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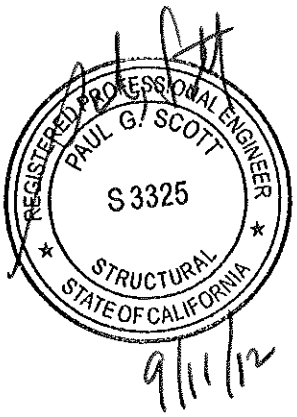
Job No. 12-242-306 Sheet No. Cover
By DTN/PGS Date Sept 2012



CLIENT:
Panel Claw
1600 Osgood Street
Building 200, Suite 2-23
North Andover, MA 01845

PROJECT:
Madonna Road
1550 Madonna Road
San Luis Obispo, CA

GENERAL INFORMATION:

BUILDING CODE:	2009 IBC, 2010 CBC, ASCE 7-05

INDEX OF SHEETS:

MEMO	Summary of Documentation and results
1.0 – 1.3	Wind Tunnel Testing
2.0 – 2.26	Array/Ballast Layouts
3.0	Ballast Loads Calculator
4.0 – 4.111	Mechanical Attachment Calculator
A1 – A10	Mechanical Attachment Capacities

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Date: September 11, 2012

Mr. Robert Clough
Panel Claw
1600 Osgood Street, Bldg 20, Ste 2-23
North Andover, MA 01845

RE: Evaluation of Panel Claw system

Project Name: Madonna Road
CTS Job No.: 12-242-306

Per the request of Robert Clough at Panel Claw, CTS was asked to review the Panel Claw system and its resistance to wind and seismic loads.

Wind Evaluation:

Panel Claw provided CTS with wind tunnel testing performed by I.F.I (Institute for Industrial Aerodynamics) at the Aachen University of Applied Science (reference pgs). The system tested was the "Polar Bear Gen II 10deg" system. This system consists of photovoltaic panels installed at a 10 degree tilt onto support assemblies. The support assemblies consist of a support frame for the PV panels, wind deflectors and areas for additional mass/weight as required for the ballast loads.

The wind tunnel testing was performed per Method 3 in Chapter 6 of ASCE 7-05. The parameters of the testing were a flat roof system in both Exposure B and C on a building with and without parapets. The testing resulted in pressure and/or force coefficients that were applied to the velocity pressure q_z in order to obtain the wind loads on the PV system (reference pgs 1.0 – 1.3). From the wind load results it is then possible to calculate the ballast loads required to resist the uplift and sliding forces. CTS agrees with the methodologies used to develop the required ballast loads for the "Polar Bear Gen II 10 deg" system per the wind tunnel testing results.

Panel Claw also provided CTS with the excel tool that was developed to express the equations used to obtain the ballast loads on roofs (reference pgs 3.0). CTS has reviewed this tool and the required ballast loads to find that the loads provided are not within the values required. Therefore, Panel Claw calculated the amount of mechanical attachments that would be required to resist the wind force that is not accommodated by the applied ballast loads (reference pg 4.0 - 4.1).

Seismic Evaluation:

CTS was asked to review the Panel Claw system to determine attachments required to resist seismic loading of the ballasted solar support system on the roof of the existing building. Please note the following support:

- The ballasted solar support system has a certain capacity to resist wind loads. If additional attachments are required, the attachments can be used for seismic and wind. There are no load combinations in the code that required the application of seismic and wind forces together.
- The building parapets provide a physical barrier that will prevent the system from sliding off the roof and becoming a life safety issue.

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As this is not a life safety issue we have calculated the required attachments. Utilizing CBC Load Combination 16-15 we have reduced the 0.6 Dead Load value further, by subtracting the vertical component of the seismic forces (0.7E).

Panel Claw has provided a calculation for the number of mechanical attachments that are required to resist any seismic forces that are applied to the system (reference pg 4.0 – 4.111). The total number of mechanical attachments is dependant on the capacity of each attachment (reference pg A1 – A10). The attachment provided is the Eco-Fasten - Universal Roof Attachment System. Each base plate of this system attaches through to the roof deck using 8 # 14 screws.

Therefore, it has been determined that the system that has been provided by Panel Claw is sufficient to resist both wind and seismic loads at Madonna Road.

Please contact CTS with any questions regarding this letter or attachments.

Respectfully,

REGISTERED PROFESSIONAL ENGINEER
PAUL G. SCOTT
S 3325
STRUCTURAL
STATE OF CALIFORNIA
9/11/12

Dean Noel
Structural Designer

Paul G Scott, PE, SE
Partner

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Institut an der
Fachhochschule Aachen

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E-Mail: info@ifi-aachen.de

Notifizierte Prüf-, Überwachungs- und
Zertifizierungsstelle Nr. 1368
nach dem Bauproduktengesetz

Client: PanelClaw Inc., North Andover, MA 01845, USA

Project No. PCM02

Report No.: PCM02-2

Wind loads on the photovoltaic roofing system „Polar Bear Gen II 10deg" of Panel Claw Inc.

Determining the characteristic values for uplift and sliding according to the American Standard ASCE/SEI 7-05

Aachen, 12/13/2011

Dr.-Ing. Th. Kray

Dipl.-Ing. (FH) F. Hunke

Wind tunnel tests were conducted on the PV flat roof system **„Polar Bear Gen II 10deg"** of **Panel Claw Inc.** in accordance with chapter 6.6 of ASCE/SEI 7-05. The tests were performed at I.F.I. Institut für Industrieaerodynamik GmbH (Institute for Industrial Aerodynamics), Institute at the Aachen University of Applied Sciences. The system consists of PV-modules angled at 10°, which are fixed on support assemblies. The support assemblies create a rigid connection of the PV solar module and the wind deflector of two rows behind one another. The rear side of a row of panels is fully covered by a wind shield, see Fig. 1.1. Fig. 1.2 shows a wind tunnel model.

Testing was carried out with surface roughnesses in the approach section of the boundary layer wind tunnel equivalent to open country (Exposure C according to ASCE/SEI 7-05) and suburban terrain (Exposure B). Pressure and/ or force coefficients were derived from the measurements. These coefficients may be multiplied by the design velocity pressure q_z, determined depending on the wind zone, the exposure category and the building height in accordance with the American standard ASCE/SEI 7-05 to determine the wind loads on the PV system. From these results it is possible to calculate the necessary ballast for uplift and sliding safety - sliding of PV elements occurs if the aerodynamic lift has decreased the down force due to deadweight sufficiently so that the drag forces are larger than the frictional forces - on flat roofs with pitch angles up to 7°.

For the present analysis, I.F.I. created a calculation tool in Excel which can be used not only for further programming or the dimensioning in a project, but also for purposes of documenting the ballast calculation. The tool presents a summary of the values calculated on the safe side from the tests for all wind directions and the roof zones 1, 2 and 3. In addition, it contains correction formulae taking into account the positive effect of a parapet on the wind loads in the edge and corner regions. The correction coefficient is calculated from the results of the wind tunnel tests.

The results are given as quasi-static characteristic values. As stated in ASCE/SEI 7-05 where local load coefficients for an area of 1 m² to 100 m² are given, the force coefficients do not apply to modules placed individually, but only to arrays with at least 10 m² module's surface where at least two rows are statically joint to one another. This is important as the simultaneity of smaller turbulences on the analysed

field of 10 m² has to be excluded and only bigger turbulence effects have to be taken into consideration. Thus, smaller arrays may have to carry more ballast depending on their situation on the roof.

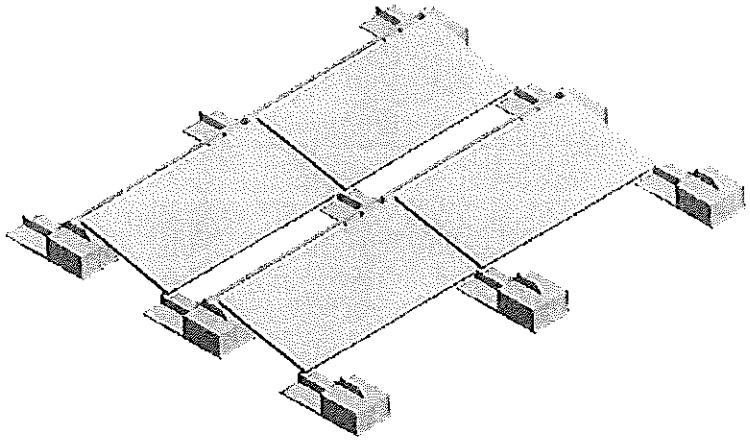


Bild 1.1: PV-system "Polar Bear II 10deg" for flat roofs

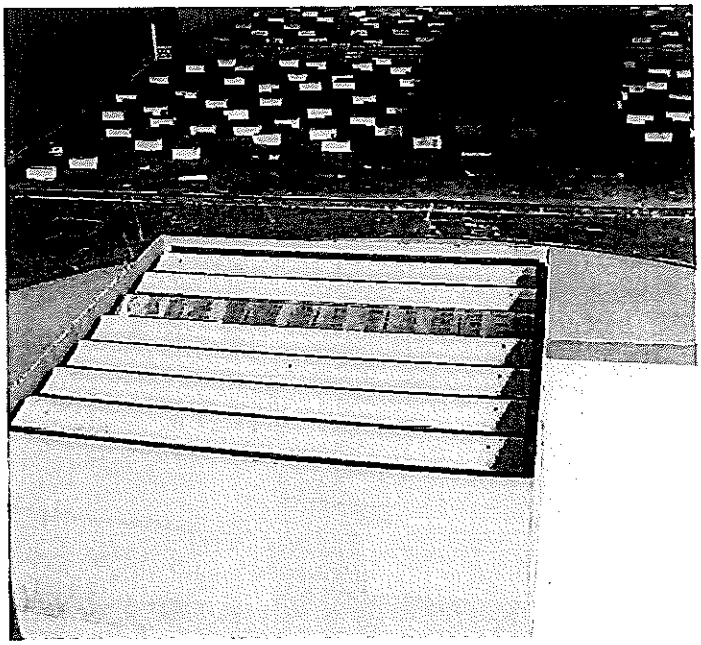


Bild 1.2: Wind tunnel model of the PV-system "Polar Bear II 10deg" with covered edge zones and with parapet; suburban terrain exposure

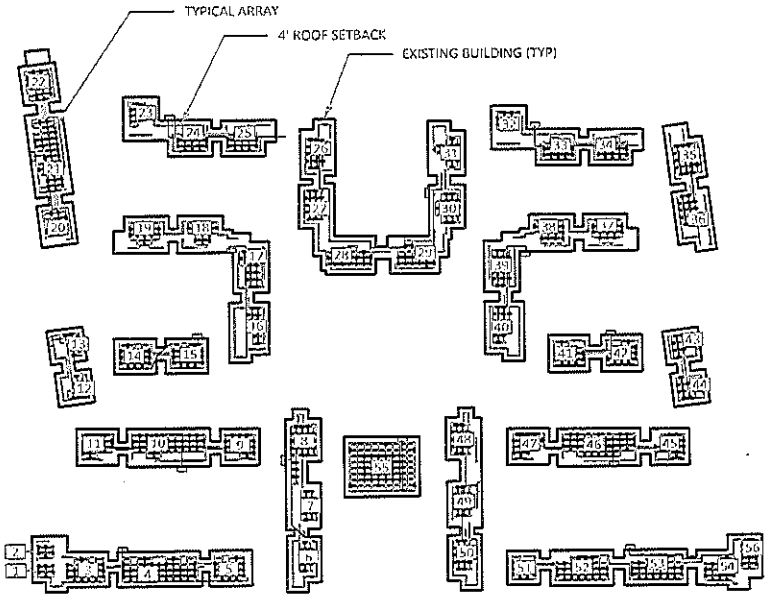
The results were determined for a set-up where the rows were aligned from east to west. However, the results are applicable for any row alignment with the points of the compass. As wind tunnel testing was carried out for a low-rise building with height of 30 ft (9.1 m) in a single exposure site as permitted in ASCE/SEI 7-05 section 6.6, the given force coefficients are only valid for PV systems installed on buildings lower than 60 ft (18.3 m).

The coefficients extracted from the wind tunnel tests may also be used in accordance with the information given in ASCE/SEI 7-05. The values show that the system in question needs very little ballasting in the centre of a field. The sliding and uplift loads exerted by the wind on the modules are very small due to the arrangement in rows. Higher loads were only observed in corners and in exposed edges of the field, and these have to be taken into account. On the basis of the measurements carried out, this may be done directly by increasing the ballast locally on the edge or corner elements as well as – in the arrangement of rows and space between the rows – by distributing the loads under consideration of areas less submitted to them and the dead load of the modules. However, in the latter case, higher structural demands are required for the load transfer by the supporting assemblies since, theoretically, a suspended corner module has to be held in place by the adjacent modules.

As stated in the ASCE/SEI 7-05 section C6.5.2, for some projects with irregular or unusual site locations or buildings or structures differing from the provisions given under ASCE/SEI 7-05 section 6.5.2, a wind engineer must be consulted to evaluate the upwind situation and the applicability of the wind tunnel results. For example unusual building shapes, neighboring tall buildings and irregular topographic features such as mountain gorges require a statement of a wind expert.

The analysis of the maximum loads in the different roof zones for the inclination angle of 10° resulted in a maximum lift coefficient of $c_{fz} = 0.09$ in the inner area of the roof and $c_{fz} = 0.12$ in the corner zone of the roof, these results being based on the module's surface area. At the same time, sliding forces appear, their coefficients reaching $c_{fx,y} = 0.07$ in the centre of the field and $c_{fx,y} = 0.13$ in the corner zones.

Details of the tests and of the analysis can be found in the long version of the report PCM02-1.

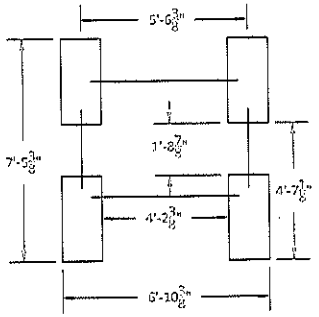


ARRAY SITE MAP
SCALE: NTS

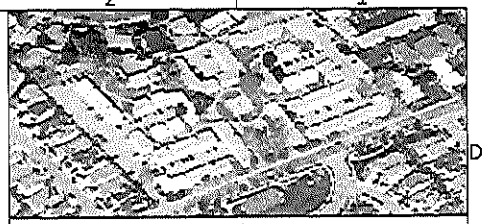
GENERAL NOTES:

1. ALL SITE, PROJECT, AND BUILDING DETAILS ARE PROVIDED BY CUSTOMER OR GENERATED VIA SATELLITE IMAGERY FROM INFORMATION PROVIDED BY CUSTOMER. PANELCLAW IS NOT RESPONSIBLE FOR SITE INACCURACIES THAT COULD LEAD TO CHANGES TO THESE DRAWING DETAILS AND ARRAY LAYOUT CONFIGURATIONS. ALL INFORMATION CONTAINED WITHIN THESE DOCUMENTS ARE TO BE FIELD VERIFIED BY CUSTOMER AND INSTALLER. ANY CHANGES OR MODIFICATIONS TO THESE DOCUMENTS, CONTAINED INFORMATION, OR FINAL ARRAY AND MOUNTING SYSTEM INSTALLATIONS MUST BE SUBMITTED TO PANELCLAW AND OTHER PROJECT AUTHORITIES FOR APPROVAL.
2. REFER TO AND FOLLOW THE APPROPRIATE PANELCLAW INSTALLATION MANUALS AND PROCEDURES DURING THE INSTALLATION PROCESS. NOT FOLLOWING SUCH PROCEDURES AND METHODS COULD RESULT IN DAMAGE TO THE COMPONENTS OR MAY VOID THE PRODUCT WARRANTY.
3. ARRAY SETBACKS: ALL ARRAYS ARE REQUIRED TO BE SETBACK 4-FEET FROM ALL ROOF EDGES UNLESS OTHERWISE SPECIFIED AND CALLED OUT ON THE ARRAY DIAGRAMS ON THIS PAGE OR ON ADDITIONAL ARRAY BALLAST PAGES.
4. REFER TO THE SPECIFIC ARRAY BALLAST SHEETS FOR BALLASTING REQUIREMENTS BASED ON THE PROVIDED SITE INFORMATION.
5. THE MODULE FOOTPRINT DETAIL INCLUDES THE ASSEMBLY OF (1) MODULE MOUNTED TO (4) SUPPORTS AND (1) DEFLECTOR. DIMENSIONS REFLECT THE CRITICAL MEASUREMENTS OF A MODULE-MOUNTING SYSTEM ASSEMBLY. DIMENSIONS DO NOT REFLECT DIRECT MODULE LENGTH AND WIDTH.
6. ALL CMU BLOCKS UTILIZED ON THIS PROJECT MUST COMPLY WITH ASTM C 1491.

DIMENSIONS REFLECT 4B SPACING.



MODULE FOOTPRINT
SCALE: 1/4" = 1'



AERIAL PHOTO / SITE DIAGRAM

POLAR BEAR FR GEN II 10°

PROJECT DETAIL

WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C
OCCUPANCY CATEGORY	II
SEISMIC DESIGN CATEGORY	D
MODULE TYPE	Trina Solar - TSM-PC/PA05 220-255
MODULE DIMENSIONS (IN x IN)	39.06 x 64.96
NUMBER OF MODULES	855
MODULE WATTAGE (W STC)	235
SYSTEM SIZE (KW STC)	200.925
SYSTEM WEIGHT (LB)	96472.29
SYSTEM AREA (SQ FT.)	24236.01
NUMBER OF ARRAYS	56
ARRAY TILT (DEG)	10.5
N-S SPACER STICK DIM. (IN)	35.30
E-W SPACER STICK DIM. (IN)	66.43

PROJECT PART QUANTITIES

ITEM	PART NUMBER	QTY
CLAW	5000005	3420
ASSY, CLAW-STANDARD, ALUMINUM		
POLAR BEAR SUPPORT	5000062	1082
ASSY, SUPPORT, G90 ST, 304SS, POLAR BEAR GEN II 10 DEG-PAD		
SOUTH SUPPORT	5000136	309
ASSEMBLY, SUPPORT, SOUTH, GBOST, POLAR/GRIZZLY, PAD		
DEFLECTOR	200010804	855
DEFLECTOR, G90 ST, 60", POLAR/GRIZZLY BEAR GEN II 10 DEG		
DEFLECTOR END PLATE	2000140	244
END PLATE, G90 STEEL, POLAR BEAR / GRIZZLY BEAR GEN II 10 DEG		
MECH. ATTACHMENT	5000070	120
ASSY, MECHANICAL ATTACHMENT, 6"L x 6"W x 6"H WITH 3" LONG SCREW		
TOTAL CMU BLOCKS	13.4 lbs	1777

REV	DESCRIPTION	DCA/RFC	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2013/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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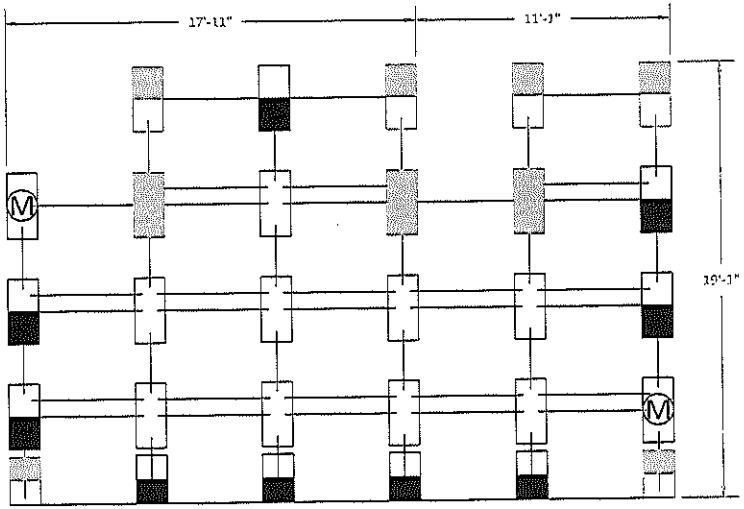
PREPARED FOR: EVERYDAY ENERGY

PROJECT: MADONNA ROAD

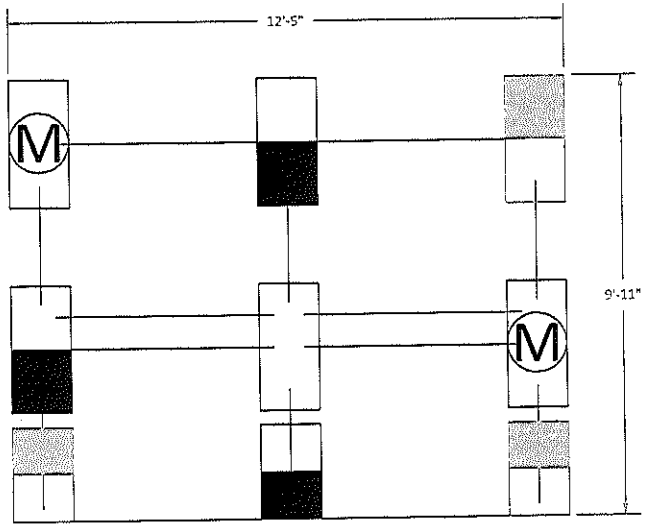
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SIZE: D | SHEET: 1 OF 26

2.0



BALLAST LAYOUT - ARRAY 3
SCALE: NTS



BALLAST LAYOUT - ARRAY 1 & 2
SCALE: NTS

ARRAY 1 & 2		ARRAY 3	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	4	NUMBER OF MODULES	18
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	0.9	ARRAY OUTPUT (Kw)	4.2
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	16	CLAWS	72
DEFLECTORS	4	DEFLECTORS	18
DEFLECTOR END PLATES	2	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	6	POLAR BEAR SUPPORTS	23
SOUTH SUPPORTS	3	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	15	TOTAL CMU BLOCKS	39
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	584.3	TOTAL ARRAY WT (LB)	2048.3
ARRAY AREA (SQ. FT)	122.8	ARRAY AREA (SQ. FT)	509.3
ARRAY LOAD (PSF)	4.8	ARRAY LOAD (PSF)	4.0

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 1-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

