERT CT CLACKAMAS, OR 97015	Work: Fax: e-Mail:	503 344-4225 503 345-9619 kcarle@litesolarcorp.com
From:	BDS Structural Engineer	Lisa Buellesbach	Phone:	503-823-7704
cc:	OWNER	PHILIP S RAGAWAY PO BOX 235 PORTLAND, OR 97207		

PROJECT INFORMATION

Street Address:	2021 NE M L KING BLVD
Description of Work:	Solar/PV panel ADD ROOFTOP SOLAR ARRAY TO SOUTHERN BUILDING

NOTE: Comments from the Structural Checksheet dated November 2, 2012 that need further clarification/correction have been provided below for reference only. This recheck is based on a response submitted to BDS on November 28, 2012. For consistency, the same item numbers from the previous structural checksheet are used in this checksheet. Item numbers from the previous checksheet that are not included in this checksheet appear to have been sufficiently addressed. Items new to this checksheet as a result of the submitted response start with 10.

Based on the plans and specifications submitted, the following items appear to be missing or not in conformance with the Oregon Structural Specialty Code and / or other city, state, or federal requirements.

Item #	Location on plans	Code Section	Clarification / Correction Required
2.	E3.2	ASCE 7 13-4	Ballast pavers must be positively attached to the frame. Adhesive is not allowed as a method for providing positive attachment. On past projects, ballast was installed tightly under a lip in the tray which held the ballast in place. It appears from the drawings that there may be a lip on the trays. In this case, adding the adhesive would be fine. Please address.
10.	E1.4, E1.5	OSSC 107.2.1	It appears you added a new sheet as there are section cuts on E1.4 that reference sheet E1.5. E1.5 was not included in the submittal package. Please provide sheet E1.5.

RNS Consulting LLC

12-176776-CO

November 25, 2012

RECEIVED
NOV 28 2012
BDS
DOCUMENT SERVICES

Ms. Jessica Kaplan
Lite Solar Corp.
8811 SE Herbert Ct.
Clackamas, OR 97015

Subject: Plan Review Check Sheet
MLK Building, 2021 NE MLK Blvd., Portland, OR 97212
City of Portland Permit Application No.: 12-176776-000-00-CO
RNS Project No.: 120174

Dear Ms. Kaplan:

This letter is in response to the plan review check sheet, by Ms. Lisa Buellesbach of the City of Portland, dated November 2, 2012. The following responses follow the same numbering sequence as the original plan review check sheet.

4. *Please eliminate the calculation sheets that are void. The calcs still show that you have to reinforce the typical 2x14 joists and reinforcing is not shown.*
   The voided calculation sheets have been removed from the calculation set.

6. *The calcs for existing roof beams seem to ignore any ballast loads. Please include ballast loads when checking the capacity of the existing structure. The Taylor & Syfan letter gives and average ballast load of 5.45 psf. Please use actual ballast that will be supported by the existing structure. In some areas the actual ballast load will be much higher than 5.45 psf.*
   Actual ballast loads have been included in all beam calculations. Please see attached pg. 2 of 32.

11605 NE 16th St., Vancouver, WA 98684
(503) 737-4344 RNS-consulting@comcast.net

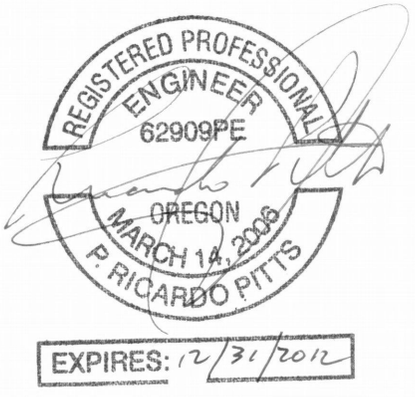
8. *Provide information showing that the truss connections are adequate to support the increased loads, or show that the increased loads are less than 5% of the original design loads.*
   Calculations comparing the stress due to the new loads verses the stress due to the existing loads are attached.

If you have any questions, please feel free to contact this office.