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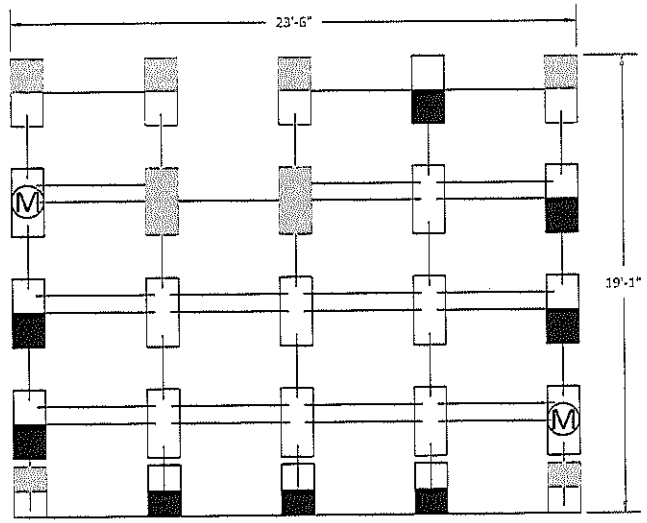
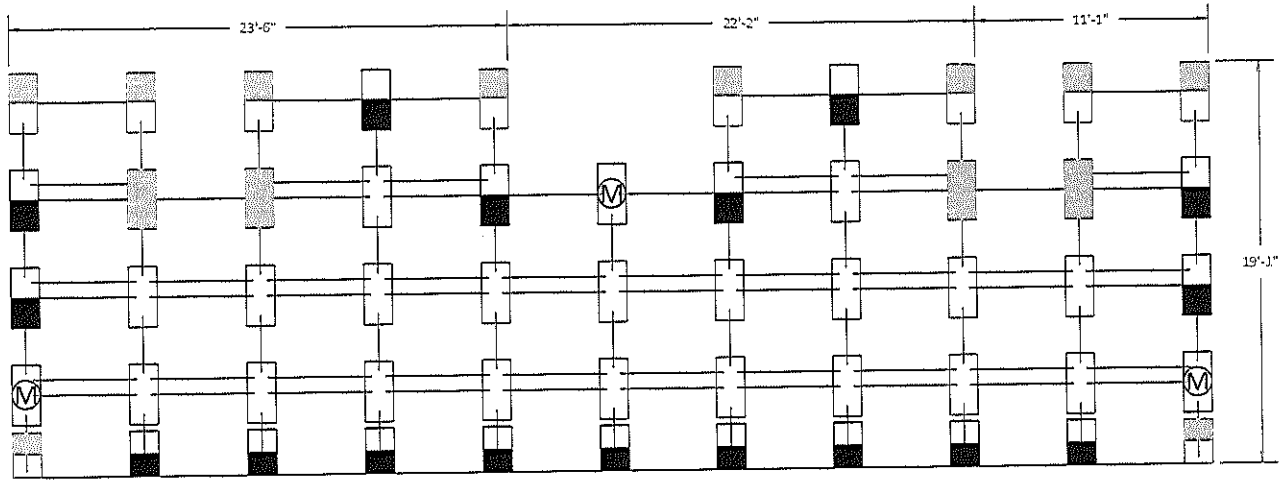


BALLAST LAYOUT - ARRAY 5 & 15
SCALE: NTS



BALLAST LAYOUT - ARRAY 4
SCALE: NTS

ARRAY 4		ARRAY 5 & 15	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	36	NUMBER OF MODULES	15
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	8.5	ARRAY OUTPUT (Kw)	3.5
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	144	CLAWS	60
DEFLECTORS	36	DEFLECTORS	15
DEFLECTOR END PLATES	7	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	43	POLAR BEAR SUPPORTS	20
SOUTH SUPPORTS	11	SOUTH SUPPORTS	5
MECH ATTACHMENTS	3	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	65	TOTAL CMU BLOCKS	34
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	3847.1	TOTAL ARRAY WT (LB)	1744.5
ARRAY AREA (SQ. FT)	999.2	ARRAY AREA (SQ. FT)	429.0
ARRAY LOAD (PSF)	3.9	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/RPC	PROP	CHECK	DATE
2	REVISED LAYOUT	DCA/RPC	JA		2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RPC		2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RPC		2012/08/30

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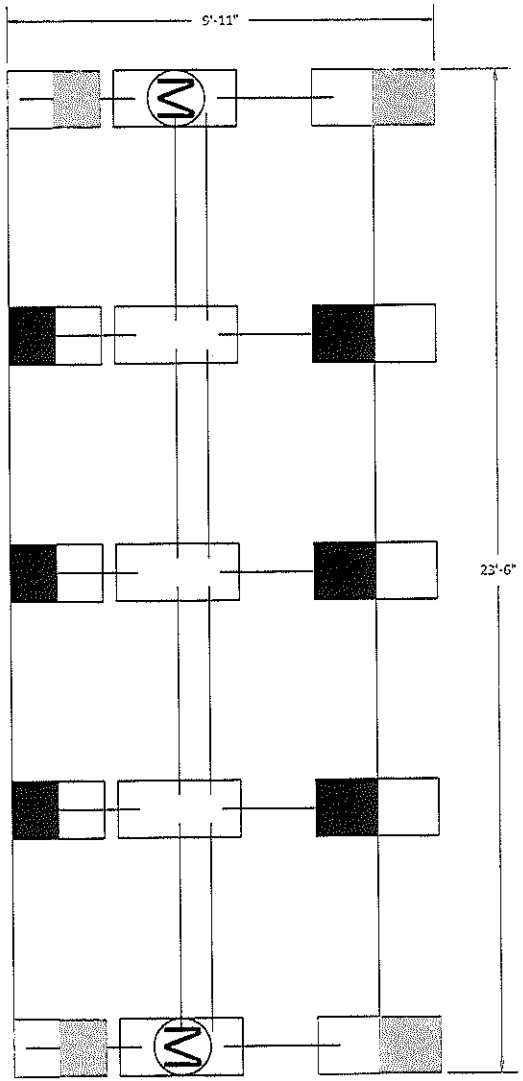
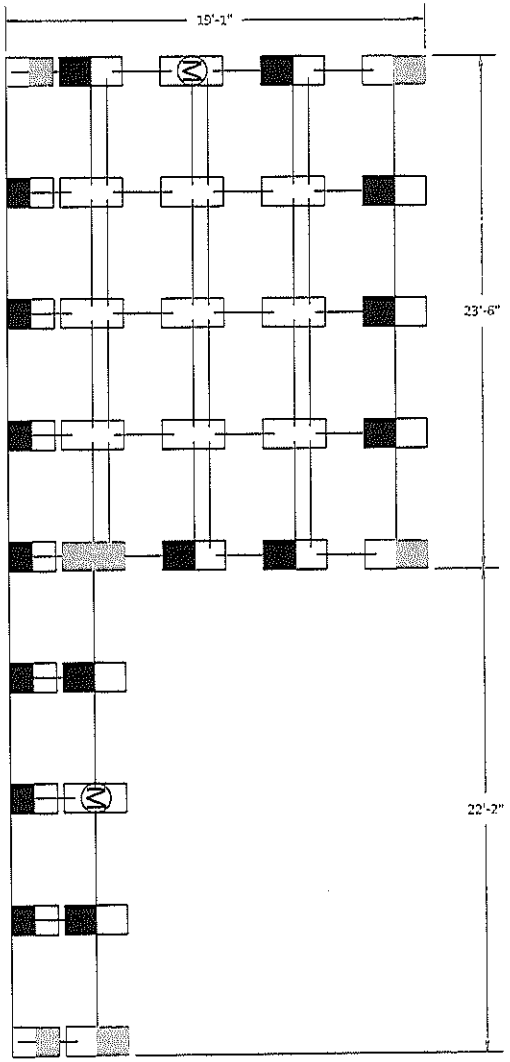


BALLAST LAYOUT - ARRAY 6 & 7
SCALE: NTS



BALLAST LAYOUT - ARRAY 8
SCALE: NTS

ARRAY 6 & 7		ARRAY 8	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	8	NUMBER OF MODULES	20
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	1.9	ARRAY OUTPUT (Kw)	4.7
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	32	CLAWS	80
DEFLECTORS	8	DEFLECTORS	20
DEFLECTOR END PLATES	2	DEFLECTOR END PLATES	8
POLAR BEAR SUPPORTS	10	POLAR BEAR SUPPORTS	24
SOUTH SUPPORTS	5	SOUTH SUPPORTS	9
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	22	TOTAL CMU BLOCKS	46
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1002.2	TOTAL ARRAY WT (LB)	2310.8
ARRAY AREA (SQ. FT)	232.5	ARRAY AREA (SQ. FT)	565.8
ARRAY LOAD (PSF)	4.3	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
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PREPARED FOR: EVERYDAY ENERGY
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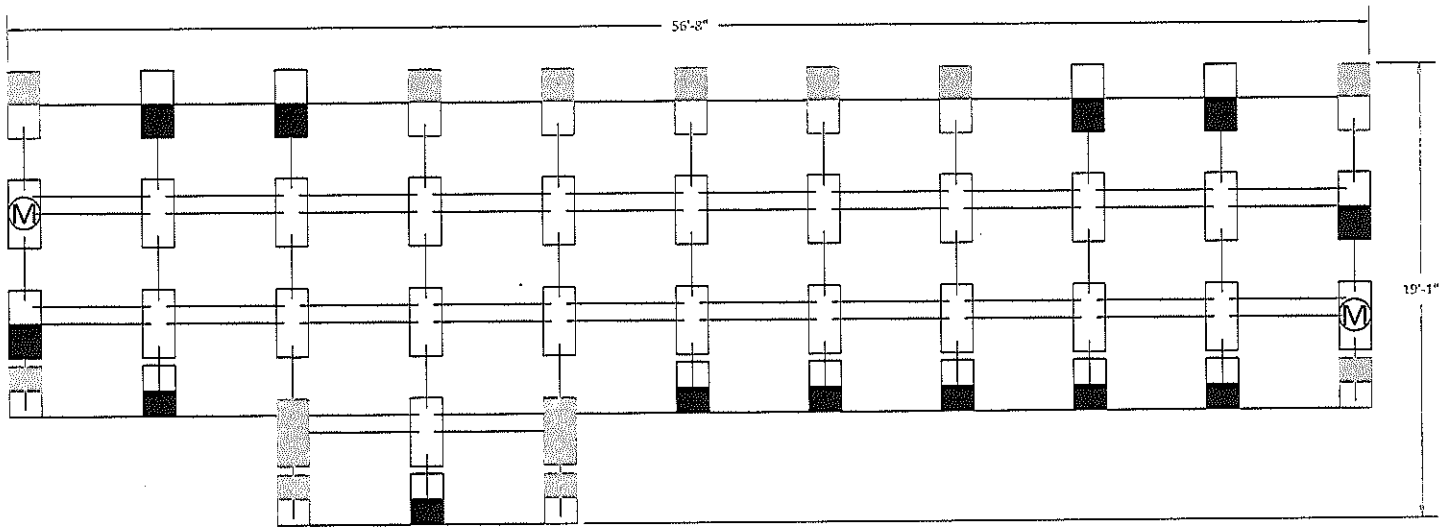
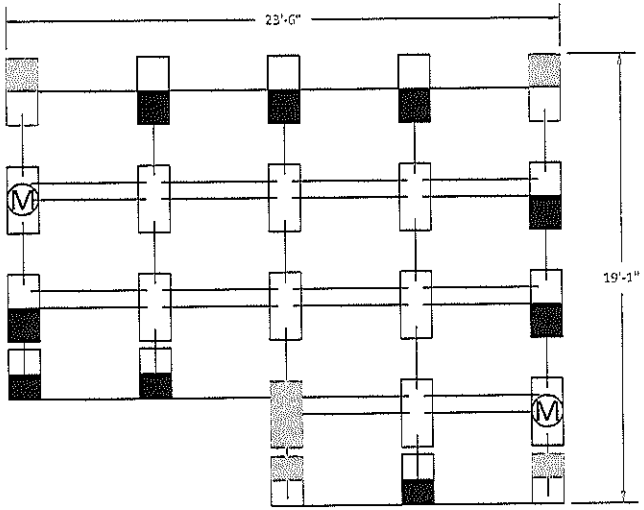
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405
SCALE: DETAIL | REV: 2 | SHEET: 4 OF 26



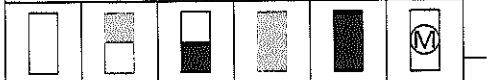
BALLAST LAYOUT - ARRAY 10
SCALE: NTS



BALLAST LAYOUT - ARRAY 9
SCALE: NTS

ARRAY 9		ARRAY 10	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	14	NUMBER OF MODULES	32
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.3	ARRAY OUTPUT (Kw)	7.5
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	56	CLAWS	128
DEFLECTORS	14	DEFLECTORS	32
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	18	POLAR BEAR SUPPORTS	36
SOUTH SUPPORTS	5	SOUTH SUPPORTS	11
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	31	TOTAL CMU BLOCKS	49
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1610.0	TOTAL ARRAY WT (LB)	3271.6
ARRAY AREA (SQ. FT)	397.5	ARRAY AREA (SQ. FT)	879.1
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	3.7

SUPPORT LEGEND



0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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PROJECT
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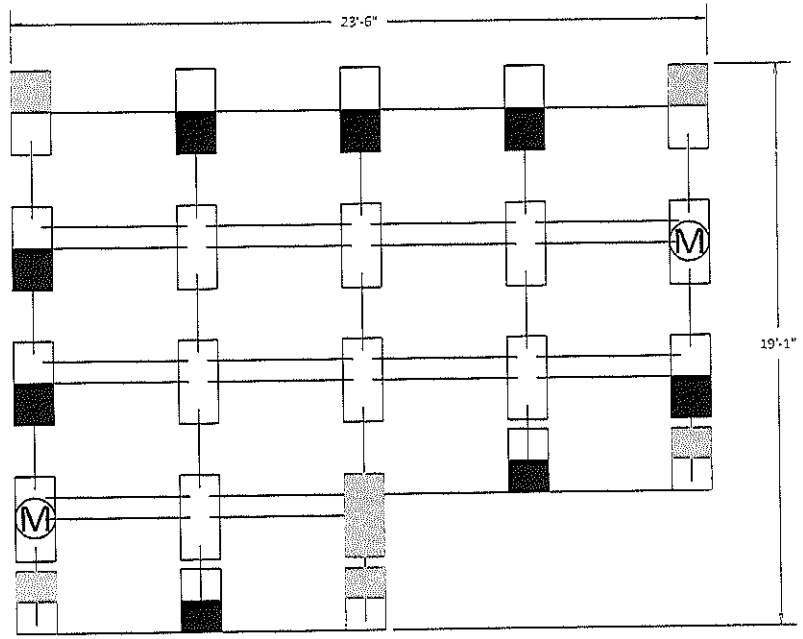
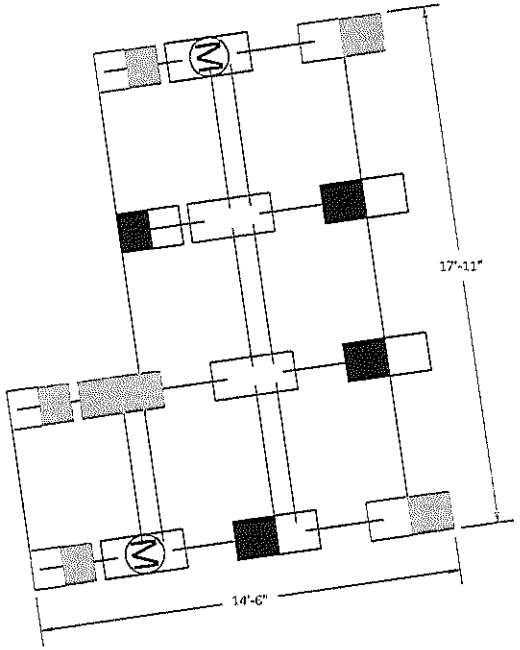
A-2.1



BALLAST LAYOUT - ARRAY 11
SCALE: NTS



BALLAST LAYOUT - ARRAY 12
SCALE: NTS

ARRAY 11		ARRAY 12	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	14	NUMBER OF MODULES	7
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.3	ARRAY OUTPUT (Kw)	1.6
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	56	CLAWS	28
DEFLECTORS	14	DEFLECTORS	7
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	3
POLAR BEAR SUPPORTS	18	POLAR BEAR SUPPORTS	10
SOUTH SUPPORTS	5	SOUTH SUPPORTS	4
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	22
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1596.6	TOTAL ARRAY WT (LB)	934.4
ARRAY AREA (SQ. FT)	397.6	ARRAY AREA (SQ. FT)	210.1
ARRAY LOAD (PSF)	4.0	ARRAY LOAD (PSF)	4.4

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/RFC	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA		2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC		2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC		2012/08/30

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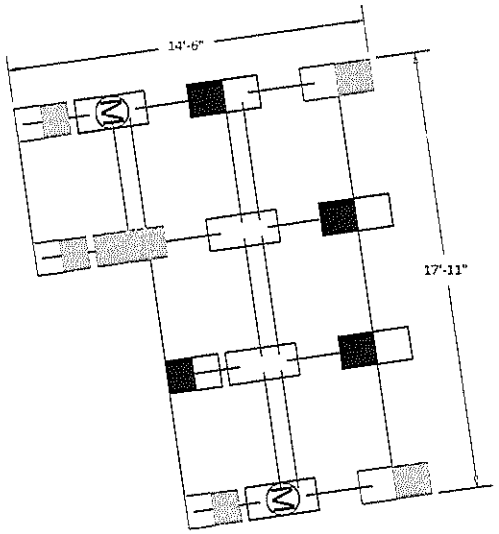
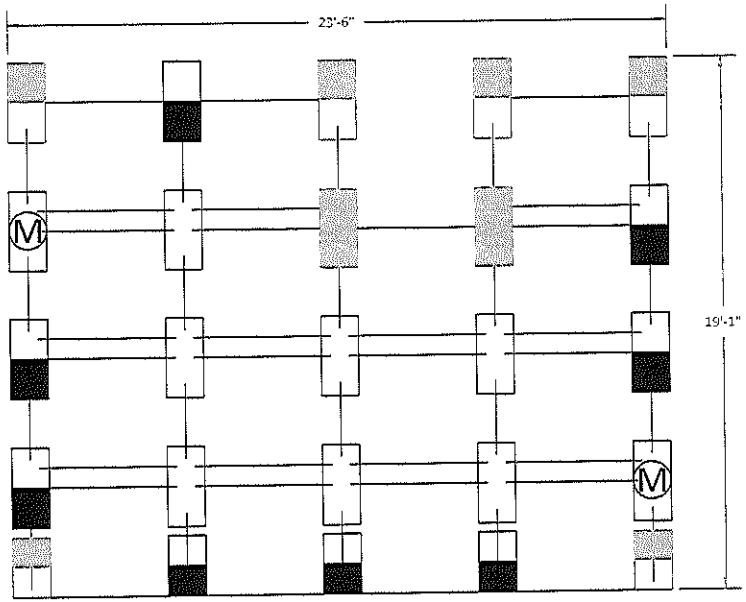
SCALE: DETAIL | REV: 2 | TAIL: B | SHEET: 6 OF 26



BALLAST LAYOUT - ARRAY 13
SCALE: NTS



BALLAST LAYOUT - ARRAY 14
SCALE: NTS

ARRAY 13		ARRAY 14	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	7	NUMBER OF MODULES	15
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	1.6	ARRAY OUTPUT (Kw)	3.5
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	28	CLAWS	60
DEFLECTORS	7	DEFLECTORS	15
DEFLECTOR END PLATES	3	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	10	POLAR BEAR SUPPORTS	20
SOUTH SUPPORTS	4	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	22	TOTAL CMU BLOCKS	34
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	934.4	TOTAL ARRAY WT (LB)	1744.5
ARRAY AREA (SQ. FT)	209.4	ARRAY AREA (SQ. FT)	429.1
ARRAY LOAD (PSF)	4.5	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/20

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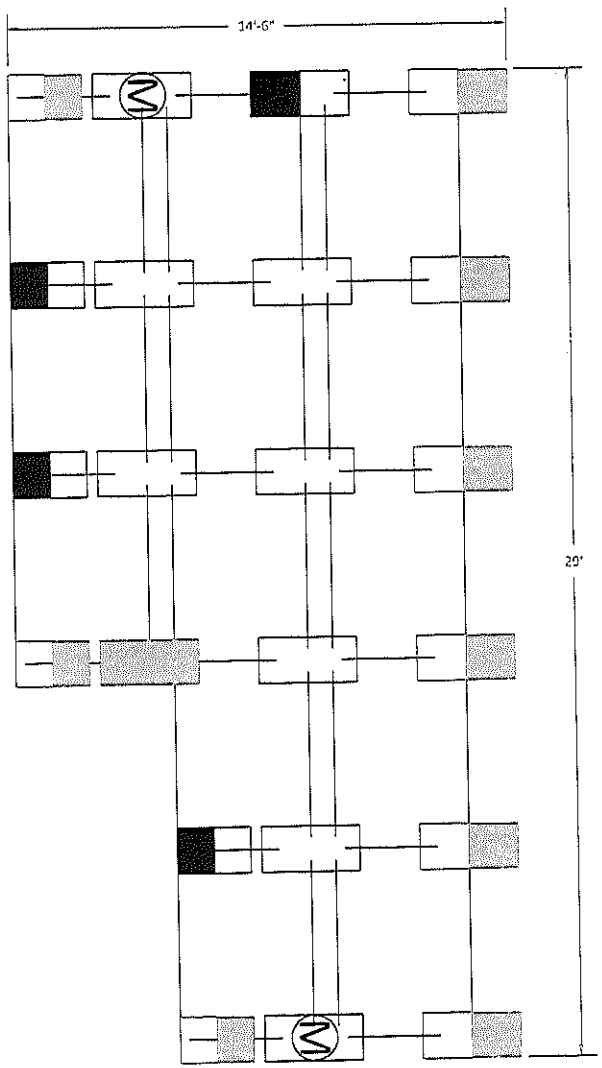
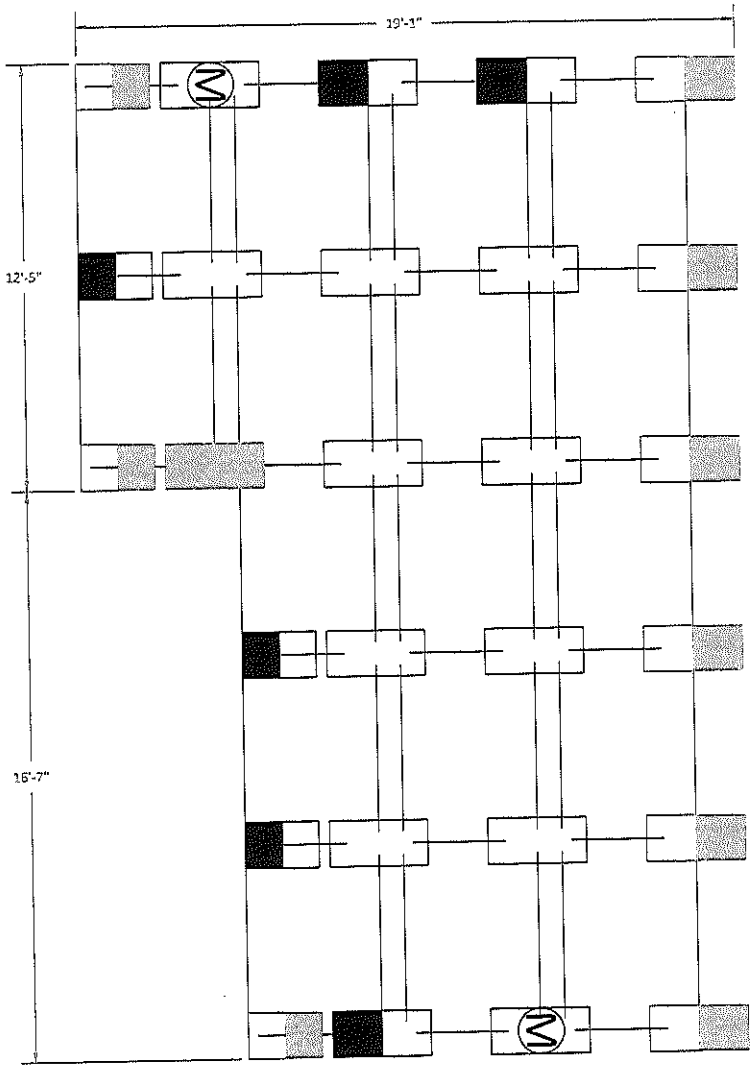
SCALE DETAIL | REV 2 | SHT 0 | SHEET 7 OF 26



BALLAST LAYOUT - ARRAY 16
SCALE: NTS



BALLAST LAYOUT - ARRAY 17
SCALE: NTS

ARRAY 16		ARRAY 17	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	17
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	4.0
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	68
DEFLECTORS	13	DEFLECTORS	17
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	21
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	26	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1461.9	TOTAL ARRAY WT (LB)	1833.6
ARRAY AREA (SQ. FT)	369.8	ARRAY AREA (SQ. FT)	477.8
ARRAY LOAD (PSF)	4.0	ARRAY LOAD (PSF)	3.8

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/20

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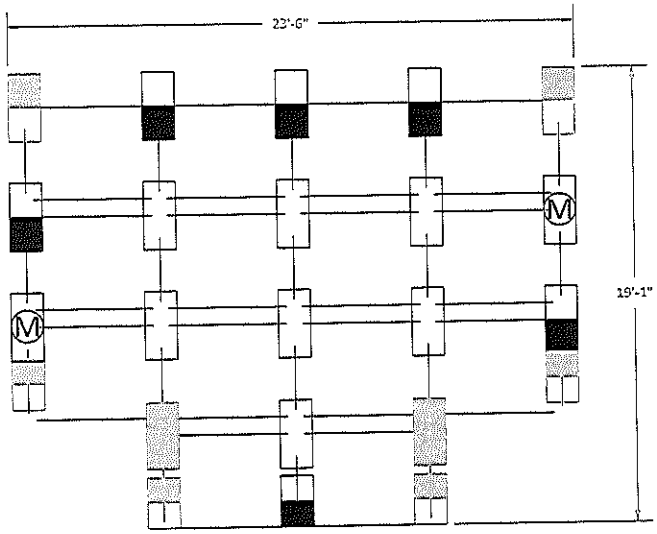
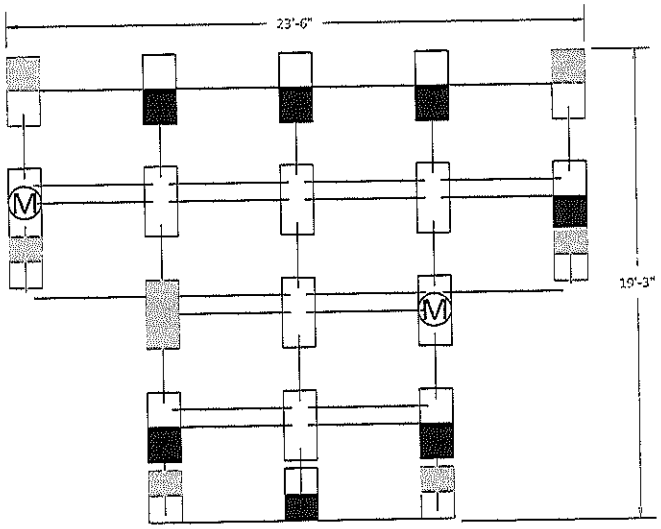
SCALE DETAIL | REV 2 | SHEET 8 OF 26



BALLAST LAYOUT - ARRAY 18
SCALE: NTS



BALLAST LAYOUT - ARRAY 19
SCALE: NTS

ARRAY 18		ARRAY 19	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	12	NUMBER OF MODULES	14
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	2.8	ARRAY OUTPUT (Kw)	3.3
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	48	CLAWS	56
DEFLECTORS	12	DEFLECTORS	14
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	18
SOUTH SUPPORTS	5	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	29	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1433.9	TOTAL ARRAY WT (LB)	1596.6
ARRAY AREA (SQ. FT)	348.5	ARRAY AREA (SQ. FT)	397.6
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.0

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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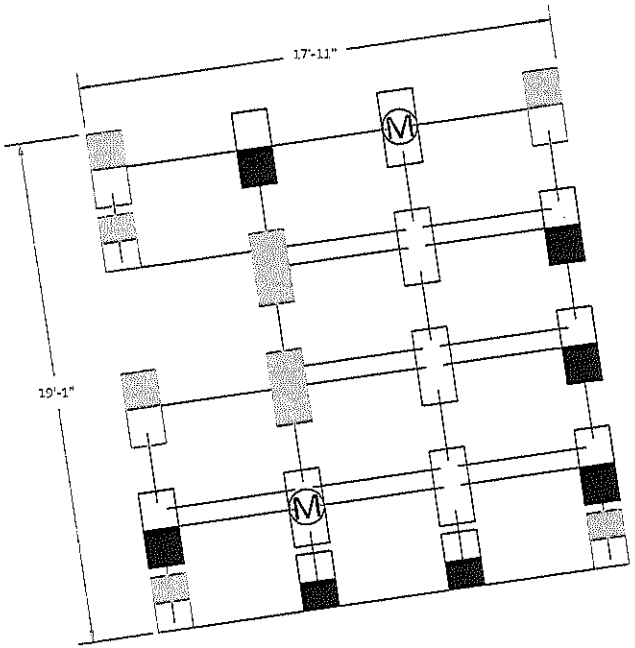
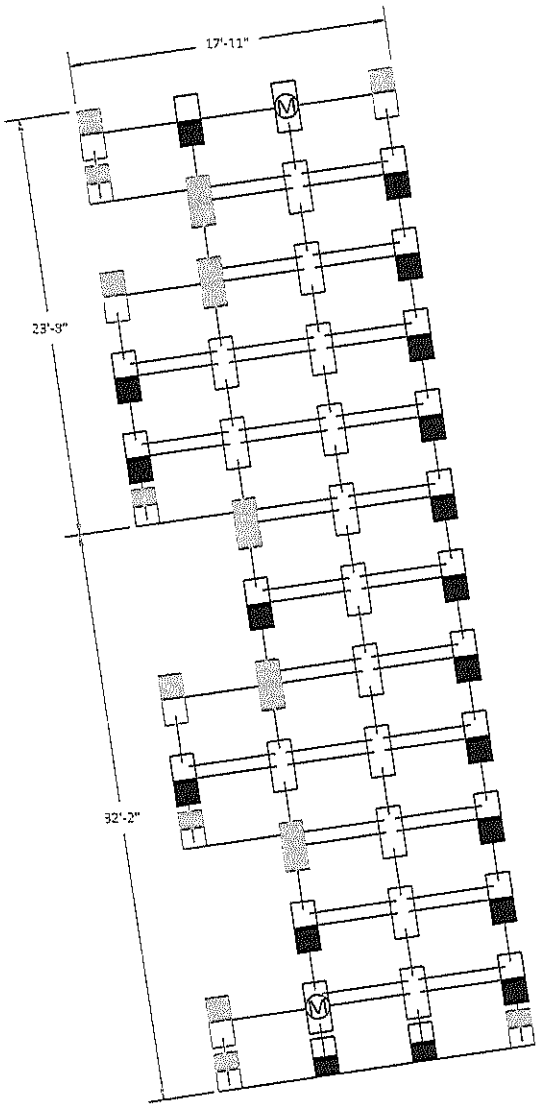
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SHT: 8 | SHEET: 9 OF 26



BALLAST LAYOUT - ARRAY 20
SCALE: NTS



BALLAST LAYOUT - ARRAY 21
SCALE: NTS

ARRAY 20		ARRAY 21	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	11	NUMBER OF MODULES	31
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	2.6	ARRAY OUTPUT (Kw)	7.3
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	44	CLAWS	124
DEFLECTORS	11	DEFLECTORS	31
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	12
POLAR BEAR SUPPORTS	15	POLAR BEAR SUPPORTS	43
SOUTH SUPPORTS	5	SOUTH SUPPORTS	7
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	32	TOTAL CMU BLOCKS	69
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1399.5	TOTAL ARRAY WT (LB)	3571.0
ARRAY AREA (SQ. FT)	321.4	ARRAY AREA (SQ. FT)	887.1
ARRAY LOAD (PSF)	4.4	ARRAY LOAD (PSF)	4.0

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/AFC	JA	2012/09/10
2	REVISED LAYOUT	JA	RFC	2012/09/07
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/08/30
0	INITIAL BALLAST LAYOUT	PREP	CHECK	DATE

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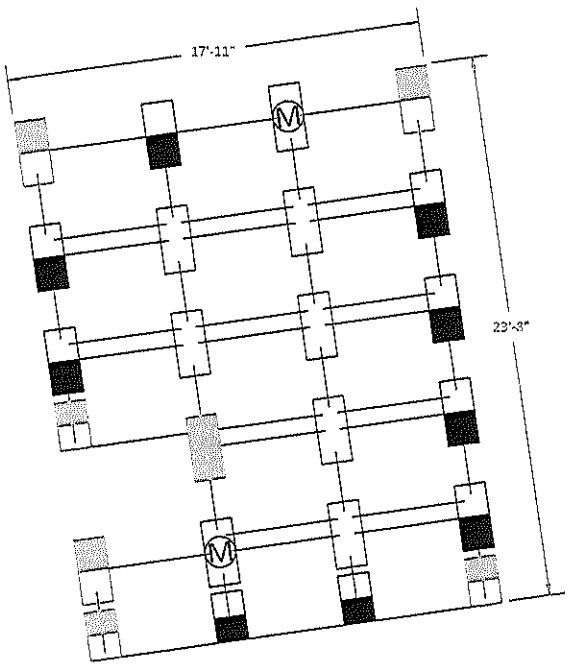
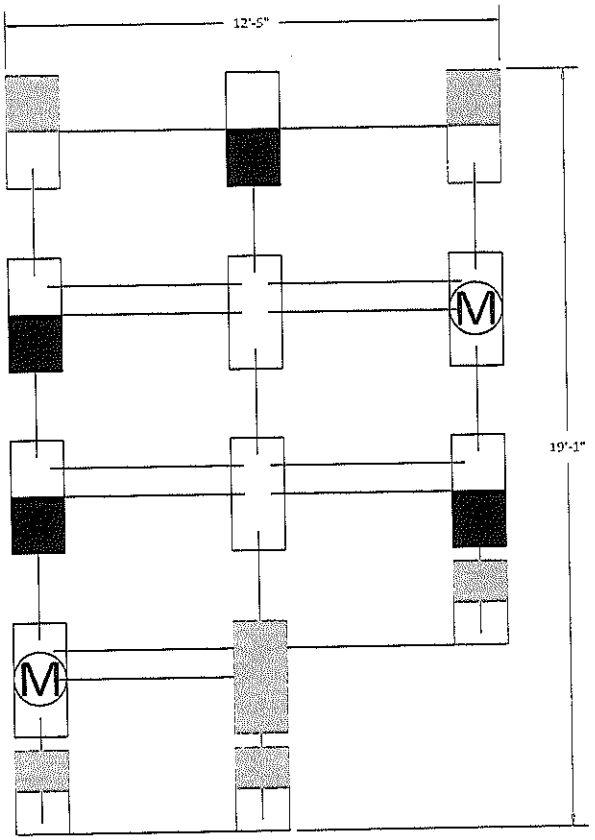
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL REV: 2 SEC: 8 SHEET: 10 OF 26



BALLAST LAYOUT - ARRAY 22
SCALE: NTS



BALLAST LAYOUT - ARRAY 23
SCALE: NTS

ARRAY 22		ARRAY 23	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	14	NUMBER OF MODULES	7
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.3	ARRAY OUTPUT (Kw)	1.6
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	56	CLAWS	28
DEFLECTORS	14	DEFLECTORS	7
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	19	POLAR BEAR SUPPORTS	11
SOUTH SUPPORTS	5	SOUTH SUPPORTS	3
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	33	TOTAL CMU BLOCKS	22
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1656.5	TOTAL ARRAY WT (LB)	941.3
ARRAY AREA (SQ. FT)	403.6	ARRAY AREA (SQ. FT)	211.5
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.5

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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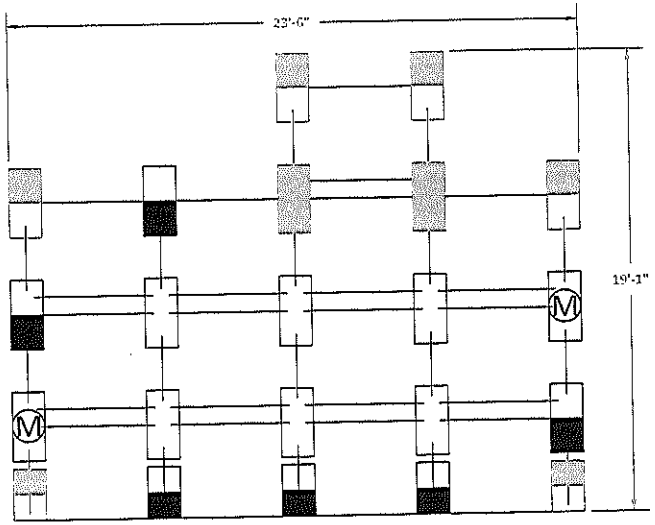
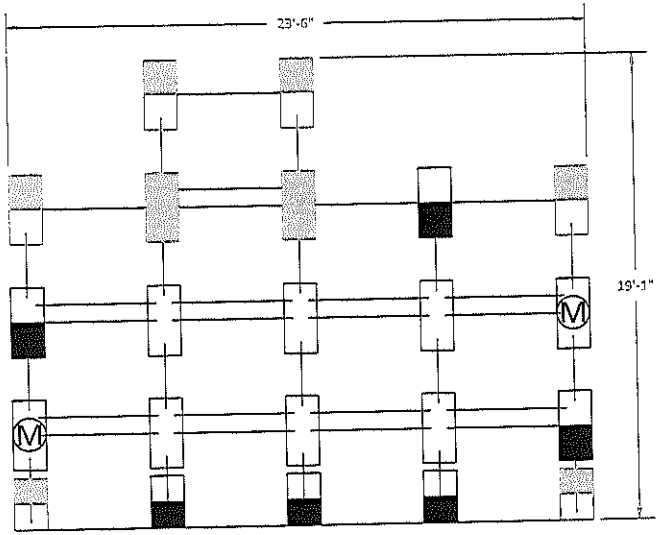
PREPARED FOR: EVERYDAY ENERGY
PROJECT: MADONNA ROAD
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405
SCALE: DETAIL | REV: 2 | SHT: 0 | SHEET: 11 OF 26



BALLAST LAYOUT - ARRAY 25 & 34
SCALE: NTS



BALLAST LAYOUT - ARRAY 24 & 33
SCALE: NTS

ARRAY 24 & 33		ARRAY 25 & 34	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	17	POLAR BEAR SUPPORTS	17
SOUTH SUPPORTS	5	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1522.0	TOTAL ARRAY WT (LB)	1522.0
ARRAY AREA (SQ. FT)	372.0	ARRAY AREA (SQ. FT)	372.0
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/20

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PREPARED FOR
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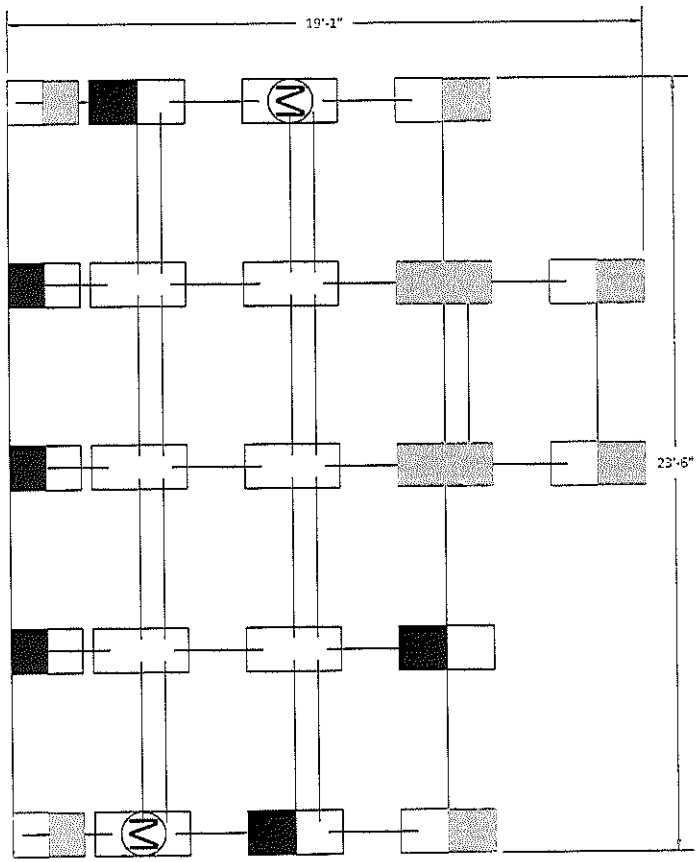
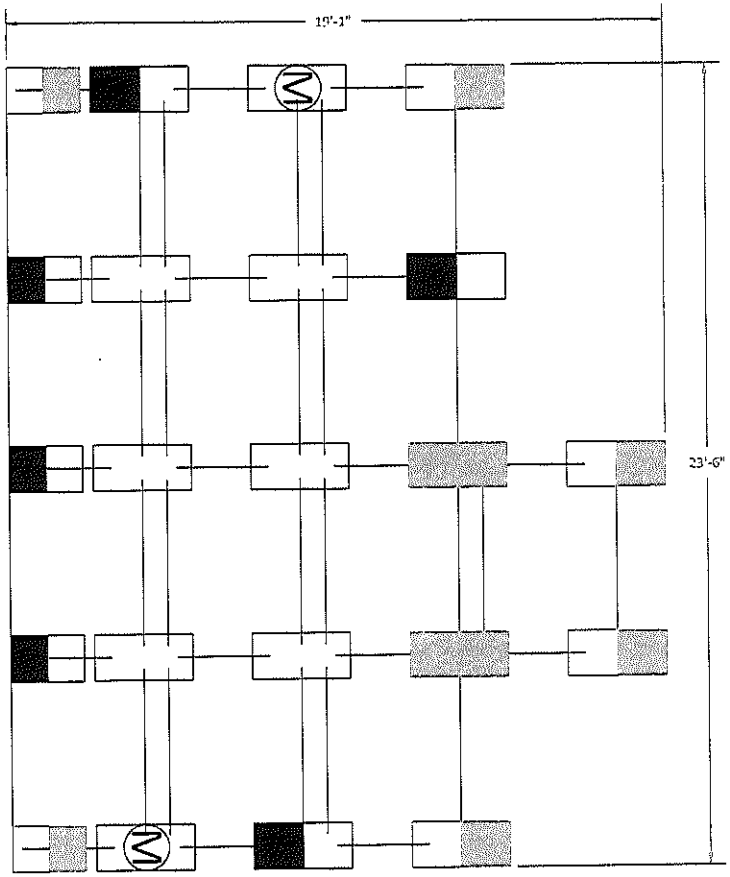
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SHEET: 12 OF 26



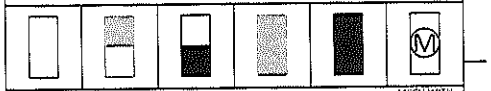
BALLAST LAYOUT - ARRAY 26
SCALE: NTS



BALLAST LAYOUT - ARRAY 27
SCALE: NTS

ARRAY 26		ARRAY 27	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	17	POLAR BEAR SUPPORTS	17
SOUTH SUPPORTS	5	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1522.0	TOTAL ARRAY WT (LB)	1522.0
ARRAY AREA (SQ. FT)	372.1	ARRAY AREA (SQ. FT)	372.1
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND



0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/KFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	KFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	KFC	2012/08/30

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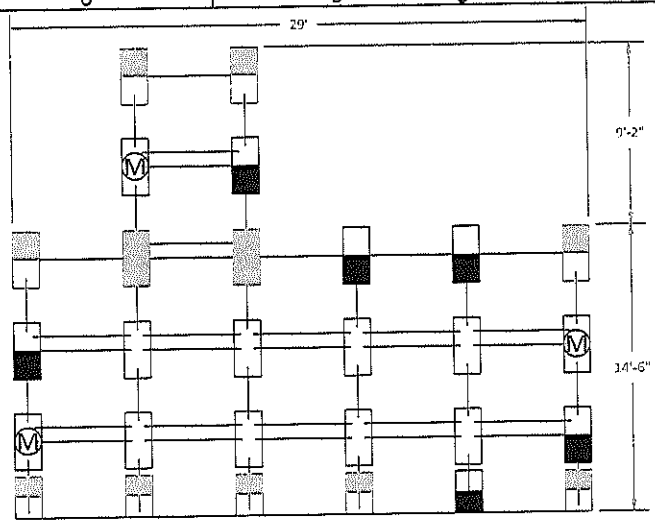
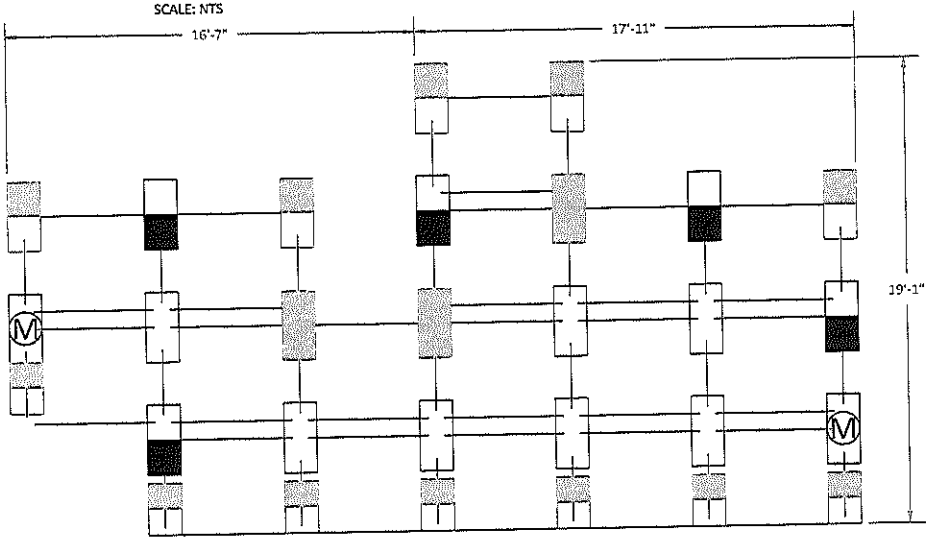
SCALE: DETAIL | REV: 2 | SHEET: 13 OF 26

2-12



BALLAST LAYOUT - ARRAY 29
SCALE: NTS



BALLAST LAYOUT - ARRAY 28
SCALE: NTS

ARRAY 28		ARRAY 29	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	17	NUMBER OF MODULES	17
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	4.0	ARRAY OUTPUT (Kw)	4.0
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	68	CLAWS	68
DEFLECTORS	17	DEFLECTORS	17
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	22	POLAR BEAR SUPPORTS	22
SOUTH SUPPORTS	7	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	3
TOTAL CMU BLOCKS	37	TOTAL CMU BLOCKS	36
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1959.5	TOTAL ARRAY WT (LB)	1937.0
ARRAY AREA (SQ. FT)	487.8	ARRAY AREA (SQ. FT)	483.9
ARRAY LOAD (PSF)	4.0	ARRAY LOAD (PSF)	4.0