Sincerely,

RNS Consulting LLC

P. Ricardo Pitts, MSc, P.E.
Principal



RNS Consulting LLC

Loading

Panel w = 2.54 psf

Max. (5) Ballast Pavers = 5(25) = 125 #

Max. (8) Ballast Pavers = 8(25) = 200 #

T.A. (per support foot) = 5.33(1.92) = 10.22 ft²

for (5) paver max.:

$$D.L. = [2.54(10.22) + 125] = 150.96\ \#$$

$$L.L. = 25(10.22) = 255.5\ \#$$
(snow)

$$\therefore\ P_{a(5)} = 150.96 + 255.5 = 406.46\ \#$$

$$P_{b(5)} = \frac{406.46}{2} = 203.23\ \#$$

for (8) paver max.:

$$D.L. = [2.54(10.22) + 200] = 225.96\ \#$$

$$\therefore\ P_{a(8)} = 225.96 + 255.5 = 481.46\ \#$$

$$P_{b(8)} = 481.46 - 200 = 281.46\ \#$$

Uniform Roof D.L. = 15 psf

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Vancouver, WA 98684
(503) 737-4344
RNS-consulting@comcast.net

Compare stresses in existing truss members

(worst case, member B3 / B5)

	Exist. Loads (Pg. 2-9)	w/New Loads (Pg. 10-18)	% diff.
Bending:	7.826 K-ft	8.222 K-ft	$\frac{(8.222-7.826)}{7.826}(100) = 5.0\%$
Compression:	34.261 K	36.069 K	$\frac{(36.069-34.261)}{34.261}(100) = 5.2\%$
Tension:	6.300 K	6.640 K	$\frac{(6.64-6.3)}{6.3}(100) = 5.3\%$
Shear:	3.130 K	3.305 K	$\frac{(3.305-3.13)}{3.13}(100) = 5.3\%$

Member stresses approximately 5% difference ∴ ok

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Vancouver, WA 98684
(503) 737-4344
RNS-consulting@comcast.net

Project: MLK Building Job #: 120174

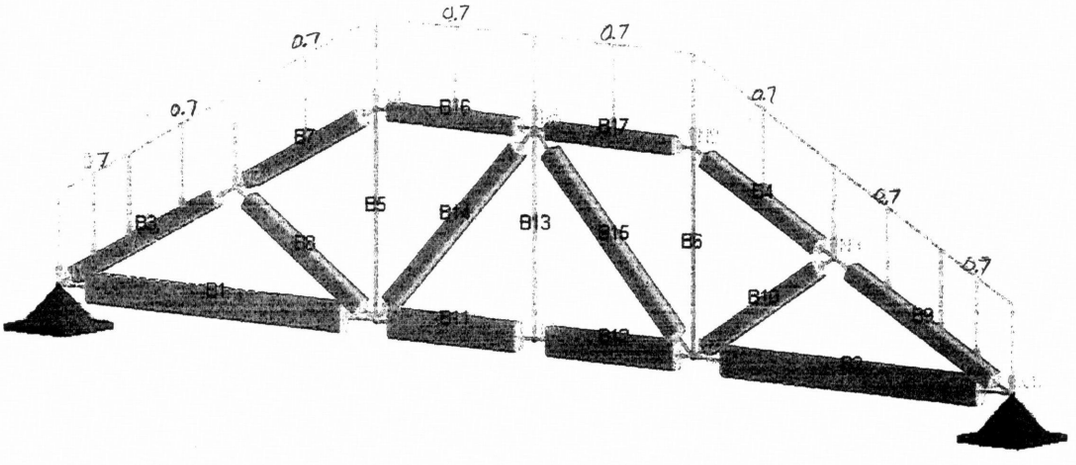
Address: 2021 NE MLK Blvd., Portland, OR

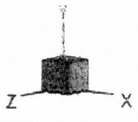
Client: Lite Solar Corp.