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/06/20

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PROJECT
MADONNA ROAD

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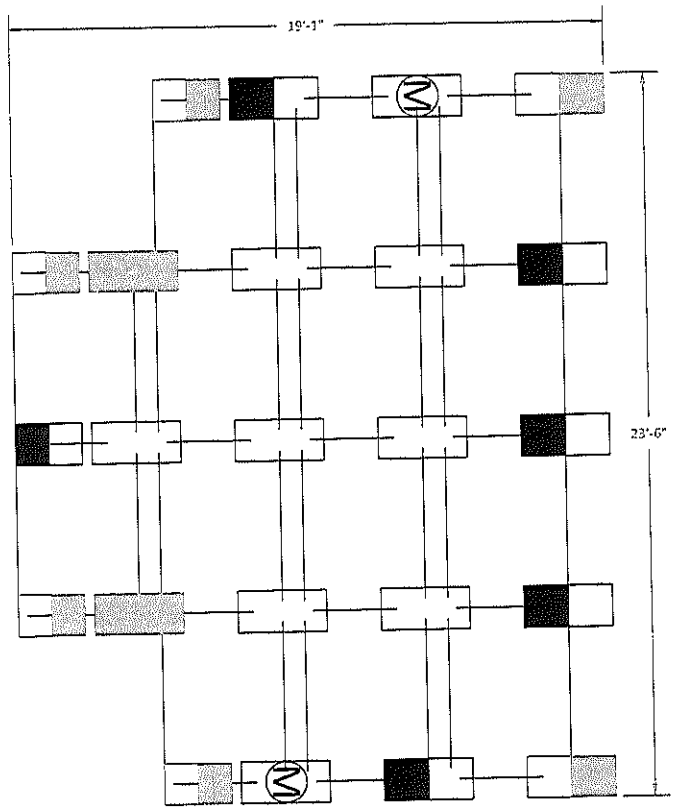
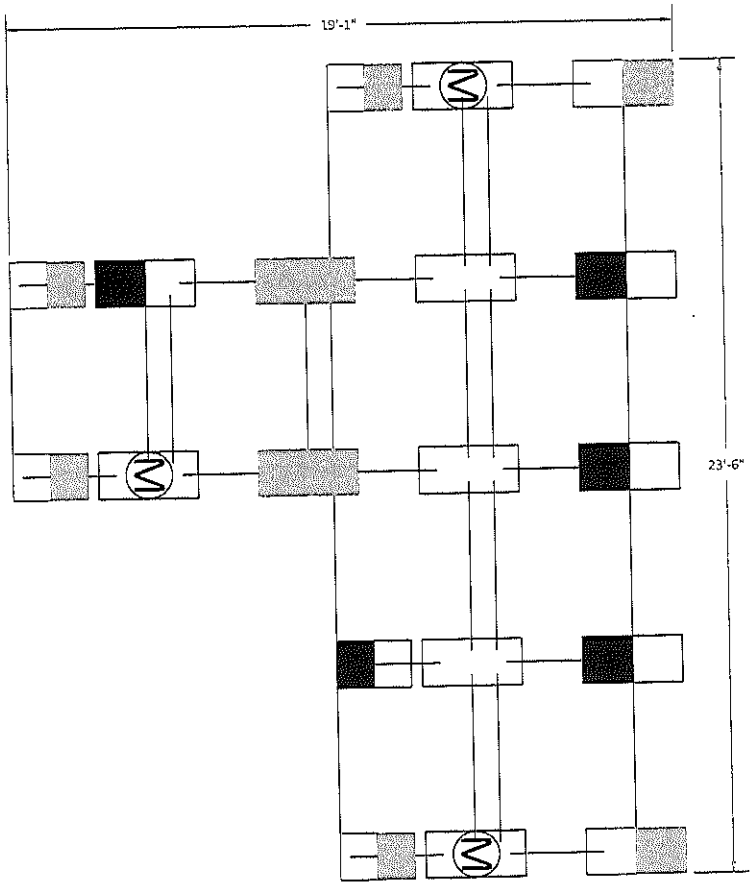
SCALE: DETAIL | REV: 2 | SHEET: 14 OF 26



BALLAST LAYOUT - ARRAY 30
SCALE: NTS



BALLAST LAYOUT - ARRAY 31
SCALE: NTS

ARRAY 30		ARRAY 31	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	14	NUMBER OF MODULES	10
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.3	ARRAY OUTPUT (Kw)	2.4
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	56	CLAWS	40
DEFLECTORS	14	DEFLECTORS	10
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	18	POLAR BEAR SUPPORTS	14
SOUTH SUPPORTS	5	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	3
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	31
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1596.6	TOTAL ARRAY WT (LB)	1315.0
ARRAY AREA (SQ. FT)	397.5	ARRAY AREA (SQ. FT)	295.8
ARRAY LOAD (PSF)	4.0	ARRAY LOAD (PSF)	4.4

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RPC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RPC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RPC	2012/08/30

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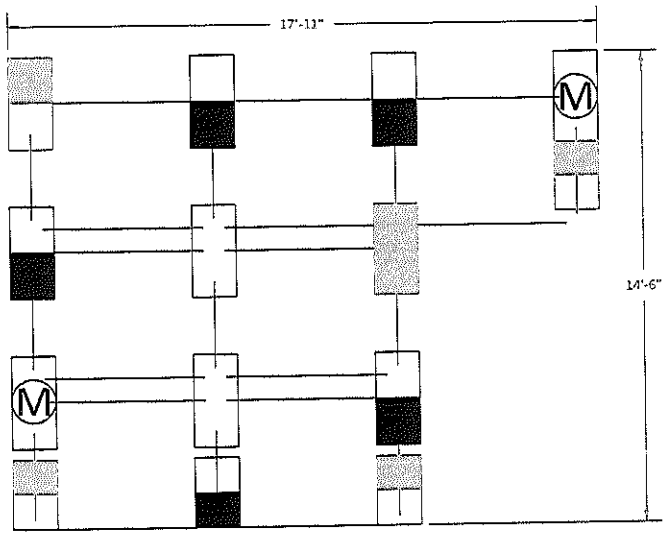
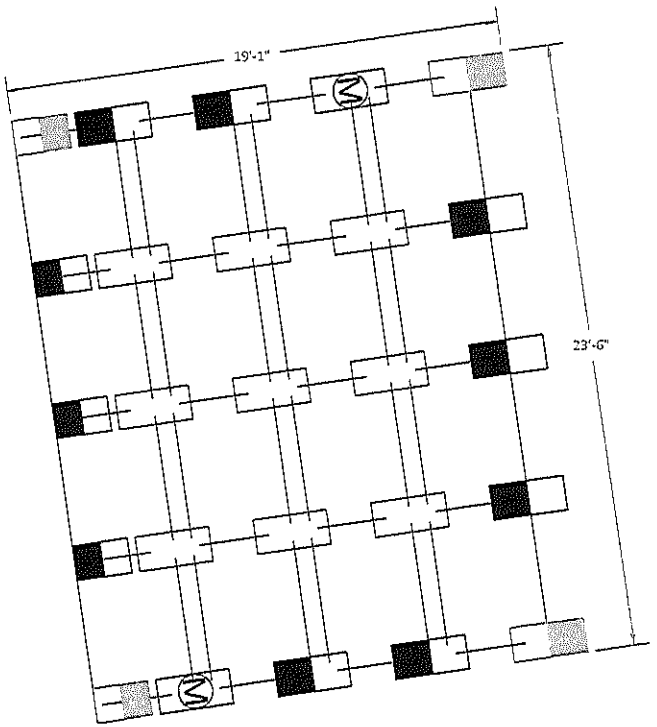
SCALE: DETAIL | REV: 2 | SIZE: D | SHEET: 15 OF 26

2.14



BALLAST LAYOUT - ARRAY 32
SCALE: NTS



BALLAST LAYOUT - ARRAY 35
SCALE: NTS

ARRAY 32		ARRAY 35	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	7	NUMBER OF MODULES	16
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	1.6	ARRAY OUTPUT (Kw)	3.8
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	28	CLAWS	64
DEFLECTORS	7	DEFLECTORS	16
DEFLECTOR END PLATES	3	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	10	POLAR BEAR SUPPORTS	20
SOUTH SUPPORTS	4	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	23	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	947.8	TOTAL ARRAY WT (LB)	1746.0
ARRAY AREA (SQ. FT)	221.1	ARRAY AREA (SQ. FT)	448.4
ARRAY LOAD (PSF)	4.3	ARRAY LOAD (PSF)	3.9

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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PROJECT: MADONNA ROAD
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405
SCALE: DETAIL REV: 2 SHEET: 16 OF 26

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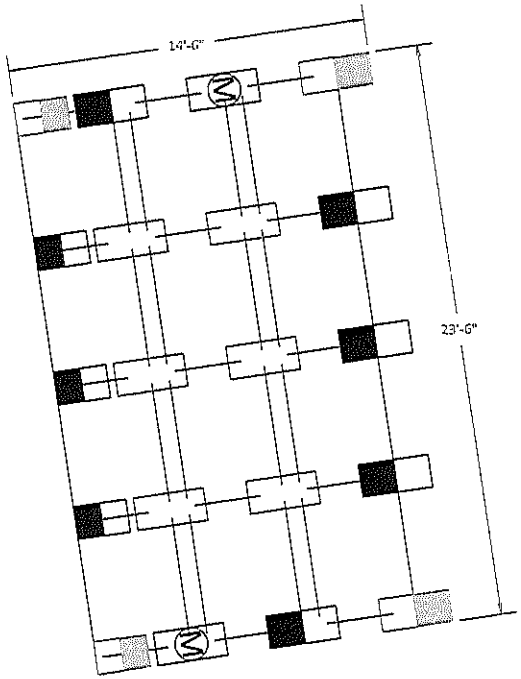
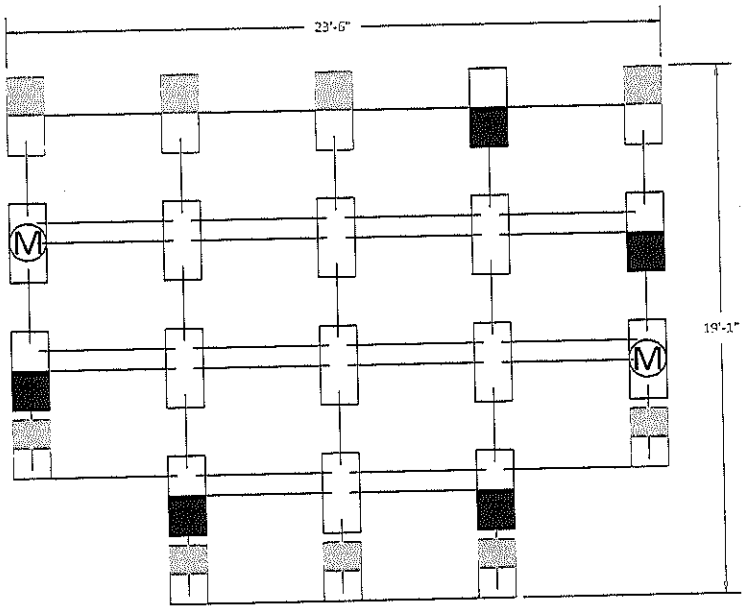


BALLAST LAYOUT - ARRAY 36
SCALE: NTS



BALLAST LAYOUT - ARRAY 37
SCALE: NTS

ARRAY 36		ARRAY 37	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	12	NUMBER OF MODULES	14
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	2.8	ARRAY OUTPUT (Kw)	3.3
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	48	CLAWS	56
DEFLECTORS	12	DEFLECTORS	14
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	4
POLAR BEAR SUPPORTS	15	POLAR BEAR SUPPORTS	18
SOUTH SUPPORTS	5	SOUTH SUPPORTS	5
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	26	TOTAL CMU BLOCKS	25
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1374.3	TOTAL ARRAY WT (LB)	1529.6
ARRAY AREA (SQ. FT)	340.5	ARRAY AREA (SQ. FT)	397.5
ARRAY LOAD (PSF)	4.0	ARRAY LOAD (PSF)	3.8

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RKC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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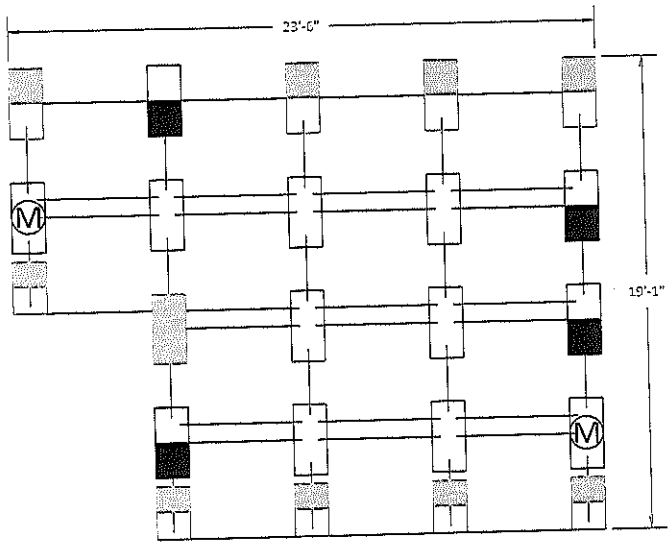
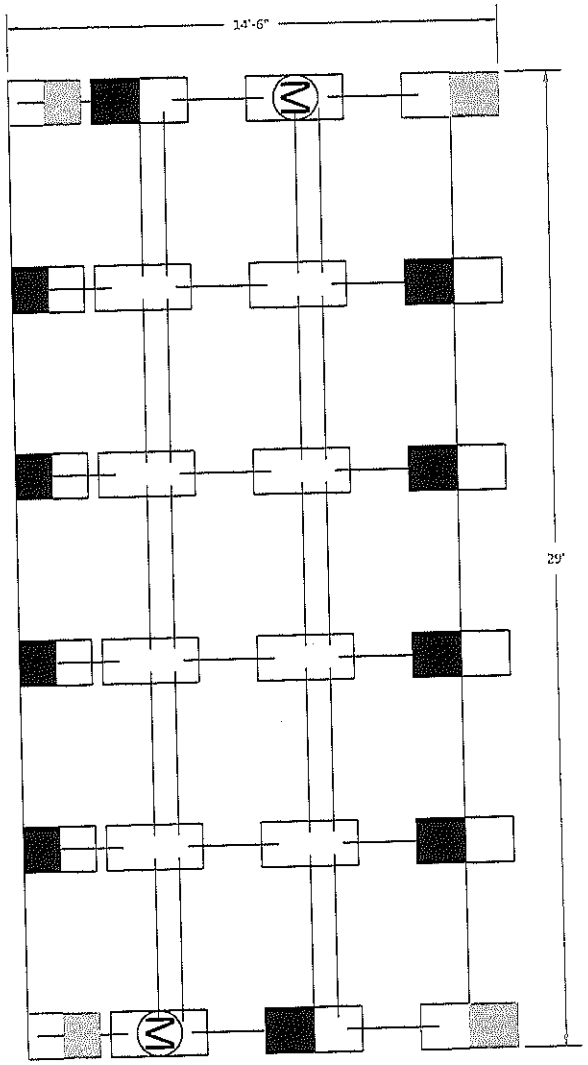
SCALE: DETAIL REV: 2 SHEET: 17 OF 26



BALLAST LAYOUT - ARRAY 38
SCALE: NTS



BALLAST LAYOUT - ARRAY 39
SCALE: NTS

ARRAY 38		ARRAY 39	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	14	NUMBER OF MODULES	15
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.3	ARRAY OUTPUT (Kw)	3.5
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	56	CLAWS	60
DEFLECTORS	14	DEFLECTORS	15
DEFLECTOR END PLATES	4	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	18	POLAR BEAR SUPPORTS	18
SOUTH SUPPORTS	5	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	26	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1543.0	TOTAL ARRAY WT (LB)	1664.8
ARRAY AREA (SQ. FT)	397.6	ARRAY AREA (SQ. FT)	420.6
ARRAY LOAD (PSF)	3.9	ARRAY LOAD (PSF)	4.0

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/RFC	CHECK	DATE
2	REVISED LAYOUT	JA	RFC	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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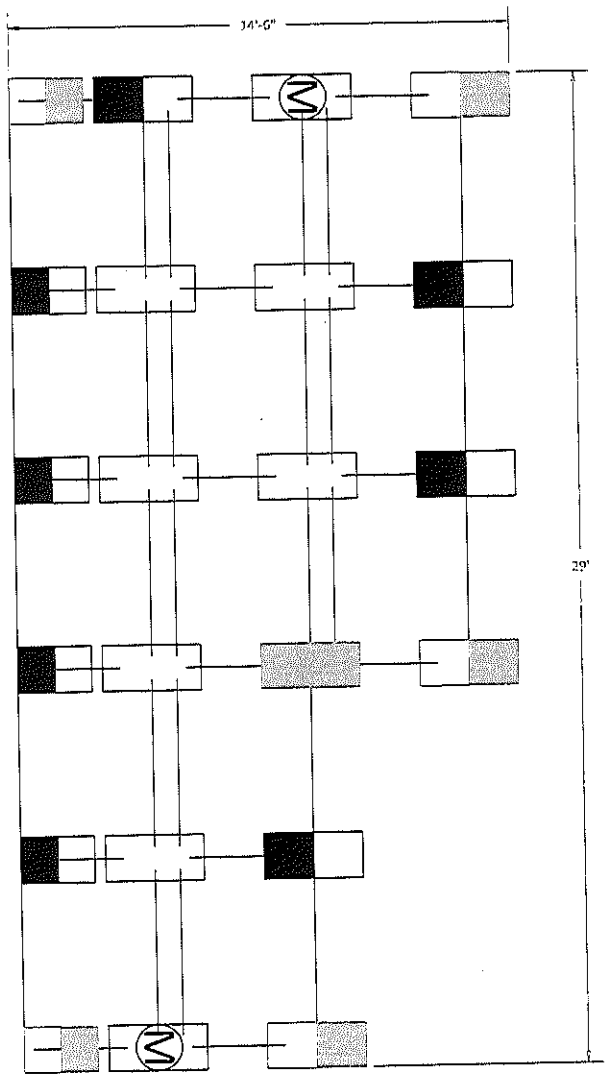
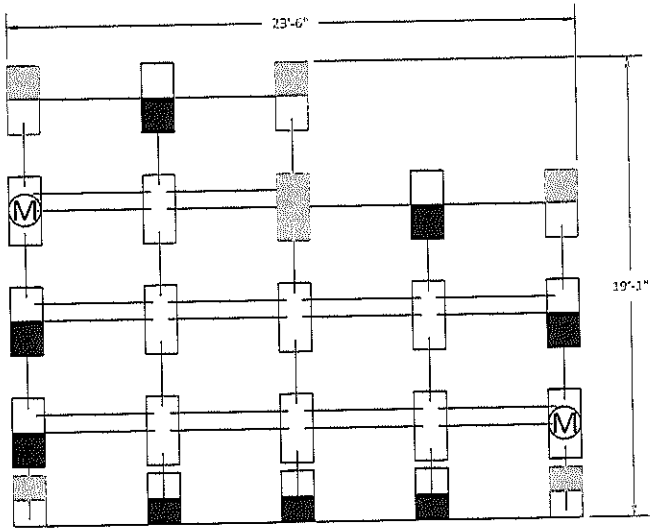
SCALE: DETAIL | REV: 2 | SIZE: D | SHEET: 18 OF 26

2.17



BALLAST LAYOUT - ARRAY 40
SCALE: NTS



BALLAST LAYOUT - ARRAY 41
SCALE: NTS

ARRAY 40		ARRAY 41	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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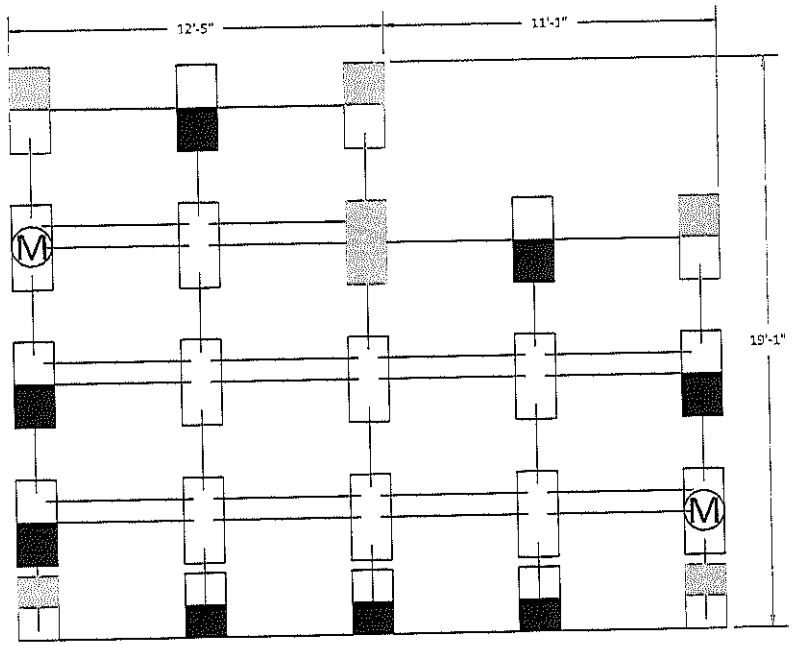
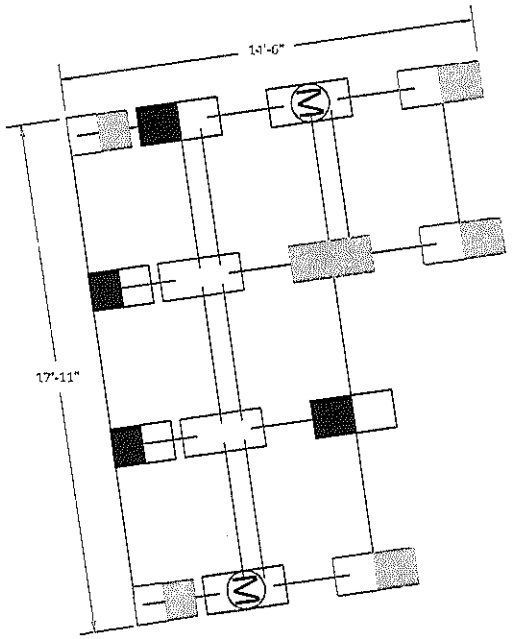
PREPARED FOR: EVERYDAY ENERGY
PROJECT: MADONNA ROAD
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405
SCALE: DETAIL | REV: 2 | SHEET: 19 OF 26



BALLAST LAYOUT - ARRAY 42
SCALE: NTS



BALLAST LAYOUT - ARRAY 43
SCALE: NTS

ARRAY 42		ARRAY 43	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/RFC	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/20

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PREPARED FOR
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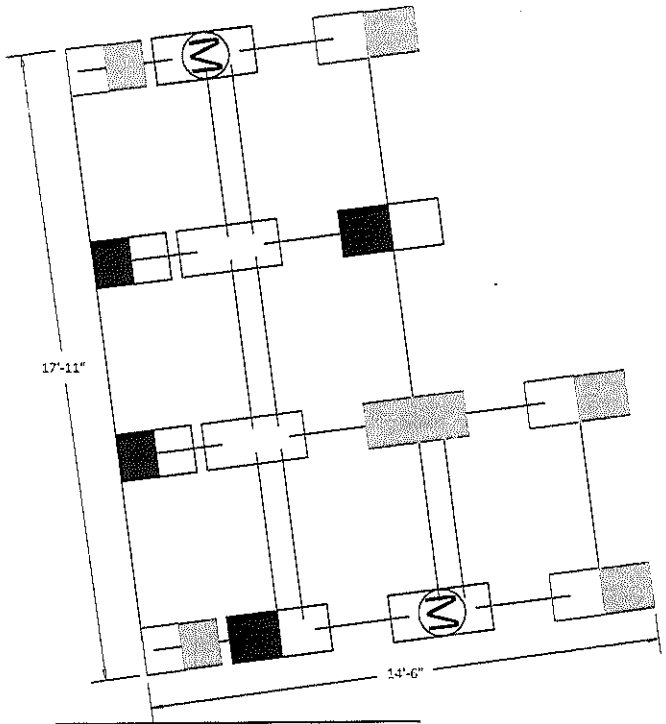
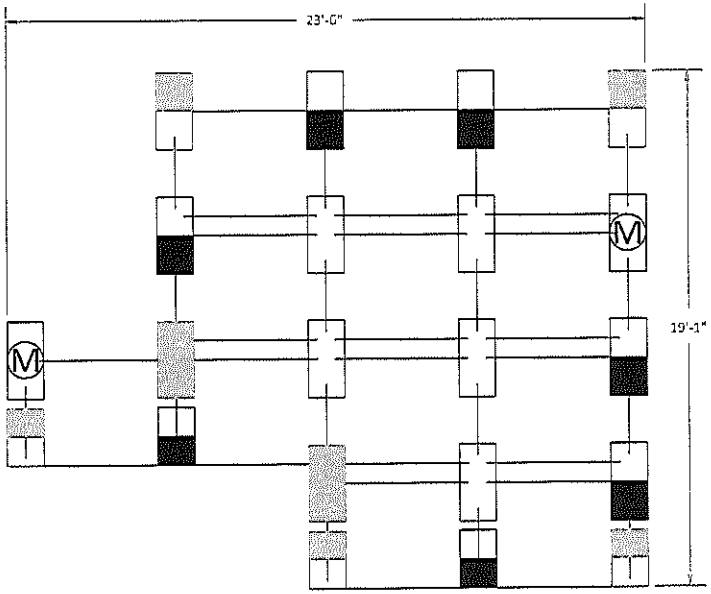
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SHEET: 20 OF 26



BALLAST LAYOUT - ARRAY 44
SCALE: NTS



BALLAST LAYOUT - ARRAY 45
SCALE: NTS

ARRAY 44		ARRAY 45	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCK

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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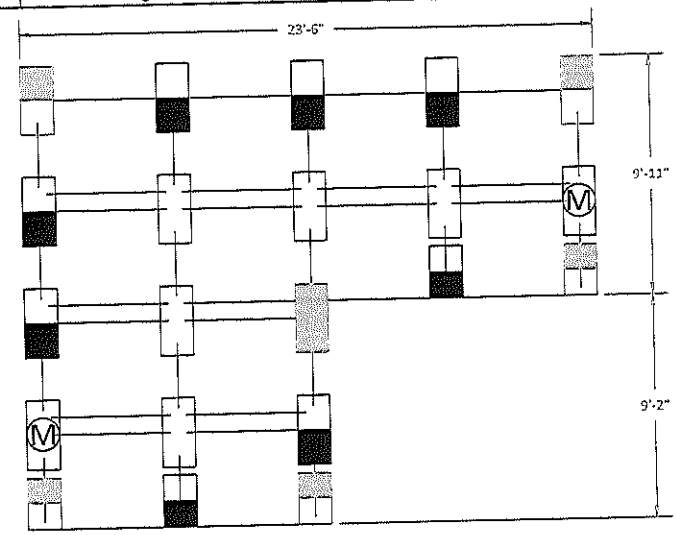
PROJECT
MADONNA ROAD

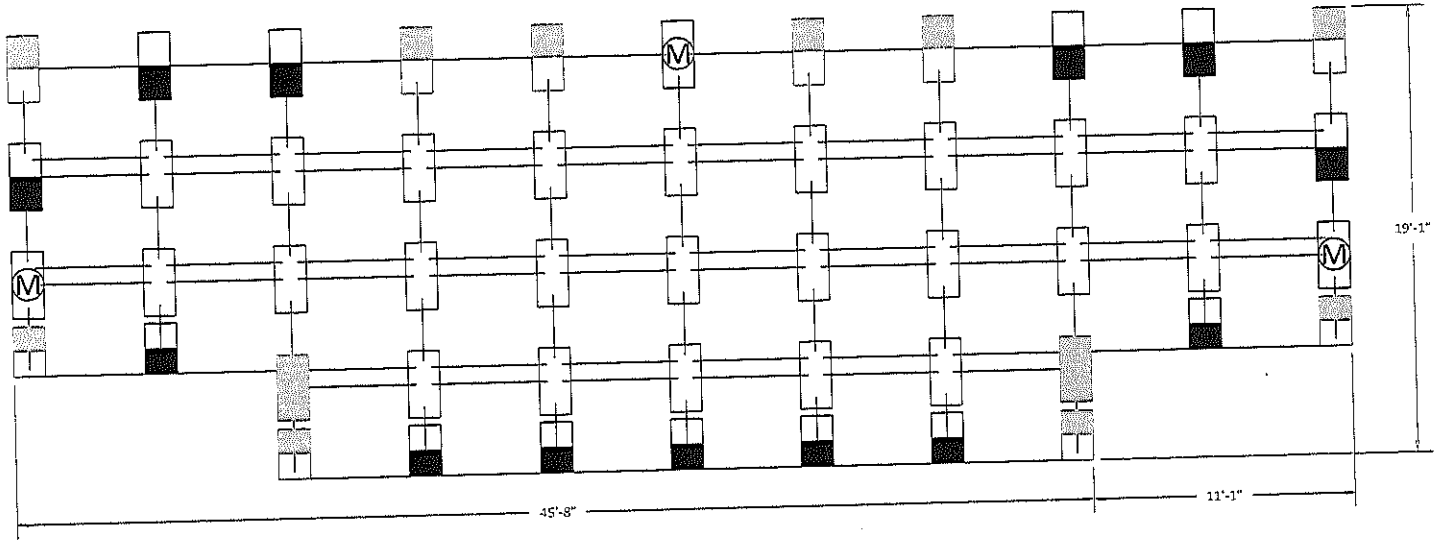
LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL REV: 2 SHEET: 21 OF 26

2.20



BALLAST LAYOUT - ARRAY 47
SCALE: NTS



BALLAST LAYOUT - ARRAY 46
SCALE: NTS

ARRAY 46		ARRAY 47	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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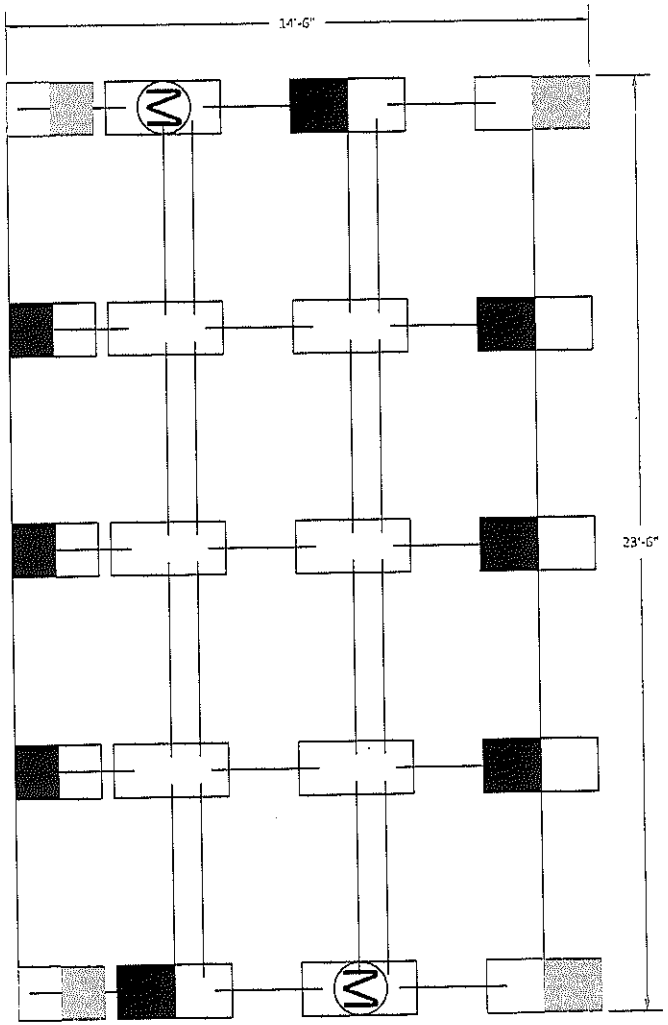
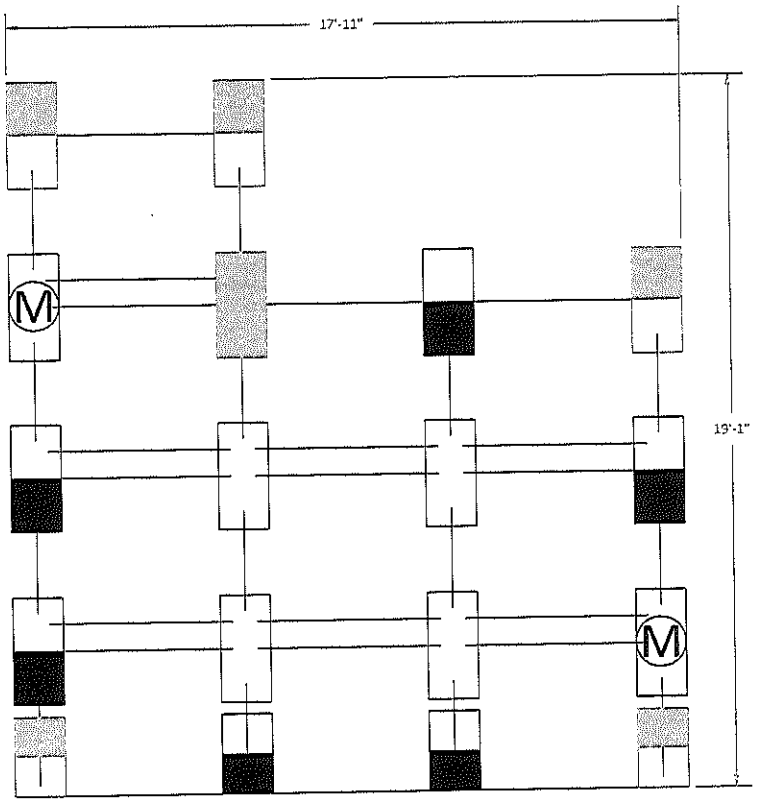
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL REV: 2 SHT: 11 SHEET: 22 OF 26



BALLAST LAYOUT - ARRAY 48 - 50
SCALE: NTS



BALLAST LAYOUT - ARRAY 51
SCALE: NTS

ARRAY 48 TO 50		ARRAY 51	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	DCA/NFC	JA	2012/09/10
2	REVISED LAYOUT	JA	NFC	2012/09/07
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	NFC	2012/08/30
0	INITIAL BALLAST LAYOUT	PREP	CHECK	DATE

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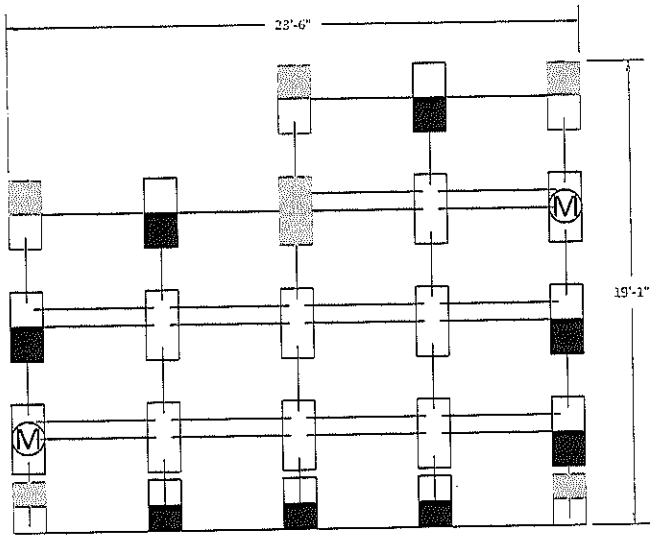
MADONNA ROAD

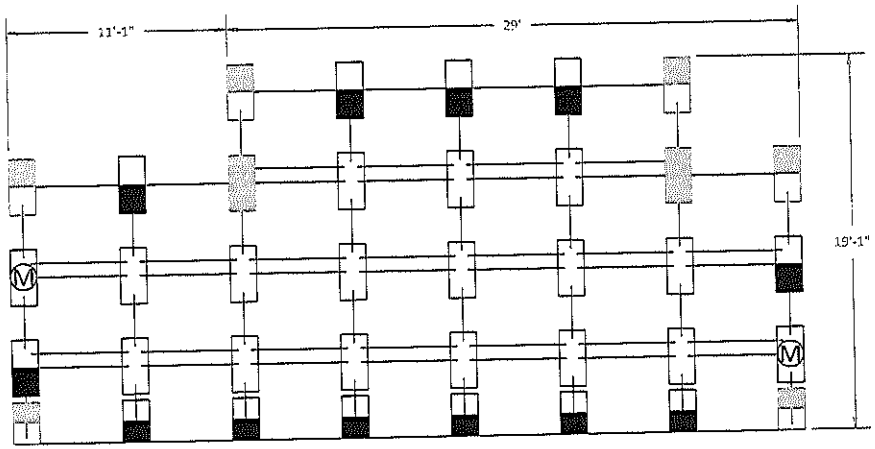
LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SEC: D | SHEET: 21 OF 26

2.23



BALLAST LAYOUT - ARRAY 54
SCALE: NTS



BALLAST LAYOUT - ARRAY 52 & 53
SCALE: NTS

ARRAY 52 & 53		ARRAY 54	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK 1-BLOCK 2-BLOCK 3-BLOCK 4-BLOCK MECH WITH 3-BLOCKS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DCA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/10

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PREPARED FOR
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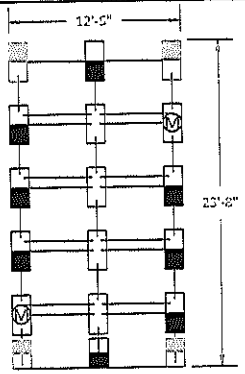
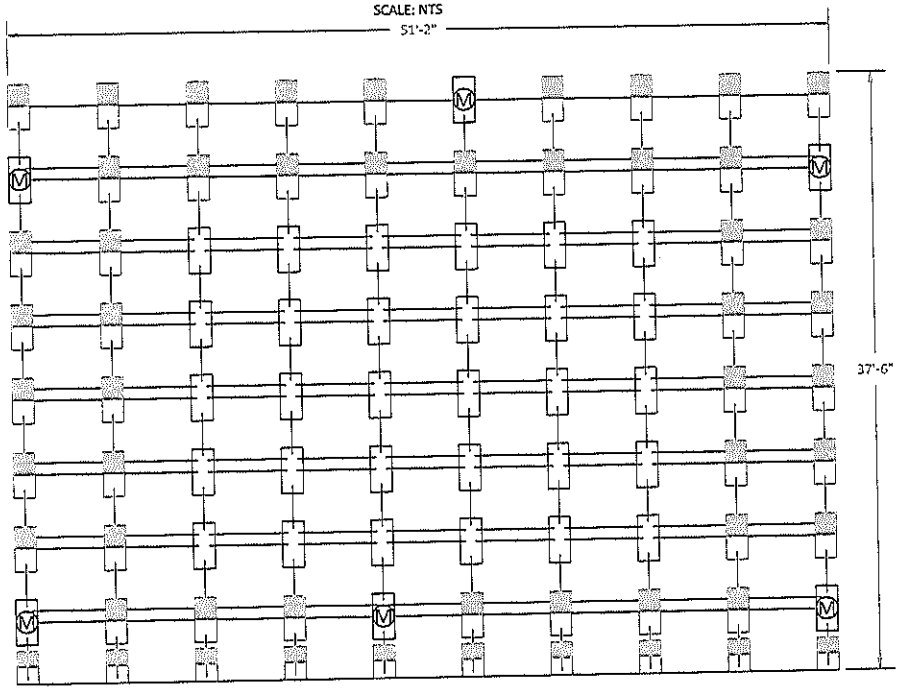
PROJECT
MADONNA ROAD

LOCATION
1550 MADONNA RD, SAN LUIS OBISPO, CA 93405

SCALE: DETAIL | REV: 2 | SHT: 11 | SHEET: 24 OF 26



BALLAST LAYOUT - ARRAY 56
SCALE: NTS



BALLAST LAYOUT - ARRAY 55
SCALE: NTS

ARRAY 55		ARRAY 56	
ROOF INFORMATION		ROOF INFORMATION	
WIND SPEED (MPH)	85	WIND SPEED (MPH)	85
EXPOSURE CATEGORY	C	EXPOSURE CATEGORY	C
ROOF HEIGHT (FT)	20	ROOF HEIGHT (FT)	20
ROOF TYPE	PVC	ROOF TYPE	PVC
SEISMIC DESIGN CAT.	D	SEISMIC DESIGN CAT.	D
ARRAY SPECIFICATIONS		ARRAY SPECIFICATIONS	
NUMBER OF MODULES	13	NUMBER OF MODULES	13
MODULE POWER (W)	235	MODULE POWER (W)	235
ARRAY OUTPUT (Kw)	3.1	ARRAY OUTPUT (Kw)	3.1
ARRAY PART QUANTITIES		ARRAY PART QUANTITIES	
ITEM	QTY	ITEM	QTY
CLAWS	52	CLAWS	52
DEFLECTORS	13	DEFLECTORS	13
DEFLECTOR END PLATES	5	DEFLECTOR END PLATES	5
POLAR BEAR SUPPORTS	16	POLAR BEAR SUPPORTS	16
SOUTH SUPPORTS	6	SOUTH SUPPORTS	6
MECH ATTACHMENTS	2	MECH ATTACHMENTS	2
TOTAL CMU BLOCKS	30	TOTAL CMU BLOCKS	30
ARRAY LOADING DETAILS		ARRAY LOADING DETAILS	
SINGLE MODULE WT (LB)	43.0	SINGLE MODULE WT (LB)	43.0
SINGLE CMU WT (LB)	13.4	SINGLE CMU WT (LB)	13.4
TOTAL ARRAY WT (LB)	1515.5	TOTAL ARRAY WT (LB)	1515.5
ARRAY AREA (SQ. FT)	369.7	ARRAY AREA (SQ. FT)	369.7
ARRAY LOAD (PSF)	4.1	ARRAY LOAD (PSF)	4.1

SUPPORT LEGEND

0-BLOCK | 1-BLOCK | 2-BLOCK | 3-BLOCK | 4-BLOCK | MECH WITH 2-BLOCKS

REV	DESCRIPTION	DRAWN	CHECK	DATE
2	REVISED LAYOUT	DGA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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PROJECT
MADONNA ROAD

LOCATION
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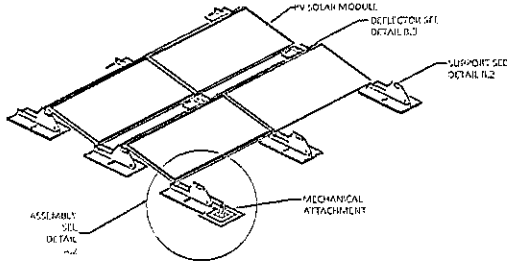
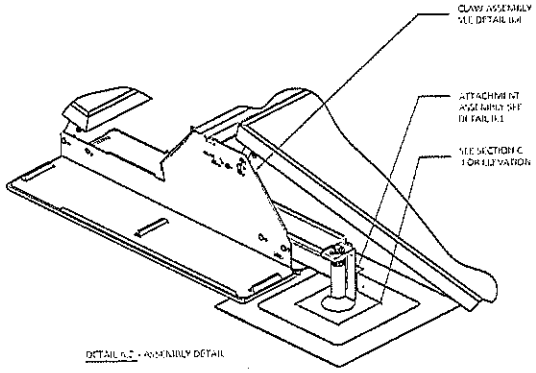
SCALE: DETAIL | REV: 2 | SHT: 11 | PAGE: 25 OF 26

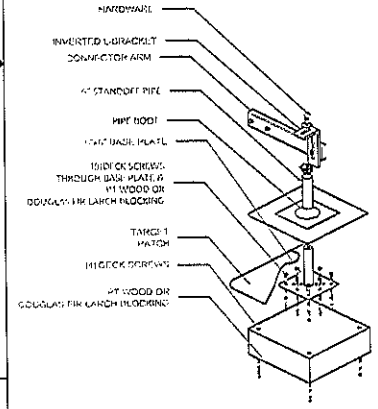


DETAIL A.1 - TYPICAL ARRAY CONFIGURATION

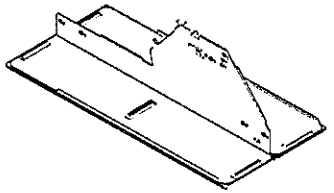


DETAIL A.2 - ASSEMBLY DETAIL

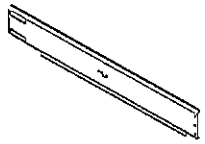
SECTION A - TYPICAL ARRAY DETAILS



DETAIL B.1 - MECHANICAL ATTACHMENT DETAIL



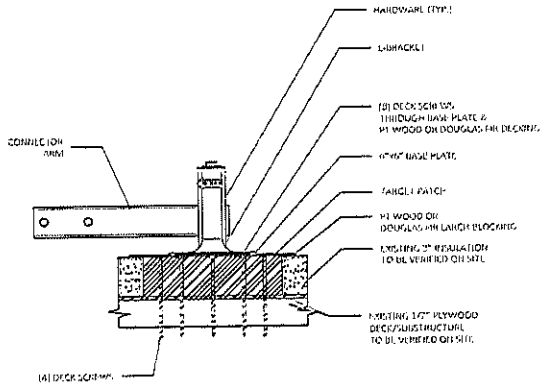
DETAIL B.2 - SUPPORT



DETAIL B.3 - DEFLECTOR

DETAIL B.4 - CLAW

SECTION B - INDIVIDUAL SYSTEM COMPONENTS



SECTION C - TYPICAL ATTACHMENT ELEVATION

MECHANICAL ATTACHMENT DETAIL
SCALE: NTS

REV	DESCRIPTION	PREP	CHECK	DATE
2	REVISED LAYOUT	DGA/RFC	JA	2012/09/10
1	OPTIMIZED BALLAST FOR SEISMIC AND UPDATED CHANGES	JA	RFC	2012/09/07
0	INITIAL BALLAST LAYOUT	JA	RFC	2012/08/30

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PREPARED FOR: EVERYDAY ENERGY
PROJECT: MADONNA ROAD
LOCATION: 1550 MADONNA RD, SAN LUIS OBISPO, CA 93405
SCALE: NTS | REV: 2 | SHEET: 26 OF 26

Rooftop Ballast Map in Unit Blocks

Weight of (1) Ballast	13.4	lbs
Zero Ballast Threshold	1	lbs
Total Ballast Required	1791	lbs
Total Ballast Calculated	2439	lbs
Over Ballast Amount	648	lbs

Ballast Per Additional Column	6	units	80.4	lbs
Ballast Per Additional Row	22	units	294.8	lbs