By: RP Date: 11/27/2012

Company/Project: RNS Consulting LLC / exisiting roof truss W/EXIST. LOADS	**VersaFrame V4.10 (525.0)** (C) Digital Canal Corp.
Engineer: P. Ricarod Pitts, P.E.	Date/Time: 11/27/12 12:50:17

LoadComb: [Default]





2 OF 18

Note:

1/11

Central Coast:
684 Clarion Court
San Luis Obispo, CA 93401
(805)547.2000
(805)547.2001 fax
(800)579.3881

Southern California:
1276 E. Colorado Blvd.
Suite 201
Pasadena, CA 91106
(626)793.7438
(626)793.7439 fax

Structural Plan Check Response

Date: November 19, 2012

Project: Series 450 Roof Installation
2021 NE MLK Blvd.
Portland, OR 97212

T&S Job No.: 12325

Plan Check No.: 0001

STRUCTURAL CORRECTION ITEMS:

1. "Provide the design that Taylor and Syfan is verifying. It appears that the loads are based on wind tunnel testing. Please provide the wind tunnel tests along with an explanation of how the loads on the panel in this project are determined."

The Wind Tunnel Testing Report may be supplied by SnapNrack. Please find the example procedure for deriving the force to a single panel that follows in addition to an outlined explanation of the results found from applying the Wind Tunnel Testing procedure.

2. "Show how the lateral loads are transferred through the panel arrays to the standoffs. For example, there is only 1 standoff for the lower left corner of the plan. There are no standoffs for the 16 panels at the north building, near the center. Provide a design for the standoffs showing their capacity to resist combined tension and bending loads."

Please find the included explanation of load flow through the PV panel system for transfer of force to the standoffs in a subarray. The subarray referenced in the center of the installation is positively connected to a single standoff; however, we suggest adding another standoff for balanced lateral force resistance to the panel indicated in the pages that follow (specifically, page 8/11.) The original anchorage calculation, including design of the standoff connection, can be found on page 1.08 of the original "Structural Calculations" dated August 3, 2012. Page 11 of the calculations contained herewith also identify the proper orientation for the installed standoffs, each installed with (2) lag screws of size and type as indicated. Please find the additional calculation for both uplift (wind) and lateral (seismic) forces on a single standoff as requested.

We thank you for your valuable help in assisting us to create a more complete set of structural calculations. Please feel free to contact our office if you have any additional questions or comments.

Sincerely,
Taylor & Syfan Consulting Engineers, Inc.

Amy Ransom
Project Engineer

TAYLOR & SYFAN CONSULTING ENGINEERS, INC

San Luis Obispo | Pasadena | www.taylorsyfan.com

2010 OSSC Wind Tunnel Analysis - Version 0.10

Project: **12325 – 2021 NE MLK – SnapNrack**

WIND TUNNEL TESTING RESULTS

The wind tunnel forces listed on the following page are the result of wind tunnel testing based on ASCE 7-05 Section 6.6 – Method 3 – Wind Tunnel Procedure. This procedure was tested by an independent wind tunnel testing company in accordance with ASCE 7-05 requirements, and the results of those tests have been issued in a report. This wind tunnel testing company defines wind zones, as seen in the following pages, for accurate wind behavior and analysis. The report can be submitted by SnapNrack (SNR) upon request by the Governing Building Enforcement Agency or Building Official.

The array plans that follow will be provided in the following order:

PRELIMINARY WIND FORCES & EXAMPLE FORCE DERIVATION

Wind speed, topographic factors, and other coefficients provided to SNR for accurate wind forces based on certain roof zone demand levels.

S450 ZONES

Based on the roof geometry, etc., the individual PV panels are assigned a "zone" based on where on the roof they have been positioned. The geometry and conditions of the roof have been accounted for at this point, so as to accurately assign the zone from the wind tunnel testing report constraints.

REQUIRED WEIGHT

Based on the zone assigned and the constraints provided in the preliminary wind forces, the individual panels are assigned a required amount of weight necessary to constrain the panel from motion.

BALLAST PAVERS

The number of brick pavers required to provide adequate weight for uplift resistance is shown on these pages. The program accounts for only 60% of the weight of the pavers in accordance with the IBC loading combination of 0.6DL + 1.0W (16-14). If more than 8 pavers are required to withstand the wind uplift force, or due to existing building constraints, a standoff is assigned to that particular panel.