Tot. # of Cols:	20
Tot. # of Rows:	20
Edge Zone Columns:	0
Edge Zone Rows:	0

Dim A	66.43	inch
Dim B	55.15	inch
Rep. Area (A*B)	25.4418	sf
Total Area Array	10176.7	sf

Ballast Load	0.69	psf
Dead Load	3.03	psf
Total Platform Load	3.71	psf

Total Ballast Weight	6994.8	lbs
Total Dead Load Weight	30797.12	lbs
Total Platform Weight	37791.92	lbs

0		0		0		0		0		0		0		0		0		0		0		0		0		0	0
	Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		
0		1		2		1		1		1		1		1		1		1		1		2		1		0	14
	Req: 0.00 lbs		Req: 42.61 lbs		Req: 42.61 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 42.61 lbs		Req: 42.61 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 40.20 lbs		Used: 23.45 lbs		Used: 20.10 lbs		Used: 20.10 lbs		Used: 20.10 lbs		Used: 20.10 lbs		Used: 20.10 lbs		Used: 23.45 lbs		Used: 40.20 lbs		Used: 46.90 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 10.99 lbs		Over: -2.41 lbs		Over: 20.62 lbs		Over: 17.27 lbs		Over: 17.27 lbs		Over: 17.27 lbs		Over: 17.27 lbs		Over: 17.27 lbs		Over: 20.62 lbs		Over: -2.41 lbs		Over: 4.29 lbs		Over: 0.00 lbs		
0		2		4		2		1		1		1		1		1		1		2		4		2		0	22
	Req: 0.00 lbs		Req: 42.61 lbs		Req: 42.61 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 2.83 lbs		Req: 42.61 lbs		Req: 42.61 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 40.20 lbs		Used: 20.10 lbs		Used: 13.40 lbs		Used: 13.40 lbs		Used: 13.40 lbs		Used: 13.40 lbs		Used: 13.40 lbs		Used: 20.10 lbs		Used: 40.20 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 10.99 lbs		Over: -2.41 lbs		Over: 17.27 lbs		Over: 10.57 lbs		Over: 10.57 lbs		Over: 10.57 lbs		Over: 10.57 lbs		Over: 10.57 lbs		Over: 17.27 lbs		Over: -2.41 lbs		Over: 10.99 lbs		Over: 0.00 lbs		
0		2		4		2		1		1		1		1		1		1		2		4		2		0	22
	Req: 0.00 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 43.55 lbs		Used: 23.45 lbs		Used: 13.40 lbs		Used: 10.05 lbs		Used: 6.70 lbs		Used: 10.05 lbs		Used: 13.40 lbs		Used: 23.45 lbs		Used: 43.55 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 5.48 lbs		Over: -4.57 lbs		Over: 14.33 lbs		Over: 4.28 lbs		Over: 10.05 lbs		Over: 6.70 lbs		Over: 10.05 lbs		Over: 4.28 lbs		Over: 14.33 lbs		Over: -4.57 lbs		Over: 5.48 lbs		Over: 0.00 lbs		
0		2		4		3		1		1		0		0		1		1		3		4		2		0	22
	Req: 0.00 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 46.90 lbs		Used: 26.80 lbs		Used: 13.40 lbs		Used: 6.70 lbs		Used: 0.00 lbs		Used: 6.70 lbs		Used: 13.40 lbs		Used: 26.80 lbs		Used: 46.90 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 5.48 lbs		Over: -1.22 lbs		Over: 17.68 lbs		Over: 4.28 lbs		Over: 6.70 lbs		Over: 0.00 lbs		Over: 6.70 lbs		Over: 4.28 lbs		Over: 17.68 lbs		Over: -1.22 lbs		Over: 5.48 lbs		Over: 0.00 lbs		
0		2		4		3		1		1		0		0		1		1		3		4		2		0	22
	Req: 0.00 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 9.12 lbs		Req: 9.12 lbs		Req: 48.12 lbs		Req: 48.12 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 46.90 lbs		Used: 30.15 lbs		Used: 20.10 lbs		Used: 13.40 lbs		Used: 6.70 lbs		Used: 13.40 lbs		Used: 20.10 lbs		Used: 30.15 lbs		Used: 46.90 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 5.48 lbs		Over: -1.22 lbs		Over: 21.03 lbs		Over: 10.98 lbs		Over: 13.40 lbs		Over: 6.70 lbs		Over: 13.40 lbs		Over: 10.98 lbs		Over: 21.03 lbs		Over: -1.22 lbs		Over: 5.48 lbs		Over: 0.00 lbs		
0		2		4		3		2		2		1		1		2		2		3		4		2		0	28
	Req: 0.00 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 10.60 lbs		Req: 10.60 lbs		Req: 10.60 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 50.25 lbs		Used: 43.55 lbs		Used: 33.50 lbs		Used: 20.10 lbs		Used: 13.40 lbs		Used: 20.10 lbs		Used: 33.50 lbs		Used: 43.55 lbs		Used: 50.25 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 12.36 lbs		Over: 9.01 lbs		Over: 2.31 lbs		Over: -7.74 lbs		Over: 9.50 lbs		Over: 2.80 lbs		Over: 9.50 lbs		Over: -7.74 lbs		Over: 2.31 lbs		Over: 9.01 lbs		Over: 12.36 lbs		Over: 0.00 lbs		
0		2		4		4		4		2		1		1		2		4		4		4		2		0	34
	Req: 0.00 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 10.60 lbs		Req: 10.60 lbs		Req: 10.60 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 41.24 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 53.60 lbs		Used: 53.60 lbs		Used: 53.60 lbs		Used: 40.20 lbs		Used: 23.45 lbs		Used: 20.10 lbs		Used: 23.45 lbs		Used: 40.20 lbs		Used: 53.60 lbs		Used: 53.60 lbs		Used: 53.60 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 12.36 lbs		Over: 12.36 lbs		Over: 12.36 lbs		Over: -1.04 lbs		Over: 12.85 lbs		Over: 9.50 lbs		Over: 12.85 lbs		Over: -1.04 lbs		Over: 12.36 lbs		Over: 12.36 lbs		Over: 12.36 lbs		Over: 0.00 lbs		
0		1		2		2		2		1		1		1		1		2		2		2		1		0	18
	Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		Req: 0.00 lbs		
	Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		Used: 0.00 lbs		
	Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		Over: 0.00 lbs		
0		0		0		0		0		0		0		0		0		0		0		0		0		0	0
													Repeatable Column														

Total Ballast 182

Drop Down Inputs
Direct Inputs
Calculated Field

DO NOT OVERRIDE ANY CALCULATED FIELDS

Company Name	EVERYDAY ENERGY		
Project Name	MADONNA ROAD		
Project Address (City,State)	1550 MADONNA RD, SAN LUIS OBISPO, CA	ZIPCODE	93405

Site Specific Seismic Conditions

Ss	1.516	Fa	1.00	Site Class	D	Mech. Attach. Vertical Strength (lb.)	808
S1	0.555	Fv	1.50			Mech. Attach. lateral Strength (lb.)	628

ENTER PROJECT SPECIFIC NOTES BELOW THAT MAY/MAY NOT BE ON THE ARRAY INTAKE FORM

Using 13.44 # blocks. 8x2x16. Half the size of a normal CMU block.

REVISION NUMBER: 2

Request Type: BALLAST

COPY NAMING CONVENTION BELOW TO FILE NAME

PanelClaw_PolarBear10_Drawing_EVERYDAY ENERGY_MADONNA ROAD_Rev2_INT

PRODUCT

PRODUCT	TILT ANGLE	MATERIAL	SUPPORT OPTIONS	ROW SPACING/SHADE CONFIGURATION
[✓] BEAR GEN II	[ ] DEG	[ ] ALUM	[ ] 4S	
[ ] GRIZZLY BEAR GEN II	[✓] 10 DEG	[✓] STEEL	[✓] 6S	
[ ] KODIAK BEAR	[ ] 15 DEG		[✓] SOUTH SUPPORT	
[ ] UNICORN (TBD)	[ ] 20 DEG			
[ ] POLAR BEAR	[ ] 25 DEG			
Total Number of Arrays	56			

SITE INFORMATION		
WIND SPEED (MPH)	85	
EXPOSURE CATEGORY	C	CALCULATED SDC
SEISMIC DESIGN CATEGORY	D	D
OCCUPANCY CATEGORY	II	
GROUND SNOW LOAD (PSF)	0	

BUILDING INFORMATION			
ROOF HEIGHT	20	Width of the building (N/S) (feet) :	120
ROOF TYPE	FLAT	Length of the building (E/W) (feet) :	128
ROOF TILT	0	Parapet Height (feet)	
NOTE: MODIFY INDIVIDUAL ARRAY DETAILS IN "ACAD TABLES" TAB			

PROJECT SUMMARY

PART	TYPE/PART#	DESCRIPTION/WATT	WEIGHT (LBS)	QTY
MODULE	Trina Solar - TSM-PC/PA05.22D-255	235	43	855
CLAW	5000005	ASSY, CLAW-STANDARD, ALUMINUM	0.25	3420
(NORTH) SUPPORT	5000062	SUPPORT, G90 ST, 30455, POLAR BEAR GEN II 10 DEG	19.44	1082
(MIDDLE) SUPPORT	N/A	N/A	0	0
SOUTH SUPPORT	5000136	EMBLY, SUPPORT, SOUTH, G90ST, POLAR/GRIZZLY, E	12.75	309
DEFLECTOR	200010804	LECTOR, G90 ST, 63", POLAR/GRIZZLY BEAR GEN II 10	11.22	855
MECHANICAL ATTACHMENT	5000130	HANICAL ATTACHMENT, 6"L x 6"W x 6"H WITH 3" LC	3.56	120
END PLATE	2000140	ATE, G90 STEEL, POLAR BEAR / GRIZZLY BEAR GEN II	0.19	244
X-BRACE	N/A	N/A	0	0
CMU BLOCK	IF Only Grizzly Bear layout, Put "0" as the CMU block weight ==>		13.4	1777

MODULE SPECIFIC INFORMATION

Claws Per Module	Standard Claw	Max Allowable Load (psf)	COMBINED WIND/SNOW LOAD (COMBO #5 OF 2.4)	UL APPROVED MODULE	Module "A" Dimension (in.)	Module "B" Dimension (in.)	MODULE WIDTH (meters) If Not Approved Manually enter below the Calculated Field	MODULE LENGTH (meters) If Not Approved Manually enter below the Calculated Field
4		50	10.82	Y	66.43	55.15	0.99	1.65

COMBINED LOAD CANNOT EXCEED THE MAX ALLOWABLE LOAD. IF SO DETERMINE BEST POSSIBLE SOLUTION. (SPEAK WITH SALES)

5/10 DEGREE COUNTS TABLE

BLOCK COUNT PER SUPPORT. MECHANICAL ATTACHMENT BLOCK COUNT MAX 4 PER ARAY'S COUNT TOWARDS THE OVERALL SUPPORTS. DO NOT COUNT SEPARATE.

Array #	Module Count	End Plates	0/Grizzly	1	2	3	4	5	MA COUNT	TOTAL NORTH SUPPORTS	0	1	2	0	TOTAL SOUTH SUPPORTS	CMU	AREA	ARRAY WT (lb)	PSF
1	4	2	1	1	2	0			2	6	0	2	1		3	15	122.83	584.27	4.76
2	4	2	1	1	2	0			2	6	0	2	1		3	15	122.83	584.27	4.76
3	18	5	9	4	5	3			2	23	0	2	4		6	39	509.33	2048.25	4.02
4	36	7	20	8	8	4			3	43	0	2	9		11	65	999.23	3847.1	3.85
5	15	5	7	4	5	2			2	20	0	2	3		5	34	428.97	1744.52	4.07
6	8	2	3	2	3	0			2	10	0	2	3		5	22	232.5	1002.21	4.31
7	8	4	3	2	3	0			2	10	0	2	3		5	22	232.56	1002.59	4.31
8	20	4	9	3	9	1			2	24	0	2	7		9	46	565.78	2310.75	4.08
9	14	4	7	2	6	1			2	18	0	2	3		5	31	397.5	1610.03	4.05
10	32	4	19	7	6	2			2	36	0	4	7		11	49	879.14	3271.61	3.72
11	14	4	7	2	6	1			2	18	0	3	2		5	30	397.6	1598.63	4.02
12	7	3	2	2	3	1			2	10	0	3	1		4	22	210.13	934.43	4.45
13	7	3	2	2	3	1			2	10	0	3	1		4	22	209.38	934.43	4.46
14	15	5	7	4	5	2			2	20	0	2	3		5	34	429.07	1744.52	4.07
15	15	5	6	6	1	1			2	20	0	2	3		5	34	429.17	1744.52	4.06
16	13	5	9	6	3	1			2	16	0	3	3		6	26	369.76	1461.87	3.95
17	17	5	5	2	6	1			2	21	0	3	3		6	30	477.75	1833.55	3.84
18	12	4	7	2	5	2			2	16	0	4	1		5	29	348.48	1433.91	4.11
19	14	4	3	3	5	2			2	18	0	4	1		5	30	397.57	1598.63	4.02
20	11	4	14	5	17	5			2	15	0	3	2		5	32	321.4	1399.45	4.35
21	31	12	6	3	7	1			2	43	0	5	2		7	69	887.14	3570.99	4.03
22	14	5	2	2	4	1			2	19	0	3	2		5	33	403.64	1656.46	4.10
23	7	4	6	4	3	2			2	11	0	3	0		3	22	211.53	941.31	4.45
24	13	4	6	4	3	2			2	17	0	2	3		5	30	371.95	1521.97	4.09
25	13	4	6	4	3	2			2	17	0	2	3		5	30	372.03	1521.97	4.09
26	13	4	6	4	3	2			2	17	0	2	3		5	30	372.1	1521.97	4.09
27	13	4	6	4	3	2			2	17	0	2	3		5	30	372.13	1521.97	4.09
28	17	5	7	5	5	3			2	22	0	2	3		7	37	487.77	1959.54	4.02
29	17	5	8	4	5	2			2	22	0	7	0		6	36	483.85	1936.95	4.00
30	14	4	7	2	5	2			2	18	0	5	1		5	30	397.51	1596.63	4.02
31	10	4	3	2	4	2			3	14	0	4	1		5	31	295.76	1314.95	4.45
32	7	3	2	1	4	1			2	10	0	3	1		4	23	221.1	947.83	4.29
33	13	4	6	4	3	2			2	17	0	2	3		5	30	371.95	1521.97	4.09
34	13	4	6	4	3	2			2	17	0	2	3		5	30	372.03	1521.97	4.09
35	16	4	9	2	7	0			2	20	0	2	3		5	30	448.39	1745.95	3.89
36	12	4	6	2	5	0			2	15	0	2	3		5	26	340.45	1374.27	4.04
37	14	4	7	4	5	0			2	18	0	5	0		5	25	337.52	1529.63	3.85
38	14	4	7	4	4	1			2	18	0	5	0		5	26	337.55	1543.03	3.88
39	15	5	8	2	6	0			2	18	0	2	4		6	30	420.62	1664.79	3.96
40	13	5	6	3	4	1			2	16	0	2	4		6	30	369.73	1515.47	4.10
41	14	4	7	3	5	1			2	18	0	2	3		5	30	397.39	1596.63	4.02
42	12	4	5	3	5	1			2	16	0	2	3		5	30	346.5	1447.31	4.18
43	7	3	2	3	2	1			2	10	0	2	2		4	22	209.57	934.43	4.46
44	7	3	2	3	2	1			2	10	0	2	2		4	22	208.95	934.43	4.47
45	12	4	5	2	5	2			2	16	0	3	2		5	31	346.6	1460.71	4.21
46	36	4	23	6	6	2			3	40	0	4	7		11	51	980.79	3600.61	3.67
47	12	4	5	2	6	1			2	16	0	3	2		5	30	370.47	1447.31	3.91
48	12	4	6	2	5	0			2	15	0	2	3		5	26	340.45	1374.27	4.04
49	12	4	6	2	5	0			2	15	0	2	3		5	26	340.52	1374.27	4.04
50	12	4	6	2	5	0			2	15	0	2	3		5	26	340.52	1374.27	4.04
51	10	4	4	3	4	1			2	14	0	2	2		4	26	291.69	1231.64	4.22
52	25	4	15	4	6	2			2	29	0	2	6		8	42	669.07	2616.94	3.80
53	25	4	15	4	6	2			2	29	0	2	6		8	42	669.07	2616.94	3.80
54	14	4	7	3	5	1			2	18	0	2	3		5	30	397.39	1596.63	4.02
55	72	8	30	44	0	0			6	80	10	0	0		10	62	1317.41	6512.22	3.40
56	10	5	4	2	7	0			2	15	0	2	1		3	26	293.89	1238.52	4.21
TOTALS	855	244	404	220	265	73	0	0	120	1082	10	150	143	0	309	1777	24236.01	96472.29	3.980535

Required Mechanical Attachments For Vertical Uplift				MECH. ATTACH. REQUIRED FOR SEISMIC		RATIO						
Required CMU Weight (lb)	CMU Block Wt. (lb.)	Actual vs. Required CMU wt. (lb.)	REQUIRED MA'S	(Default)W/O FRICTION	WITH FRICTION	Support to Module Ratio	Ratio Check	Variance of MA's (Must be 0 or Higher)	% of Over Ballast	% of Virtual OverBallast (MA'S)	High Rise Ballast Comp.
184.3	201	-17	1	1	1	2.25	Too High!	1	9%	886%	-1
184.3	201	-17	1	1	1	2.25	Too High!	1	9%	886%	-1
840	522.6	317	1	2	1	1.61	OK	0	-38%	155%	-2
1521.3	871	650	1	3	1	1.50	OK	0	-43%	117%	-4
700.5	455.6	245	1	1	1	1.67	OK	1	-35%	196%	-2
371.2	294.8	76	1	1	1	1.88	OK	1	-21%	415%	-1
328.8	294.8	34	1	1	1	1.88	OK	1	-10%	481%	-1
832.8	616.4	216	1	2	1	1.65	OK	0	-26%	168%	-3
626	415.4	211	1	1	1	1.64	OK	1	-34%	225%	-2
1133	656.6	476	1	2	1	1.47	OK	0	-42%	101%	-4
583.5	402	182	1	1	1	1.64	OK	1	-31%	246%	-2
289	294.8	-6	1	1	1	2.00	OK	1	2%	561%	-1
289	294.8	-6	1	1	1	2.00	OK	1	2%	561%	-1
626	455.6	170	1	1	1	1.67	OK	1	-27%	231%	-2
626	455.6	170	1	1	1	1.67	OK	1	-27%	231%	-2
462.7	348.4	114	1	1	1	1.69	OK	1	-25%	325%	-2
629.8	402	228	1	1	1	1.59	OK	1	-36%	220%	-2
498.6	348.6	110	1	1	1	1.75	OK	1	-22%	302%	-2
583.5	402	182	1	1	1	1.64	OK	1	-31%	246%	-2
595.9	428.8	167	1	1	1	1.82	OK	1	-28%	243%	-2
1390.5	924.6	466	1	2	1	1.61	OK	0	-34%	83%	-4
595.9	442.2	154	1	1	1	1.71	OK	1	-26%	245%	-2
291.8	294.8	-3	1	1	1	2.00	OK	1	1%	555%	-1
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
628.4	495.8	133	1	2	1	1.71	OK	0	-21%	236%	-2
630.9	482.4	149	1	2	1	1.65	OK	1	-24%	361%	-2
583.5	402	182	1	1	1	1.64	OK	1	-31%	246%	-2
413.7	415.4	-2	1	1	1	1.90	OK	2	0%	586%	-2
290.4	308.2	-18	1	1	1	2.00	OK	1	6%	563%	-1
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
541.1	402	139	1	1	1	1.69	OK	1	-26%	273%	-2
668.4	402	266	1	1	1	1.56	OK	1	-40%	202%	-2
498.6	348.4	150	1	1	1	1.67	OK	1	-30%	294%	-2
508	335	173	1	1	1	1.64	OK	1	-34%	284%	-2
493.7	348.4	145	1	1	1	1.64	OK	1	-29%	298%	-2
623.3	402	221	1	1	1	1.60	OK	1	-36%	224%	-2
538.3	402	136	1	1	1	1.69	OK	1	-25%	275%	-2
583.5	402	182	1	1	1	1.64	OK	1	-31%	246%	-2
498.6	402	97	1	1	1	1.75	OK	1	-19%	305%	-2
289	294.8	-6	1	1	1	2.00	OK	1	2%	561%	-1
289	294.8	-6	1	1	1	2.00	OK	1	2%	561%	-1
500	415.4	85	1	1	1	1.75	OK	1	-17%	306%	-2
1183.8	683.4	500	1	1	1	1.42	OK	2	-42%	162%	-4
541.1	402	139	1	1	1	1.75	OK	1	-26%	273%	-2
498.6	348.4	150	1	1	1	1.67	OK	1	-30%	294%	-2
498.6	348.4	150	1	1	1	1.67	OK	1	-30%	294%	-2
498.6	348.4	150	1	1	1	1.67	OK	1	-30%	294%	-2
416.4	348.4	68	1	1	1	1.80	OK	1	-16%	372%	-2
1002.7	562.8	440	1	1	1	1.48	OK	1	-44%	117%	-3
1002.7	562.8	440	1	1	1	1.48	OK	1	-44%	117%	-3
583.5	402	182	1	1	1	1.64	OK	1	-31%	246%	-2
430.1	830.8	-401	-1	1	1	1.25	OK	5	93%	1220%	-7
2525.3	348.4	2177	4	1	1	1.80	OK	-2	-86%	-22%	1
34649.7	23811.8	10837.9	57	#DIV/0!	#DIV/0!	1.27	OK				-115

Array Informations			
qty	item	weight	total
4	Modules + Deflectors	54.22	217
15	Ballast CMU Block	13.4	201.0
6	North Support	19.44	116.6
3	South Support	12.75	38.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		11%
	area, SQFT		123
	total weight, LBS		573
	total load, PSF		4.7
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	198	
		Fpmax	926	
		Fpmin	174	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	573	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			83	
	vetical resisting load		.9*DL	0.9*Wp
			515	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	198	[lbs]
	Seismic Vertical Design Force, Fv	83	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
4	Modules + Deflectors	54.22	217
15	Ballast CMU Block	13.4	201.0
6	North Support	19.44	116.6
3	South Support	12.75	38.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		11%
	area, SQFT		123
	total weight, LBS		573
	total load, PSF		4.7
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	11.4.3, 2/3*Sms
	Short Periods	SDs	1.011	11.4.4, 2/3*Sm1
	1 second period	SD1	0.555	

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	198	
		Fpmax	926	
		Fpmin	174	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	573	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			83	
	vetical resisting load		.9*DL	0.9*Wp
			515	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	198	[lbs]
	Seismic Vertical Design Force, Fv	83	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
18	Modules + Deflectors	54.22	976
39	Ballast CMU Block	13.4	522.6
23	North Support	19.44	447.1
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		509
	total weight, LBS		2022
	total load, PSF		4.0
	total mech attach		2

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	701	
		Fpmax	3270	
		Fpmin	613	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	2022	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			292	
	vetical resisting load		.9*DL	0.9*Wp
			1820	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	701	[lbs]
	Seismic Vertical Design Force, Fv	292	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
36	Modules + Deflectors	54.22	1952
65	Ballast CMU Block	13.4	871.0
43	North Support	19.44	835.9
11	South Support	12.75	140.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		6%
	area, SQFT		999
	total weight, LBS		3799
	total load, PSF		3.8
	total mech attach		3