STANDOFFS

From either the ballast calculation, or manual input for necessary weight reduction, the standoffs assigned to the arrays are displayed with an "S" in the applicable PV panel.

SYSTEM WEIGHT

The weight of the panels and pavers, etc. are taken into account to show exactly how much weight is assigned to each individual panel.

UPLIFT FORCES

This page shows the resultant uplift force from the wind uplift force minus the system weight. A positive number denotes net uplift on the panel, while a negative number indicates excess weight beyond uplift demand.

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12325 PROJECT | 3/11 SHEET

PROJECT ADDRESS

ADR ENGINEER | DATE

EXAMPLE FORCE DERIVATION ON SINGLE PANEL

Per Wind Tunnel Testing results, "Zones" are assigned to the roof areas as shown in Figure 1 on the following page (page 4/11).

Page 6 shows how these zones are applied to the roof, assigning each panel a specific zone for uplift analysis.

Page 5 shows the table referenced for assigning the appropriate uplift value to each panel. This value is dependent on the panel's zone, its exposure type, and how many panels are connected to it in the East-West direction.

For for the example panel selected on page 6 , the panel has the following properties:

Zone: B
Row Exposure: INTERIOR
Panels Attached: 12 (∴10+)

This panel is also allowed a 6 x (5% per Interior row) = 30% reduction in force for being on the interior portion of an array block, as permitted per the Wind Tunnel Testing Report (maximum 40% reduction).

So, per the table on page 5 ,

For a(n) INTERIOR row, Zone B , 10+ - panel row (INTERIOR),

$W_{REQ'D}$ = 183# × (1 - 0.30)

= 128# As seen on page 6 ! ∴ OK! ✓✓

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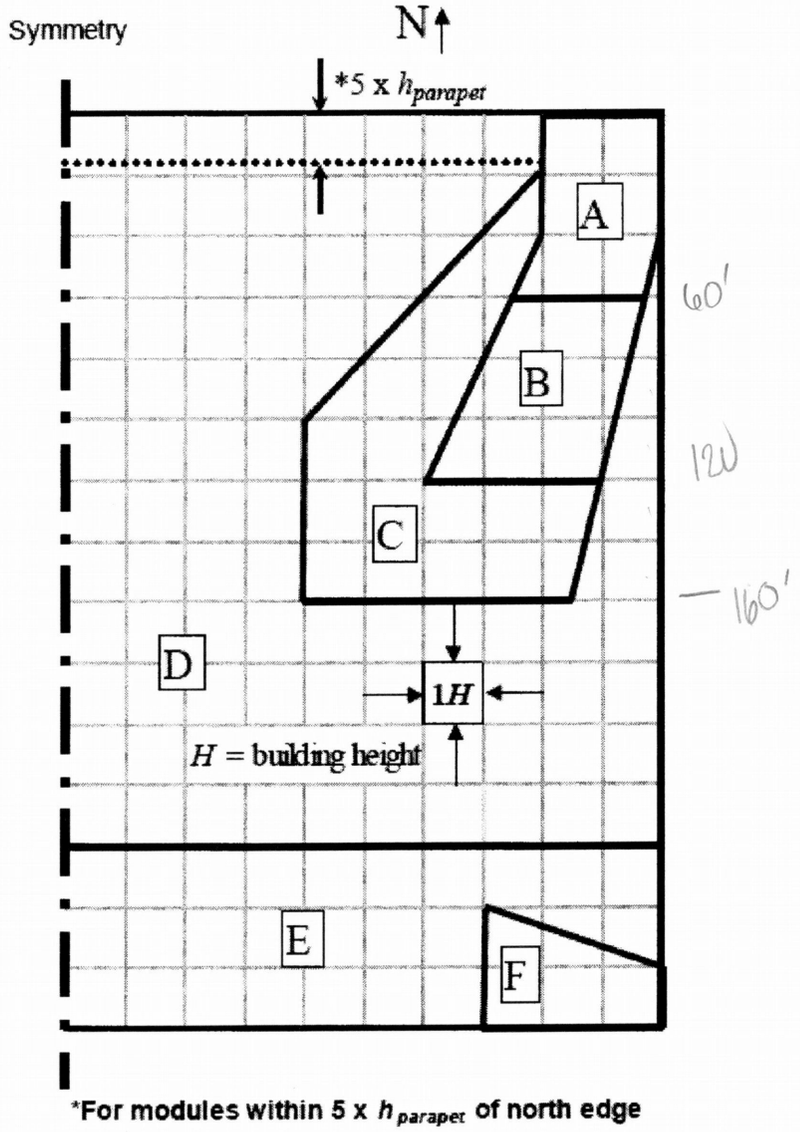
Project: **12325 – 2021 NE MLK – SnapNrack**