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1316	
		Fpmax	6143	
		Fpmin	1152	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	3799	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			549	
	vetical resisting load		.9*DL	0.9*Wp
			3419	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	1316	[lbs]
	Seismic Vertical Design Force, Fv	549	[lbs]
	total roof attachments req for lateral	3	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
15	Modules + Deflectors	54.22	813
34	Ballast CMU Block	13.4	455.6
20	North Support	19.44	388.8
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		429
	total weight, LBS		1721
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	597	
		Fpmax	2784	
		Fpmin	522	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1721	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			249	
	vetical resisting load		.9*DL	0.9*Wp
			1549	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	597	[lbs]
	Seismic Vertical Design Force, Fv	249	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
8	Modules + Deflectors	54.22	434
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		233
	total weight, LBS		987
	total load, PSF		4.2
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	342	
		Fpmax	1596	
		Fpmin	299	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	987	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			142	
	vetical resisting load		.9*DL	0.9*Wp
			888	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	342	[lbs]
	Seismic Vertical Design Force, Fv	142	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
8	Modules + Deflectors	54.22	434
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		233
	total weight, LBS		987
	total load, PSF		4.2
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	342	
		Fpmax	1596	
		Fpmin	299	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	987	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			142	
	vetical resisting load		.9*DL	0.9*Wp
			888	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	342	[lbs]
	Seismic Vertical Design Force, Fv	142	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
20	Modules + Deflectors	54.22	1084
46	Ballast CMU Block	13.4	616.4
24	North Support	19.44	466.6
9	South Support	12.75	114.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		6%
	area, SQFT		566
	total weight, LBS		2282
	total load, PSF		4.0
	total mech attach		2

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

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13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	791	
		Fpmax	3690	
		Fpmin	692	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	2282	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			329	
	vetical resisting load		.9*DL	0.9*Wp
			2054	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	791	[lbs]
	Seismic Vertical Design Force, Fv	329	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
31	Ballast CMU Block	13.4	415.4
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1588
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	550	
		Fpmax	2568	
		Fpmin	482	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1588	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			229	
	vetical resisting load		.9*DL	0.9*Wp
			1429	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	550	[lbs]
	Seismic Vertical Design Force, Fv	229	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
32	Modules + Deflectors	54.22	1735
49	Ballast CMU Block	13.4	656.6
36	North Support	19.44	699.8
11	South Support	12.75	140.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		879
	total weight, LBS		3232
	total load, PSF		3.7
	total mech attach		2

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1120	
		Fpmax	5226	
		Fpmin	980	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	3232	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			467	
	vetical resisting load		.9*DL	0.9*Wp
			2909	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	1120	[lbs]
	Seismic Vertical Design Force, Fv	467	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1575
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

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13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	546	
		Fpmax	2546	
		Fpmin	477	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1575	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			227	
	vetical resisting load		.9*DL	0.9*Wp
			1417	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	546	[lbs]
	Seismic Vertical Design Force, Fv	227	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

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Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		210
	total weight, LBS		920
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	319	
		Fpmax	1487	
		Fpmin	279	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	920	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			133	
	vetical resisting load		.9*DL	0.9*Wp
			828	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	319	[lbs]
	Seismic Vertical Design Force, Fv	133	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		209
	total weight, LBS		920
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

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13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	319	
		Fpmax	1487	
		Fpmin	279	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	920	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			133	
	vetical resisting load		.9*DL	0.9*Wp
			828	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	319	[lbs]
	Seismic Vertical Design Force, Fv	133	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
15	Modules + Deflectors	54.22	813
34	Ballast CMU Block	13.4	455.6
20	North Support	19.44	388.8
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		429
	total weight, LBS		1721
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	597	
		Fpmax	2784	
		Fpmin	522	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1721	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			249	
	vetical resisting load		.9*DL	0.9*Wp
			1549	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	597	[lbs]
	Seismic Vertical Design Force, Fv	249	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
15	Modules + Deflectors	54.22	813
34	Ballast CMU Block	13.4	455.6
20	North Support	19.44	388.8
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		429
	total weight, LBS		1721
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	597	
		Fpmax	2784	
		Fpmin	522	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1721	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			249	
	vetical resisting load		.9*DL	0.9*Wp
			1549	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	597	[lbs]
	Seismic Vertical Design Force, Fv	249	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
26	Ballast CMU Block	13.4	348.4
16	North Support	19.44	311.0
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		370
	total weight, LBS		1441
	total load, PSF		3.9
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	499	
		Fpmax	2330	
		Fpmin	437	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1441	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			208	
	vetical resisting load		.9*DL	0.9*Wp
			1297	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	**Design Forces**		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	499	[lbs]
	Seismic Vertical Design Force, Fv	208	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
17	Modules + Deflectors	54.22	922
30	Ballast CMU Block	13.4	402.0
21	North Support	19.44	408.2
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		478
	total weight, LBS		1808
	total load, PSF		3.8
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	627	
		Fpmax	2924	
		Fpmin	548	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1808	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			261	
	vetical resisting load		.9*DL	0.9*Wp
			1628	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	627	[lbs]
	Seismic Vertical Design Force, Fv	261	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
29	Ballast CMU Block	13.4	388.6
16	North Support	19.44	311.0
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		348
	total weight, LBS		1414
	total load, PSF		4.1
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	490	
		Fpmax	2287	
		Fpmin	429	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1414	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			204	
	vetical resisting load		.9*DL	0.9*Wp
			1273	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	490	[lbs]
	Seismic Vertical Design Force, Fv	204	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1575
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	546	
		Fpmax	2546	
		Fpmin	477	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1575	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			227	
	vetical resisting load		.9*DL	0.9*Wp
			1417	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	546	[lbs]
	Seismic Vertical Design Force, Fv	227	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
11	Modules + Deflectors	54.22	596
32	Ballast CMU Block	13.4	428.8
15	North Support	19.44	291.6
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		321
	total weight, LBS		1381
	total load, PSF		4.3
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	478	
		Fpmax	2232	
		Fpmin	419	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1381	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			199	
	vetical resisting load		.9*DL	0.9*Wp
			1243	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	478	[lbs]
	Seismic Vertical Design Force, Fv	199	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
31	Modules + Deflectors	54.22	1681
69	Ballast CMU Block	13.4	924.6
43	North Support	19.44	835.9
7	South Support	12.75	89.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		887
	total weight, LBS		3531
	total load, PSF		4.0
	total mech attach		2

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1223	
		Fpmax	5709	
		Fpmin	1070	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	3531	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			510	
	vetical resisting load		.9*DL	0.9*Wp
			3178	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	1223	[lbs]
	Seismic Vertical Design Force, Fv	510	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
33	Ballast CMU Block	13.4	442.2
19	North Support	19.44	369.4
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		404
	total weight, LBS		1634
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	566	
		Fpmax	2643	
		Fpmin	496	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1634	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			236	
	vetical resisting load		.9*DL	0.9*Wp
			1471	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	566	[lbs]
	Seismic Vertical Design Force, Fv	236	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
22	Ballast CMU Block	13.4	294.8
11	North Support	19.44	213.8
3	South Support	12.75	38.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		212
	total weight, LBS		926
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	321	
		Fpmax	1498	
		Fpmin	281	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	926	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			134	
	vetical resisting load		.9*DL	0.9*Wp
			834	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	**Design Forces**		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	321	[lbs]
	Seismic Vertical Design Force, Fv	134	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
17	Modules + Deflectors	54.22	922
37	Ballast CMU Block	13.4	495.8
22	North Support	19.44	427.7
7	South Support	12.75	89.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		488
	total weight, LBS		1934
	total load, PSF		4.0
	total mech attach		2

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp={(0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	670	
		Fpmax	3128	
		Fpmin	587	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1934	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			279	
	vetical resisting load		.9*DL	0.9*Wp
			1741	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	670	[lbs]
	Seismic Vertical Design Force, Fv	279	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
17	Modules + Deflectors	54.22	922
36	Ballast CMU Block	13.4	482.4
22	North Support	19.44	427.7
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		484
	total weight, LBS		1908
	total load, PSF		3.9
	total mech attach		2

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Eictrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	661	
		Fpmax	3086	
		Fpmin	579	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1908	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			276	
	vetical resisting load		.9*DL	0.9*Wp
			1717	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	661	[lbs]
	Seismic Vertical Design Force, Fv	276	[lbs]
	total roof attachments req for lateral	2	
	total roof attachments req for vertical	4	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1575
	total load, PSF		4.0
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	546	
		Fpmax	2546	
		Fpmin	477	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1575	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			227	
	vetical resisting load		.9*DL	0.9*Wp
			1417	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	546	[lbs]
	Seismic Vertical Design Force, Fv	227	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
10	Modules + Deflectors	54.22	542
31	Ballast CMU Block	13.4	415.4
14	North Support	19.44	272.2
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		296
	total weight, LBS		1294
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	448	
		Fpmax	2092	
		Fpmin	392	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1294	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			187	
	vetical resisting load		.9*DL	0.9*Wp
			1164	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	448	[lbs]
	Seismic Vertical Design Force, Fv	187	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
23	Ballast CMU Block	13.4	308.2
10	North Support	19.44	194.4
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		221
	total weight, LBS		933
	total load, PSF		4.2
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

4.4.4

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	323	
		Fpmax	1509	
		Fpmin	283	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	933	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			135	
	vetical resisting load		.9*DL	0.9*Wp
			840	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	323	[lbs]
	Seismic Vertical Design Force, Fv	135	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

4.66

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
17	North Support	19.44	330.5
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		372
	total weight, LBS		1501
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	520	
		Fpmax	2427	
		Fpmin	455	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1501	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			217	
	vetical resisting load		.9*DL	0.9*Wp
			1351	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	520	[lbs]
	Seismic Vertical Design Force, Fv	217	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
16	Modules + Deflectors	54.22	868
30	Ballast CMU Block	13.4	402.0
20	North Support	19.44	388.8
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		448
	total weight, LBS		1722
	total load, PSF		3.8
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	597	
		Fpmax	2785	
		Fpmin	522	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1722	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			249	
	vetical resisting load		.9*DL	0.9*Wp
			1550	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	597	[lbs]
	Seismic Vertical Design Force, Fv	249	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
26	Ballast CMU Block	13.4	348.4
15	North Support	19.44	291.6
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		340
	total weight, LBS		1354
	total load, PSF		4.0
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	469	
		Fpmax	2190	
		Fpmin	411	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1354	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			196	
	vetical resisting load		.9*DL	0.9*Wp
			1219	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	469	[lbs]
	Seismic Vertical Design Force, Fv	196	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
25	Ballast CMU Block	13.4	335.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1508
	total load, PSF		3.8
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	522	
		Fpmax	2438	
		Fpmin	457	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1508	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			218	
	vetical resisting load		.9*DL	0.9*Wp
			1357	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	522	[lbs]
	Seismic Vertical Design Force, Fv	218	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
26	Ballast CMU Block	13.4	348.4
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		398
	total weight, LBS		1521
	total load, PSF		3.8
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	Symbol	Value/Comment	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	Seismic Design Force			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	527	
		Fpmax	2460	
		Fpmin	461	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1521	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			220	
	vetical resisting load		.9*DL	0.9*Wp
			1369	
13.3.2	Seismic Relative Displacements			

13.4	Nonstructural Component Anchorage		Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered
13.4.1	Design Forces		The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	527	[lbs]
	Seismic Vertical Design Force, Fv	220	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
15	Modules + Deflectors	54.22	813
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		421
	total weight, LBS		1642
	total load, PSF		3.9
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	569	
		Fpmax	2655	
		Fpmin	498	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1642	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			237	
	vetical resisting load		.9*DL	0.9*Wp
			1478	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	569	[lbs]
	Seismic Vertical Design Force, Fv	237	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
13	Modules + Deflectors	54.22	705
30	Ballast CMU Block	13.4	402.0
16	North Support	19.44	311.0
6	South Support	12.75	76.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		370
	total weight, LBS		1494
	total load, PSF		4.0
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

4.80

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	
13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	Seismic Demands on Nonstructural Components			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	518	
		Fpmax	2417	
		Fpmin	453	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	1494	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			216	
	vetical resisting load		.9*DL	0.9*Wp
			1345	
13.3.2	**Seismic Relative Displacements**			

13.4	Nonstructural Component Anchorage		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional resistance. The component forces shall be those determined in section 13.3.1 except that modifications to Fp and Rp due to anchorage conditions need not be considered**
13.4.1	**Design Forces**		**The force shall be determined based on the prescribed forces and displacements for the component determined in sections 13.3.1 and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	518	[lbs]
	Seismic Vertical Design Force, Fv	216	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof attachments are required for the vertical forces.

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		397
	total weight, LBS		1575
	total load, PSF		4.0
	total mech attach		1

ASCE 7-05 Seismic Worksheet for Non-Structural Members

11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
30	Ballast CMU Block	13.4	402.0
16	North Support	19.44	311.0
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		347
	total weight, LBS		1427
	total load, PSF		4.1
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	7	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		210
	total weight, LBS		920
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	2	
		Fpmax	7	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	2	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
7	Modules + Deflectors	54.22	380
22	Ballast CMU Block	13.4	294.8
10	North Support	19.44	194.4
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		7%
	area, SQFT		209
	total weight, LBS		920
	total load, PSF		4.4
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	2	
		Fpmax	7	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	2	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
31	Ballast CMU Block	13.4	415.4
16	North Support	19.44	311.0
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		347
	total weight, LBS		1441
	total load, PSF		4.2
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	7	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	±	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
36	Modules + Deflectors	54.22	1952
51	Ballast CMU Block	13.4	683.4
40	North Support	19.44	777.6
11	South Support	12.75	140.3
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		2%
	area, SQFT		981
	total weight, LBS		3553
	total load, PSF		3.6
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			3	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
30	Ballast CMU Block	13.4	402.0
16	North Support	19.44	311.0
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		370
	total weight, LBS		1427
	total load, PSF		3.9
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			3	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
26	Ballast CMU Block	13.4	348.4
15	North Support	19.44	291.6
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		340
	total weight, LBS		1354
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

4.20

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
26	Ballast CMU Block	13.4	348.4
15	North Support	19.44	291.6
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		341
	total weight, LBS		1354
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
12	Modules + Deflectors	54.22	651
26	Ballast CMU Block	13.4	348.4
15	North Support	19.44	291.6
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		5%
	area, SQFT		341
	total weight, LBS		1354
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
10	Modules + Deflectors	54.22	542
26	Ballast CMU Block	13.4	348.4
14	North Support	19.44	272.2
4	South Support	12.75	51.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		6%
	area, SQFT		292
	total weight, LBS		1214
	total load, PSF		4.2
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	7	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
25	Modules + Deflectors	54.22	1356
42	Ballast CMU Block	13.4	562.8
29	North Support	19.44	563.8
8	South Support	12.75	102.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		3%
	area, SQFT		689
	total weight, LBS		2584
	total load, PSF		3.8
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

41.104

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			3	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
25	Modules + Deflectors	54.22	1356
42	Ballast CMU Block	13.4	562.8
29	North Support	19.44	563.8
8	South Support	12.75	102.0
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		3%
	area, SQFT		689
	total weight, LBS		2584
	total load, PSF		3.8
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			3	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
14	Modules + Deflectors	54.22	759
30	Ballast CMU Block	13.4	402.0
18	North Support	19.44	349.9
5	South Support	12.75	63.8
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		4%
	area, SQFT		397
	total weight, LBS		1575
	total load, PSF		4.0
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	6	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	4	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			1	
	vetical resisting load		.9*DL	0.9*Wp
			4	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**	
13.4.1	**Design Forces**		**and 13.3.2**	
	roof attach lateral strength	628	[lbs]	
	roof attach vertical strength	808	[lbs]	
	Seismic Lateral Design Force, Fp	1	[lbs]	
	Seismic Vertical Design Force, Fv	1	[lbs]	
	total roof attachments req for lateral	1		
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof	

Array Informations			
qty	item	weight	total
72	Modules + Deflectors	54.22	3904
62	Ballast CMU Block	13.4	830.8
80	North Support	19.44	1555.2
10	South Support	12.75	127.5
0	Middle Support	0	0.0
	% of Mechanical Attachments to Supports Ratio		1%
	area, SQFT		1917
	total weight, LBS		6417
	total load, PSF		3.3
	total mech attach		1

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11.4	Seismic Ground Motion Values			
	Description	**Symbol**	**Input Values**	**Sections/Figures / Comments**
	Zip Code	93405	1550 MADONNA RD, SAN LUIS OBISPO, CA	
11.4.1	**Mapped acceleration parameters**			If S1 is less than or equal to .04 and Ss less than or equal to 0.15 Then Seismic Design category A only applies
	mapped MCE spectral response, short periods	Ss	1.516	Figures 22-1 to 22-14
	mapped MCE spectral response, 1 second	S1	0.555	Figures 22-1 to 22-14
11.4.2	**Site Class**		D	A, B, C D, E or F. D is default if site soil properties unknown - See table table 20.3.1
11.4.3	**Site Coefficients and Adjusted "Maximum Considered Earthquake" MCE Spectral Response Acceleration Parameters**			
	Site coefficient, short period	Fa	1.000	table 11.4-1
	Site coefficient, 1 second	Fv	1.500	table 11.4-2
	mapped MCE spectral response at short period	Sms	1.516	Sec 11.4 , =Fa*Ss
	mapped MCE spectral response at 1 second period	Sm1	0.833	Sec 11.4 , Fv*S1
11.4.4	**Design Spectral Acceleration Parameters**		**Output Values**	
	Short Periods	SDs	1.011	11.4.3, 2/3*Sms
	1 second period	SD1	0.555	11.4.4, 2/3*Sm1

13.1	Seismic Design Requirements for Nonstructural components			
	Description	**Symbol**	**Value/Comment**	
13.1.2	Seismic Design Category	D	Same as parent structure is site soil conditions unknown	
13.1.3	Component Importance Factor	Ip	1.00	13.1.3 Does not meet conditions requiring a 1.5 importance factor
13.1.4	Exemptions		do not meet any exemptions	
13.1.5	Applicability of Nonstructural Component Requirements		the array is not considered a *nonbuilding structure* as it is not 25% of the building seismic weight	12.7.2 Definition of effective seismic weight W
13.1.6	Reference Documents			
13.1.7	Reference Documents using allowable Stress Design			

13.2	General Design Requirements			
	Description	**Symbol**	**Value/Comment**	
13.2.1	Applicable Requirements for architectural, Mechanical and Elctrical Components and Supports		Table 13.2-1 states that mechanical and electrical supports must meet sections: 13.2, 13.3,13.4,13.6	
13.2.2	Special Certification Requirements		N/A	

13.2.3	Consequential Damage		cannot cause failure of other essential architectural, electrical for mechanical components	
13.2.4	Flexibility		Flexibility as well as strength must be considered	
13.2.5	Testing Alternative		components tested to ICC-ES AC 156 are acceptable	
13.2.6	Use of Experience Data		An alternative to analytical seismic capacity is data	
13.2.7	Construction Documents		construction documents are to be prepared by a registered design professional where required be table 13.2-1	

13.3	**Seismic Demands on Nonstructural Components**			
13.3.1	**Seismic Design Force**			
		Fp	Fp=((0.4*ap*SDs*Wp)/(Rp/Ip))*(1+2z/h)/1.4	Fp values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
	[lbs]	Fph	1	
		Fpmax	5	
		Fpmin	1	
	spectral acceleration, short period [g]	SDS	1.011	
	component amplification factor (table13.6-1)	ap	1.00	
	Component Importance Factor	Ip	1.00	
	Operating Weight (total load of array) [lbs]	Wp	3	
	Response modification Factor (table 13.5-1 or 13.6-1)	Rp	2.50	1
	point of component attachment [ft]	z	25	Only ratio z/h is used, which is 1.0
	average roof height [ft]	h	25	Only ratio z/h is used, which is 1.0
	concurrent vertical load [lb]	fv	fv = (.2*SDs*Wp)/1.4	fv values shall be divided by a factor of 1.4 per Equation 16A-21 of 2007 CBC
			0	
	vetical resisting load		.9*DL	0.9*Wp
			3	
13.3.2	**Seismic Relative Displacements**			

13.4	**Nonstructural Component Anchorage**		**Components shall be bolted, welded or otherwise positively fastened without consideration for of frictional**
13.4.1	**Design Forces**		**and 13.3.2**
	roof attach lateral strength	628	[lbs]
	roof attach vertical strength	808	[lbs]
	Seismic Lateral Design Force, Fp	1	[lbs]
	Seismic Vertical Design Force, Fv	0	[lbs]
	total roof attachments req for lateral	1	
	total roof attachments req for vertical	1	60% of the vertical resisting load (0.6*Wp) is greater than the concurrent vertical load from the seismic forces. Therefore, no roof

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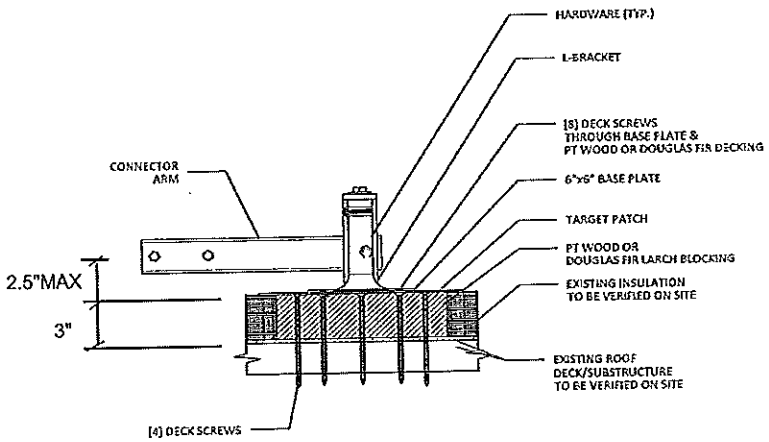
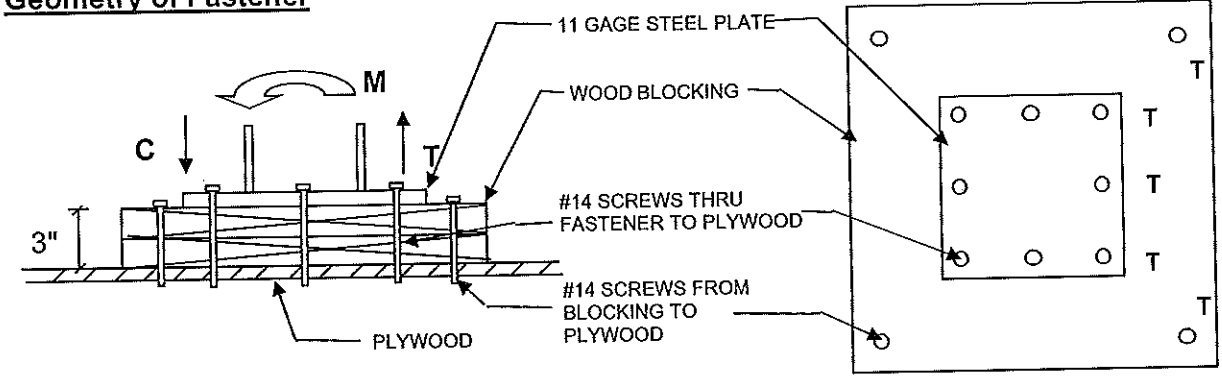
Capacity of Eco Fasten Attachment To Wood

Maximum of 3" Insulation with a Max 2.5" Connection

The Ecofasten Fastener plate is attached to plywood/OSB with 8#14 screws. The wood blocking is attached to the plywood/OSB with 4#14 screws. Therefore there is a total of 12 #14 screws attaching the fastener to the roof deck.



Geometry of Fastener



5 Screws in Tension
7 Screws in Shear

Allowable Screw Values

Allowable Screw Shear Values = $\frac{\text{Ultimate Shear } (C_D)(\text{Factor for Group})}{5}$ {Reference APA Fastener Loads for Plywood-Screws}

Allowable Screw Tension Values = Screw Capacity(C_D) {Reference APA Screw in Withdrawl - APA TT-051}

Note: The screw tension capacity is dependant on the specific gravity. Therefore, a SG=0.43 was assumed to obtain values from NDS Table 11.2B. The screw capcaity is also dependant on the penetration of the screw.

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Check Lateral Strength

Check Shear Loads:

$V_{allowable}$ = (7 Screws)(Allowable Screw Shear Value)

Check Pryout Loads:

$T_{allowable\ (fastener)}$ = (3 screws)(Allowable Screw Tension Value)

$T_{allowable\ (wood)}$ = (2 screws)(Allowable Screw Tension Value)

Allowable Moment = $T_{allowable\ (fastener)}$ x 6.5" + $T_{allowable\ (wood)}$ x 7.25"

$$\textbf{Allowable Lateral Load for Pryout} = \frac{\text{Allowable Moment}}{5.5"}$$

Table 1: Allowable Lateral Strength

Roof Material	Shear (lbs)	*Pryout (lbs)
1/2" Plywood/OSB	1169	628
5/8" Plywood/OSB	1232	785
3/4" Plywood/OSB	1246	942

Note: Pryout values will govern for lateral strength values. Therefore, lateral strength of the attachment is limited to the pryout values for each sheathing type.

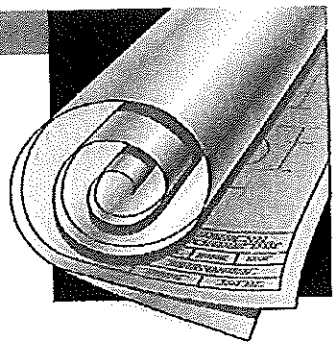
Check Vertical Strength

$T_{allowable}$ = (8 screws)(Allowable Screw Tension Value)

Table 2: Allowable Vertical Strength

Roof Material	Uplift (lbs)
1/2" Plywood/OSB	813
5/8" Plywood/OSB	1016
3/4" Plywood/OSB	1219

T E C H N I C A L N O T E



Fastener Loads for Plywood - Screws

Number E830C
December 1995

Introduction

The integrity of a structure is frequently dependent upon the connections between its component elements. For maximum strength and stability, each joint requires design which is adapted to the fastener type and to the strength properties of the individual structural members. Included in the following tables are ultimate withdrawal and lateral loads for plywood joints fastened with wood and sheet metal screws. These load values are based upon tests conducted by *APA – The Engineered Wood Association.*

Test Results

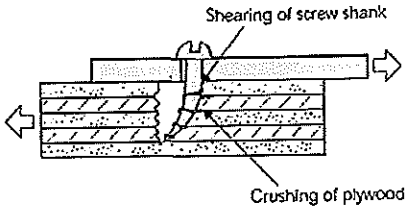
Plywood-and-Metal Connections
Self-drilling, self-tapping screws are commonly used to attach plywood up to 1-1/8 in. thick to steel flanges up to 3/16 in. thick. However, since threads are usually provided on only a portion of the fastener shank, it is important to specify the appropriate fastener length for a given plywood thickness. This precaution ensures that the threaded portion of the shank will engage in the steel framing. Several lengths and styles are available. Additional details for these types of screws may be obtained from specific fastener manufacturers. The following data apply to wood screws and sheet metal screws.

Lateral Resistance:
Performance of plywood-and-metal connections is dependent upon the strength properties of all three elements.

a) Plywood-critical joints are characterized by a shearing of the plywood veneers oriented parallel to the direction of the applied force. Veneer plugs, whose width equals the diameter of the screw shank, may shear loose and protrude at the loaded end.

b) Fastener-critical joints are characterized by a shear failure of the screw shank. As shown in Figure 1, once localized crushing of the wood has occurred, resistance to fastener-head embedment into the metal causes the screw to become a shear specimen and joint behavior is dependent upon the shear strength of the fastener. Shear failure of the screw shank occurs at the wood-metal interface.

FIGURE 1.
Failure of Laterally Loaded, Single-Shear Metal-to-Plywood Connection



c) The metal-critical joint may fail in one of two ways. Failure occurs when the resistance of the screw head to embedment is greater than the resistance of the metal to lateral and/or withdrawal load, and the screw tears away from the metal framing. Failure also occurs when thin metal in a metal-to-plywood joint crushes or tears away from the screw.

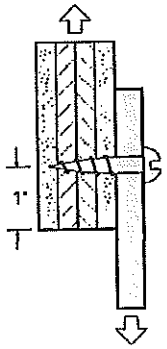
Tables 1 and 2 present ultimate lateral loads for wood- and sheet-metal-screw connections in plywood-and-metal joints. Loaded end distance in these tests was one inch. Plywood face grain was parallel to the load since this direction yields the lowest lateral loads when the joint is plywood-critical. All wood-screw specimens were tested with a 3/16-in.-thick steel side plate, and values should be modified if thinner steel is used.

TABLE 1.
Screws: Metal-to-Plywood Connections[a]

Depth of Threaded Penetration (in.)	Ultimate Lateral Load (lb)[b]					
	Wood Screws			Sheet Metal Screws		
	#8	#10	#12	#8	#10	#12
1/2	415	(500)	590	465	(565)	670
5/8	–	–	–	500	(600)	705
3/4	–	–	–	590	(655)	715

(a) Plywood was C-D grade with exterior glue (all plies Group 1), face grain parallel to load. Side plate was 3/16"-thick steel.
(b) Values in parentheses are estimates based on other tests.

ULTIMATE SCREW SHEAR VALUES.
↓
WITH APPLIED FACTORS
1/2" → 167 LBS
5/8" → 176 LBS
3/4" → 178 LBS



Wood Screw

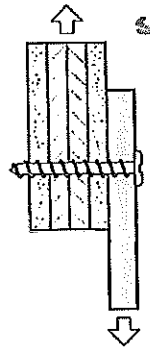
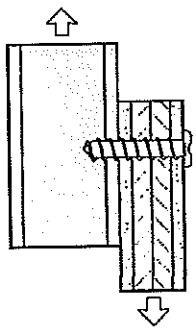

Sheet Metal Screw

TABLE 2.
Sheet Metal Screws: Plywood-to-Metal Connections[a]

Framing	Plywood Thickness (in.)	Ultimate Lateral Load (lb)[b]				
		Screw Size				1/4"-20 Self Tapping Screw
		#8	#10	#12	#14	
0.080" Aluminum	1/4	330	360	390	410	590
	1/2	630	850*	860	920	970
	3/4	910*	930*	1250	1330	1440
0.078" Galvanized Steel (14 gage)	1/4	360	380	400	410	650
	1/2	700*	890*	900	920	970
	3/4	700*	950*	1300*	1390*	1500

(a) Plywood was A-C EXT (all plies Group 1), face grain parallel to load.
(b) Loads denoted by an asterisk(*) were limited by screw-to-framing strength; others were limited by plywood strength.



Withdrawal:

Tables 3 and 4 present average ultimate withdrawal loads for wood and sheet metal screws in plywood-and-metal joints, based on analysis of test results. Wood screws have a tapered shank and are threaded for only 2/3 of their length. Sheet metal screws typically have higher ultimate load than wood screws in the smaller gages, because of their uniform shank diameter and full-length thread. The difference is not as apparent in the larger gages and lengths because the taper is not as significant.

Values shown in Table 3 for wood screws are based on 1/4-in. protrusion of the wood screw from the back of the panel. This was to assure measurable length of thread embedment in the wood, since the tip of the tapered wood screw may be smaller than the pilot hole. This was not a factor for sheet metal screws due to their uniform shanks.

Adjustment for Species Other Than Group 1:

All the ultimate loads presented in Tables 1 through 4 are based on plywood panels of all-Group 1 construction. For plywood panels of other species groups, the ultimate loads in these tables must be adjusted by

correction factors presented in Table 5. Correction factors apply for both lateral and withdrawal loading. The adjustment factor for the highest numbered species group present in any veneer should be used.

Fastening Into Plywood Panel Edges

Fastening into plywood panel edges is not normally recommended. For some purposes, however, edge fastening may be necessary. Table 6 presents ultimate lateral and withdrawal loads for various sizes of wood screws in this application.

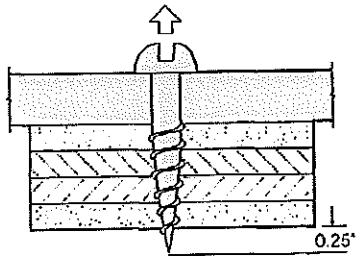
Estimating Allowable Design Loads

It is the responsibility of the designer to select a working load suitable for the particular application. A high degree of variability is inherent in individual fastener test results. Therefore, for screws in withdrawal, a working load of about one-sixth of the ultimate load has traditionally been used for long-duration loads. For normal load duration, the long-term working load may be increased by 10 percent. Normal load duration contemplates fully stressing the connection for approximately ten years, either continuously or cumulatively.

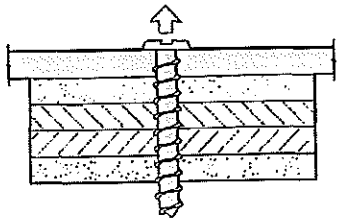
TABLE 3.
Wood and Sheet Metal Screws: Metal-to-Plywood Connections[a]

Depth of Threaded Penetration (in.)	Average Ultimate Withdrawal Load (lb)					
	Screw Size					
	#6	#8	#10	#12	#14	#16
3/8	150	180	205	–	–	–
1/2	200	240	275	315	350	–
5/8	250	295	345	390	440	–
3/4	300	355	415	470	525	–
1	–	–	–	625	700	775
1-1/8	–	–	–	705	790	875
2-1/4	–	–	–	–	1580	–

(a) Plywood was C-D grade with exterior glue (all plies Group 1).



Wood Screw

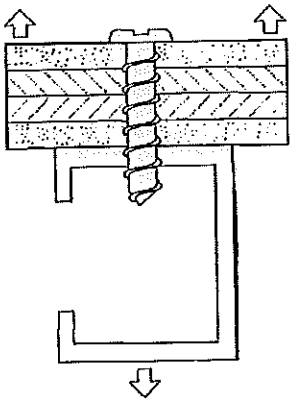


Sheet Metal Screw

TABLE 4.
Sheet Metal Screws: Plywood-to-Metal Connections[a]

Framing	Plywood Thickness (in.)	Ultimate Lateral Load (lb)[b]				
		Screw Size				1/4"-20 Self Tapping Screw
		#8	#10	#12	#14	
0.080" Aluminum	1/4	130	150	170	180	220
	1/2	350	470	500	520	500
	3/4	660	680	790	850*	790*
0.078" Galvanized Steel (14 gage)	1/4	130	150	170	180	220
	1/2	350	470	500	520	500
	3/4	660	680	800	900	850

(a) Plywood was A-C EXT (all plies Group 1).
(b) Loads denoted by an asterisk(*) were limited by screw-to-framing strength; others were limited by plywood strength.



For laterally loaded screws, a working load of normal duration may be approximated by dividing the tabulated ultimate load by 5 or 6. For practically all laterally loaded screw connections shown, the normal-duration working load will correspond to a joint slip of less than 0.01 inch.

Adjustments for shorter or longer duration of load apply to design values for mechanical fasteners where the strength of the wood (i.e., not the strength of the metal fastener) determines the load capacity. Adjustments of design values for varying durations of load and combinations of load should be in accordance with the current AF&PA National Design Specification for Wood Construction.

Assume.

TABLE 5.
Load Adjustment for Screws into Plywood for Species Groups Noted[a] [b]

Types of Loading	All-Group 1	All-Group 2	All-Group 3, 4, 5
Lateral	100%	78%	78%
Withdrawal	100%	60%	47%

(a) Adjustments based on the species groups for plywood shown in Voluntary Product Standard PS 1 and the equations in U.S. Agricultural Handbook No. 72.

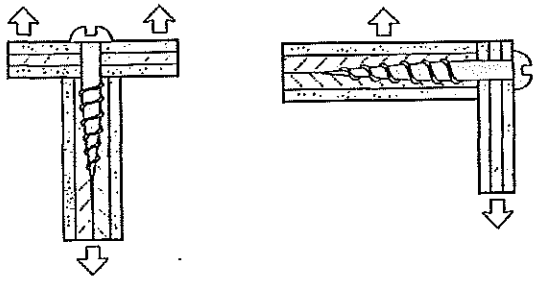
(b) Face, back, and core veneer must be of the same species group. When species group is unknown, assume all-Group 4.

TABLE 6.
Wood Screws: Plywood-to-Plywood Edge Connections[a]

Depth of Threaded Penetration (in.)	Ultimate Lateral Load (lb)[b]			Ultimate Withdrawal Load (lb)[b]		
	#8	#10	#12	#8	#10	#12
1	180	(185)	195	360	(405)	450
1-1/2	180	(185)	195	410	(455)	500

(a) Plywood receiving screw thread was 3/4"-thick C-D grade with exterior glue (Group 2 inner plies).

(b) Values in parentheses are estimates based on other tests.



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Form No. E830C
Revised December 1995/0100

APA Technical Topics
TT-051C JUNE 2011

Screw Withdrawal from the Face of APA-Trademarked Structural Panels

BACKGROUND

Withdrawal capacities of screws from wood products are dependent upon a number of variables including the type and diameter of the screw, the specific gravity of the wood component, the effective penetration of the *threaded portion* (approximately 2/3 of total screw length) of the screw, and moisture conditions. These variables are briefly discussed below:

- Various screw types have different combinations of thread pitch and profile, diameter, and material type. The capacity of the fastener is dependent on the combination of each of these factors. Of the various types available, recommendations in this Technical Topic are based on the result of testing No. 10, Type A sheet metal screws. The results given in the following table are applicable to only this type of screw.
- The capacity of a screw in solid lumber depends on the specific gravity[a] of the wood component into which it is driven. The equivalent specific gravity of engineered wood products, like plywood and OSB, for use with screws is based on test results.
- Fastener withdrawal capacities for wood products are usually provided on a "per inch of penetration of the threaded portion" basis. Tabulated values that are provided on such a basis must therefore be adjusted to reflect the depth of penetration of the thread portion of the screw in the wood component anchoring the screw.
- The values tabulated in this publication are based on the use of screws driven into dry panels (moisture content < 16%) and used under circumstances where the connection will remain dry in service. For any wet-use conditions (moisture content ≥ 16%), *before*, during or after installation, the capacity of the fastener must be multiplied by a 0.7 factor[b].

Another important consideration is the relative ease in over-torquing or overdriving the screws when using power tools. If the screw continues to turn (spin) after the head has contacted the panel surface, the threads will essentially drill a hole in the panel which may reduce the withdrawal capacity of the fastener significantly.

This Technical Topic addresses screw withdrawal in two ways. It first looks at the results of withdrawal testing of No. 10, Type A sheet metal screws in various wood structural panels, as shown in Table 1. Note that the values given are ultimate values. Traditionally, single-fastener design values are determined by dividing the average ultimate values by a factor of 5.0. *APA Technical Note, Fastener Loads for Plywood – Screws*, Form E830, contains information for screw withdrawal and lateral load on plywood-to-metal connections (www.apawood.org).

a. 2005 *National Design Specification (NDS) for Wood Construction*, Table 11.3.2A.
b. 2005 *National Design Specification (NDS) for Wood Construction*, Table 10.3.3.

TESTS RESULTS

A series of tests were conducted using 1-1/2-inch-long No. 10, Type A sheet metal screws (12 threads per inch, flat head, pointed tip, 0.190-inch nominal diameter) primarily on 23/32-inch-thick wood structural panels in compliance with ASTM D 1761. The withdrawal rate was 0.6 inch per minute. The tabulated average withdrawal values provide a basis for comparison among various panel types and wood species. Data shown in Table 1 cannot be generalized to determine the withdrawal capacity of screws from edges or their lateral load capacities.

TABLE 1. WITHDRAWAL VALUES OF NO. 10 TYPE A 1-1/2-INCH SHEET METAL SCREWS (12 THREADS PER INCH) FROM PANEL FACES NORMALIZED TO POUNDS PER INCH OF THREAD PENETRATION[a]

	Type of Panel				
	Wood Species in Plywood			Wood Species in OSB	
	Southern Pine	Douglas-fir	Mixed Species	Aspen	Southern Pine
Number of Tests	529	145	119	146	131
Average Ultimate Load (lbf/in.)	835	730	641	550	648
Design Load (lbf/in.)[b]	167	146	128	110	130
Equivalent Specific Gravity, G for Withdrawal	0.55	0.52	0.49	0.45	0.49
Recommended Equivalent Specific Gravity, G, for Withdrawal			0.45		

a. Ultimate values listed are based primarily of tests of 23/32-inch-thick wood structural panels.
b. Design values are based on average ultimate load divided by 5.0.

CALCULATED DESIGN CAPACITIES

The second method for determining design values is to use the mechanics-based method provided in the 2005 National Design Specification (NDS) for Wood Construction based on the equivalent specific gravity listed in Table 1. Adjustments for moisture content or duration of load shall be permitted to be applied as appropriate.

When calculating the design withdrawal capacity for screws, NDS Equation 11.2.2 was adapted to take into account penetration into the panel as follows:

$$W = 2{,}850 \times G^2 \times D \times L,$$ → TABLE 11.2B OF NDS.

where:

W = reference withdrawal design value (lbf)
G = the equivalent specific gravity of the wood receiving member. (See Table 1)
D = nominal screw diameter (in.)
L = length of thread penetration into the panel (in.)

Common adjustment values for screw withdrawal are:

C_D – Duration of load (NDS 10.3.2)

Permanent duration	0.90
Normal duration	1.00
Two month duration	1.15
Seven days duration	1.25
Ten minutes duration	1.60 ← C_D

C_M – Wet Service Factor (NDS 10.3.3)
Wood Structural Panel moisture content before, during or after construction ≥ 16% (note[6], page 1) 0.70

The following design example is for calculating the allowable withdrawal design value of screws from the face of OSB panels.

Example:

Calculate the withdrawal capacity of a 1-inch-long No. 12 wood screw (0.216 inch in diameter) through a 1/8-inch-thick steel bracket into 23/32-inch-thick OSB. The screws will be driven into dry panels and will be used in dry service conditions. The application is for normal duration of load.

The threaded portion of the screw is 2/3 x 1 = 0.67 inch. The unthreaded portion is 1 – 0.67 = 0.33 inch. The length of unthreaded screw imbedded in the panel is 0.33 – 0.125 = 0.205 inch. The screw fully penetrates the 23/32-inch panel. The threaded portion in the panel is 0.7188 – 0.205 = 0.51 inch. G = 0.45. The design withdrawal capacity is:

$$W = 2{,}850 \times 0.45^2 \times 0.216 \times 0.51 = 64 \text{ pounds/per screw}$$

Adjustment for duration of load and moisture conditions:

$$64 \times 1.00 \times 1.00 = 64 \text{ pounds per screw}$$

Designers are cautioned about over-torquing screws in wood products. Good construction practice should minimize the potential for over-torquing. Over-torquing will reduce screw withdrawal capacity, regardless of the construction materials involved.

11.2.2 Wood Screws

11.2.2.1 The reference withdrawal design value, in lb/in. of penetration, for a single wood screw (cut thread or rolled thread) inserted in side grain, with the wood screw axis perpendicular to the wood fibers, shall be determined from Table 11.2B or Equation 11.2-2, within the range of specific gravities and screw diameters given in Table 11.2B. Reference withdrawal design values, W, shall be multiplied by all applicable adjustment factors (see Table 10.3.1) to obtain adjusted withdrawal design values, W'.

$$W = 2850\,G^2D \qquad (11.2\text{-}2)$$

11.2.2.2 Wood screws shall not be loaded in withdrawal from end grain of wood.

11.2.2.3 When wood screws are loaded in withdrawal, the adjusted tensile strength of the wood screw at net (root) section shall not be exceeded (see 10.2.3).

11.2.3 Nails and Spikes

11.2.3.1 The reference withdrawal design value, in lb/in. of penetration, for a single nail or spike driven in the side grain of the main member, with the nail or spike axis perpendicular to the wood fibers, shall be determined from Table 11.2C or Equation 11.2-3, within the range of specific gravities and nail or spike diameters given in Table 11.2C. Reference withdrawal design values, W, shall be multiplied by all applicable adjustment factors (see Table 10.3.1) to obtain adjusted withdrawal design values, W'.

$$W = 1380\,G^{5/2}D \qquad (11.2\text{-}3)$$

11.2.3.2 Nails and spikes shall not be loaded in withdrawal from end grain of wood.

11.2.4 Drift Bolts and Drift Pins

Drift bolt and drift pin connections loaded in withdrawal shall be designed in accordance with principles of engineering mechanics.

Table 11.2B Cut Thread or Rolled Thread Wood Screw Reference Withdrawal Design Values (W)[1]

Tabulated withdrawal design values (W) are in pounds per inch of thread penetration into side grain of main member. Thread length is approximately 2/3 the total wood screw length (see Appendix L).

Specific Gravity, G	Wood Screw Number										
	6	7	8	9	10	12	14	16	18	20	24
0.73	209	229	249	268	288	327	367	406	446	485	564
0.71	198	216	235	254	272	310	347	384	421	459	533
0.68	181	199	216	233	250	284	318	352	387	421	489
0.67	176	193	209	226	243	276	309	342	375	409	475
0.58	132	144	157	169	182	207	232	256	281	306	356
0.55	119	130	141	152	163	186	208	231	253	275	320
0.51	102	112	121	131	141	160	179	198	217	237	275
0.50	98	107	117	126	135	154	172	191	209	228	264
0.49	94	103	112	121	130	147	165	183	201	219	254
0.47	87	95	103	111	119	136	152	168	185	201	234
0.46	83	91	99	107	114	130	146	161	177	193	224
0.44	76	83	90	97	105	119	133	148	162	176	205
0.43	73	79	86	93	100	114	127	141	155	168	196
0.42	69	76	82	89	95	108	121	134	147	161	187
0.41	66	72	78	85	91	103	116	128	141	153	178
0.40	63	69	75	81	86	98	110	122	134	146	169
0.39	60	65	71	77	82	93	105	116	127	138	161
0.38	57	62	67	73	78	89	99	110	121	131	153
0.37	54	59	64	69	74	84	94	104	114	125	145
0.36	51	56	60	65	70	80	89	99	108	118	137
0.35	48	53	57	62	66	75	84	93	102	111	130
0.31	38	41	45	48	52	59	66	73	80	87	102

1. Tabulated withdrawal design values (W) for wood screw connections shall be multiplied by all applicable adjustment factors (see Table 10.3.1).