EXAMPLE EXCERPT FROM WIND TUNNEL TESTING REPORT FOR WIND ZONING

H = 20' ±



*For modules within 5 x $h_{parapet}$ of north edge of building, multiply PV GC_N values by 0.5

Figure 1. Roof zones for array north rows.

12 Degree Tilt – 2021 NE MLK BLVD, PORTLAND

North Rows of Arrays

Total Wt. Required Per Panel/Deflector Unit										
Row Length (# of Modules)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**> 10 Modules**
Roof Zone										
A	501	472	443	414	385	355	326	297	268	239
B	437	408	379	350	321	292	263	233	204	175
C	191	184	177	170	163	156	149	141	134	127
D	167	164	162	159	156	154	151	148	146	143
E	159	154	150	146	141	137	132	128	123	119
F	214	204	193	183	172	161	151	140	130	119

Interior Rows of Arrays

Total Wt. Required Per Panel/Deflector Unit																			
Row Length (# of Modules)	**1**		**2**		**3**		**4**		**5**		**6**		**7**		**8**		**9**		**> 10 Modules**
Roof Zone	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	Interior	Edge	
A	517	596	479	549	441	503	403	456	365	409	327	362	289	316	251	269	213	222	175
B	246	365	239	345	232	325	225	305	218	284	211	284	204	244	197	223	190	203	183
C	230	270	219	255	209	240	198	225	188	210	177	195	167	180	156	165	145	150	135
D	190	190	180	180	169	169	159	159	148	148	137	137	127	127	116	116	106	106	95
E	198	238	190	225	181	212	172	198	163	185	154	172	146	159	137	146	128	132	119
F	461	381	431	361	402	341	373	320	344	300	315	280	286	259	257	239	228	219	198

EXAMPLE PANEL FORCE

South Rows of Arrays

Total Wt. Required Per Panel/Deflector Unit										
Row Length (# of Modules)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**> 10 Modules**
Roof Zone										
A	398	377	357	337	316	296	276	256	235	215
B	231	224	217	209	202	195	188	181	174	167
C	159	154	150	146	141	137	132	128	123	119
D	190	180	169	159	148	137	127	116	106	95
E	190	180	169	159	148	137	127	116	106	95
F	564	530	497	463	430	396	363	329	296	262
G	602	577	551	526	500	474	449	423	398	372
H	443	425	406	388	370	351	333	314	296	277

6/11

Array Layout & Design per SnapNrack

Zones

(From WTT Report)

		A	A	A	A				C	C	A			
		A	A	A	A				F	A	A			
B	B	F	F	F	B	B	B	B	F	B	B			
B	F	F	F	F	F	F	F	F	F	B	B			
B	F	F	F	F	F	F	F	F	F	F	B			
		F	F	F	F				F	F	F			
		F	F	F	F				F	F	F			
F	F	F	F	F	F				F	F	F			

EXAMPLE PANEL

A	A	A	A	A			D	D						A	A	A	A	A	
A	A	A	A	A			D	D						A	A				
A	A	A	A	A			D	D						A	A				
							D	D	D	A				A	A	A	A	A	
							D	D											
							D	C											
							C	C											
							C	C											

Required Weight

(lbs)

		388	365	365	365	388			126	126				368	346	385	385	409	
		388	347	347	347	388			126	126				494	494				
		388	301	301	301	388			126	126				494	494				
									111	111	159	456		368	285	385	385	409	
									126	126									
									126	179									
									179	179									
									179	179									
		319	290	290	319				168	124	352								
		319	282	282	319				238	309	352								
174	166	139	139	139	128	166	166	166	139	128	128								
174	188	139	139	139	139	188	188	188	139	128	128								
174	249	139	139	139	139	249	249	249	139	139	128								
		224	261	261	224				238	282	238								
		224	261	261	224				238	282	238								
396	396	277	277	277	277				348	348	348								

EXAMPLE PANEL

7/11

Array Layout & Design per SnapNrack

Zones
(From WTT Report)

		A	A	A	A	A			D	D				A	A	A	A	A	
		A	A	A	A	A			D	D				A	A				
		A	A	A	A	A			D	D				A	A				
									D	D	D	A		A	A	A	A	A	
									D	D									
									D	C									
									C	C									
									C	C									
		A	A	A	A				C	C	A								
		A	A	A	A				F	A	A								
B	B	F	F	F	B	B	B	B	F	B	B								
B	F	F	F	F	F	F	F	F	F	B	B								
B	F	F	F	F	F	F	F	F	F	F	B								
		F	F	F	F				F	F	F								
		F	F	F	F				F	F	F								
F	F	F	F	F	F				F	F	F								

Required Weight
(lbs)

		388	365	365	365	388			126	126				368	346	385	385	409	
		388	347	347	347	388			126	126				494	494				
		388	301	301	301	388			126	126				494	494				
									111	111	159	456		368	285	385	385	409	
									126	126									
									126	179									
									179	179									
									179	179									
		319	290	290	319				168	124	352								
		319	282	282	319				238	309	352								
174	166	139	139	139	128	166	166	166	139	128	128								
174	188	139	139	139	139	188	188	188	139	128	128								
174	249	139	139	139	139	249	249	249	139	139	128								
		224	261	261	224				238	282	238								
		224	261	261	224				238	282	238								
396	396	277	277	277	277				348	348	348								

8/11

Required Ballast Pavers per Panel

(# of Pavers)

		0	0	0	0	0			3	3				0	0	0	0	0
		0	0	0	0	0			3	3				0	0			
		0	0	0	0	0			3	3				0	0			
									2	2	4	0		0	0	0	0	0
									3	3								
									3	5								
									5	5								
									5	5								
		0	0	0	0				4	3	0							
		0	8	8	0				7	0	0							
5	5	3	3	3	3	5	5	5	3	3	3							
5	5	3	3	3	3	5	5	5	3	3	3							
5	7	3	3	3	3	7	7	7	3	3	3							
		6	8	8	6				7	8	7							
		6	8	8	6				7	8	7							
0	0	8	8	8	8				0	0	0							

Required Standoff Locations (S,0)

(S = Standoff, 0 = Dependent Panel)

		S	0	0	S									S	0	S	0	S	
		S			S						0	S		S	0				
														S	0				
														S	0	S	0	S	
S	0								S	0	S								

ADD STANDOFF HERE, AS REQUESTED

SUBARRAY UNDER INVESTIGATION

this adds TO 17725

9/11

1005 2750 950

System Weight (lbs)

		70	65	65	65	70			145	145				70	65	65	65	70
		70	65	65	65	70			145	145				70	70			
		70	65	65	65	70			145	145				70	70			
									120	115	165	70		70	65	65	65	70
									145	145								
									145	195								
									195	195								
									195	195								
		70	65	65	70				170	140	70	650						
		70	283	283	70				263	65	70	1109						
195	190	140	140	140	140	190	190	190	140	140	145	1940						
195	190	140	140	140	140	190	190	190	140	140	145	1940						
195	258	140	140	140	140	258	258	258	140	140	145	2212						
		238	283	283	238				263	283	263							
		238	283	283	238				263	283	263							
70	65	283	283	283	288				70	65	70							

3351 1783

Net Uplift (lbs)

		191	180	180	180	191			-11	-11				179	169	192	192	204
		191	169	169	169	191			-11	-11				255	255			
		191	141	141	141	191			-11	-11				255	255			
									-5	-3	-4	232		179	132	192	192	204
									-11	-11								
									-11	-10								
									-10	-10								
									-10	-10								
		150	135	135	150				-1	-10	169							
		150	-1	-1	150				-15	146	169							
-13	-14	-1	-1	-1	-7	-14	-14	-14	-1	-7	-10							
-13	-1	-1	-1	-1	-1	-1	-1	-1	-1	-7	-10							
-13	-6	-1	-1	-1	-1	-6	-6	-6	-1	-1	-10							
		-8	-13	-13	-8				-15	-1	-15							
		-8	-13	-13	-8				-15	-1	-15							
196	199	-4	-4	-4	-6				167	170	167							

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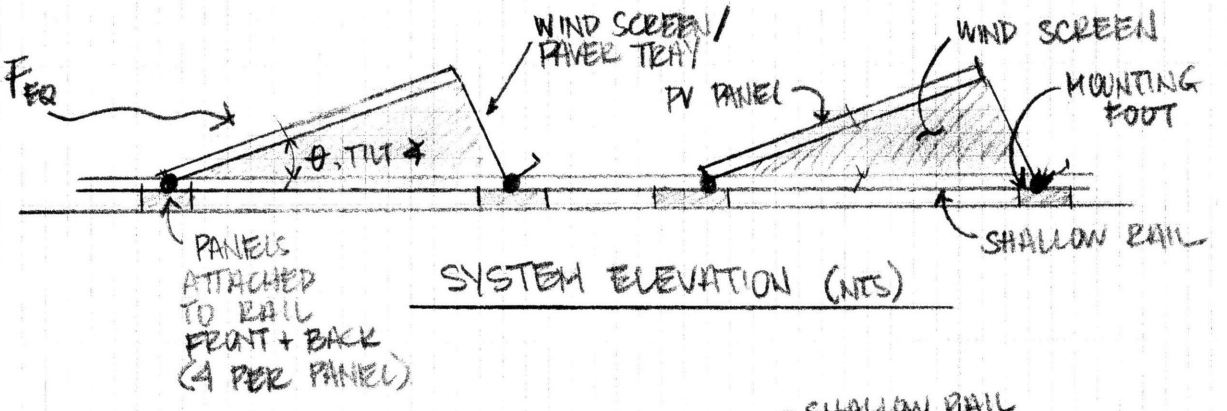
12325 PROJECT | 10/11 SHEET

PROJECT ADDRESS

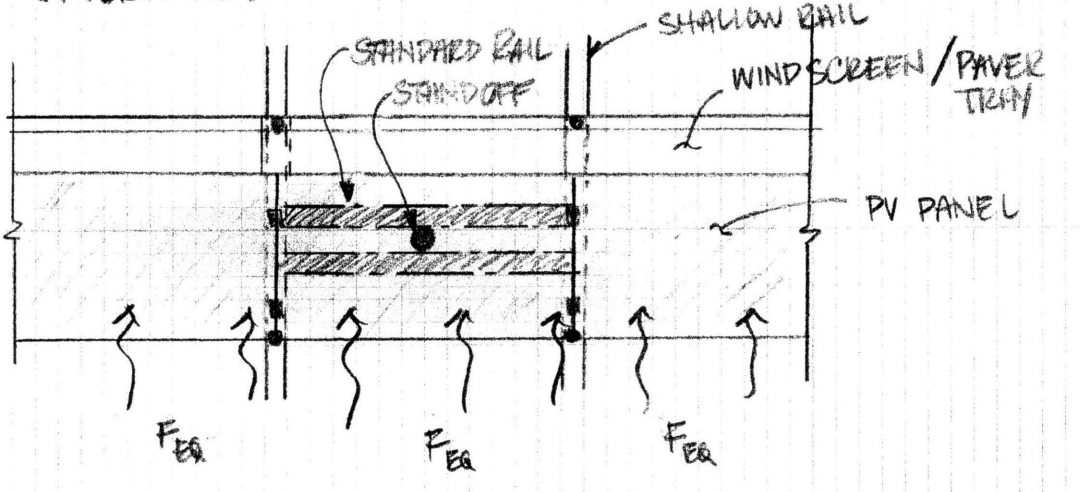
ADR ENGINEER | DATE

LOAD FLOW IN PV PANEL (SERIES 450 INSTALLATION)

SEE SNAPNRACK DETAIL SHEETS FOR OFFICIAL SYSTEM DETAILS + CONNECTIONS



SYSTEM ELEVATION (NTS)



PANELS ARE INSTALLED WITH RIGID PAVER TRAYS ALONG BACK OF PV PANEL, RIGID WIND SCREENS AT EDGES, AND ARE INTER-CONNECTED WITH NEIGHBORING PANELS TO FORM A RIGID UNIT IN THE EAST-WEST DIRECTION. PANEL ROWS ARE ALSO INSTALLED ON "SHALLOW RAILS" THAT RUN CONTINUOUSLY ALONG THE NORTH-SOUTH LENGTH OF THE SUB-ARRAY, RIGIDLY LINKING THE ENTIRE SUBARRAY + PROHIBITING INDEPENDENT PANEL BEHAVIOR.

AT A STANDOFF LOCATION, (2) STANDARD RAILS SPAN FROM THE NEIGHBORING SHALLOW RAILS TO EFFECTIVELY CAPTURE AND RESIST THE LATERAL FORCES OF THE TRIBUTARY SUBARRAY.

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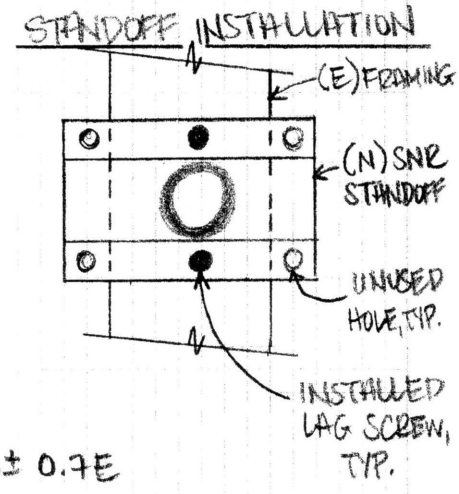
12325 — PROJECT
11/11 — SHEET
PROJECT ADDRESS
ADR — ENGINEER
DATE

COMBINED STRESS ANALYSIS

TOTAL WEIGHT OF SUBARRAY (INDICATED ON P. 8/11, W/2 S.O.)



FROM "SYSTEM WEIGHT" RESULTS,

$W_{SUBARRAY} = 2{,}870^{\#}$

$F_p = 0.477\, W_{SUBAR.}$ (1.0E)

$= 0.477\,(2{,}870^{\#})$

$= \underline{1{,}369^{\#}}$ LATERAL FORCE @ 1.0E

$V_{anchor} = 0.7\,(1{,}369^{\#})$ FOR L.C. 0.6DL ± 0.7E

$= 958^{\#}$

$= \underline{239.6^{\#}/\text{SCREW}}$ (FOR 2 S.O. W/2 LAGS PER S.O.)

$P_{anchor} = 232^{\#}$ (UPLIFT FORCE ON PANEL) FOR L.C. 0.6DL + 1.0WL

$= \underline{116^{\#}/\text{SCREW}}$ (FOR 2 LAGS IN S.O.)

ALLOWABLE SHEAR, $\underline{W' = 240^{\#}/\text{lag}}$ (PER ORIG. CALCS)

$W' = C_D \times W = 1.6 \times 225^{\#}$ (PER NDS CH 11, T. 11.2A)

$= \underline{360^{\#}/\text{IN./LAG}}$

FOR SEISMIC DEMANDS	FOR WIND DEMAND
$\frac{D}{C} = \frac{239.6^{\#}}{240} = 0.998$	$\frac{D}{C} = \frac{116^{\#}}{360^{\#} \times 2''} = 0.161$
$0.998 \leq 1.00 \therefore$ OK ✓	$0.161 \leq 1.00 \therefore$ OK ✓

$\therefore$ (2) 1/4" LAG SCREWS W/ 2" MIN. EMBED OK FOR ANCHORAGE