

April 30, 2021

To: ReVision Energy  
7 Commercial Drive  
Brentwood, NH 03833

Subject: Structural Certification for Installation of Solar Panels  
Clavier Residence  
10 Old Stage Coach Road  
Plainfield, NH. 03781

To Whom It May Concern,

A design check for the subject residence was done on the existing roofing and framing systems for the installation of solar panels over the roof. From a field inspection of the property, the existing roof support structures were observed by the client's auditors as follows:

The roof structure of (MP1) consists of metal roofing on roof plywood that is supported by nominal 2x10 rafters @ 16"o.c., paired with nominal 2x10 ceiling joists @ 16"o.c.. The total horizontal span of the roof is 24'-0", with a load bearing wall that separates the attic level and the second floor. Therefore, the rafters have a max projected horizontal span of 12'-0", with a slope of 35 degrees. The rafters are connected at the ridge to a continuous 2x12 ridge board and are supported at the eave by a load bearing wall. There are 2x6 collar ties @ 16"o.c. for structural stability, and as the ceiling joists of the attic.

The existing roof framing system of (MP1) is judged to be adequate to withstand the loading imposed by the installation of the solar panels. No reinforcement is necessary.

The spacing of the solar standoffs should be kept at 48" o.c. with a staggered pattern to ensure proper distribution of loads.

I further certify that all applicable loads required by the codes and design criteria listed below were applied to the Ironridge solar rail system and analyzed by the manufacturer. Furthermore, the installation crews have been thoroughly trained to install the solar panels based on the specific roof installation instructions developed by Ironridge for the racking system and S-5! for the roof connections. Finally, I accept the certifications indicated by the solar panel manufacturer for the ability of the panels to withstand high wind and snow loads.

Design Criteria:

- Applicable Codes = 2015 IBC/IRC, ASCE 7-10, and 2015 NDS
- Roof Dead Load = 9.4 psf (MP1)
- Roof Live Load = 20 psf
- Wind Speed = 115 mph, Exposure C
- Ground Snow Load = 90 psf - Roof Snow Load = 69.3 psf

Please contact me with any further questions or concerns regarding this project.

Sincerely,

Elaine Huang, P.E.  
Project Engineer



## Wind Calculations

### Per ASCE 7-10 Components and Cladding

#### Input Variables

Wind Speed	115 mph
Exposure Category	C
Roof Shape	Gable/Hip
Roof Slope	35 degrees
Mean Roof Height	20 ft
Building Least Width	40 ft
Effective Wind Area	17.5 ft

#### Design Wind Pressure Calculations

**Wind Pressure  $P = qh^*(G^*Cp)$**

$qh = 0.00256 * Kz * Kzt * Kd * V^2 * I$  (Eq. 30.3-1)

$Kz$  (Exposure Coefficient) = 0.9 (Table 30.3-1)

$Kzt$  (topographic factor) = 1 (Fig. 26.8-1)

$Kd$  (Wind Directionality Factor) = 0.85 (Table 26.6-1)

$V$  (Design Wind Speed) = 115 mph

$I$  Importance Factor = 1 (Table 1.5-1)

$qh = 25.90$

#### Standoff Uplift Calculations

	Zone 1	Zone 2	Zone 3	Positive	
$GCp =$	-0.90	-1.10	-1.10	0.85	(Fig. 6-11)
Uplift Pressure =	-23.31 psf	-28.49 psf	-28.49 psf	22.0 psf	
X Standoff Spacing =	4.00	4.00	4.00		
Y Standoff Spacing =	2.75	2.75	2.75		
Tributary Area =	11.00	11.00	11.00		
<b>Footing Uplift =</b>	<b>-256 lb</b>	<b>-313 lb</b>	<b>-313 lb</b>		

#### Standoff Uplift Check

Maximum Design Uplift = -313 lb

Standoff Uplift Capacity = 400 lb

400 lb capacity > 313 lb demand Therefore, OK

#### Fastener Uplift Capacity Check

Fastener = -- #14 roofing screws

Number of Fasteners = 4

Embedment Depth = 1

Pullout Capacity Per Inch = 150 lb (NDS Eq 12.2-1)

Fastener Capacity = 600 lb (NDS Eq 11.3-1)

w/ F.S. of 1.0 = 600 lb

600 lb capacity > 313 lb demand Therefore, OK

#### Fastener Shear Capacity Check

Embedment Depth Reduction Factor 1

Lateral Force From Gravity Loads 273

Attachment Lateral Capacity 288 (NDS Table 12K)

288 lb capacity > 274 lb demand Therefore, OK

# / Single Phase Inverter with HD-Wave Technology for North America

SE3000H-US / SE3800H-US / SE5000H-US / SE6000H-US/  
SE7600H-US / SE10000H-US / SE11400H-US

Model Number	SE3000H-US	SE3800H-US	SE5000H-US	SE6000H-US	SE7600H-US	SE10000H-US	SE11400H-US	
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXXXH-XXXXXBXX4							
<b>OUTPUT</b>								
Rated AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
Maximum AC Power Output	3000	3800 @ 240V 3300 @ 208V	5000	6000 @ 240V 5000 @ 208V	7600	10000	11400 @ 240V 10000 @ 208V	VA
AC Output Voltage Min -Nom -Max. (211 - 240 - 264)	✓	✓	✓	✓	✓	✓	✓	Vac
AC Output Voltage Min -Nom -Max. (163 - 208 - 229)	-	✓	-	✓	-	-	✓	Vac
AC Frequency (Nominal)	59.3 - 60 - 60.5							Hz
Maximum Continuous Output Current @240V	12.5	16	21	25	32	42	47.5	A
Maximum Continuous Output Current @208V	-	16	-	24	-	-	48.5	A
Power Factor	1, adjustable -0.85 to 0.85							
GFDI Threshold	1							A
Utility Monitoring, Islanding Protection, Country Configurable Thresholds	Yes							
<b>INPUT</b>								
Maximum DC Power @240V	4650	5900	7750	9300	11800	15500	17650	W
Maximum DC Power @208V	-	5100	-	7750	-	-	15500	W
Transformer-less, Ungrounded	Yes							
Maximum Input Voltage	480							Vdc
Nominal DC Input Voltage	380				400			Vdc
Maximum Input Current @240V <sup>1</sup>	8.5	10.5	13.5	16.5	20	27	30.5	Adc
Maximum Input Current @208V <sup>2</sup>	-	9	-	13.5	-	-	27	Adc
Max. Input Short Circuit Current	45							Adc
Reverse-Polarity Protection	Yes							
Ground-Fault Isolation Detection	600k $\Omega$ Sensitivity							
Maximum Inverter Efficiency	99	99.2						%
CEC Weighted Efficiency	99						99 @ 240V 96.5 @ 208V	%
Nighttime Power Consumption	< 2.5							W

<sup>1</sup> For other regional settings please contact SolarEdge support  
<sup>2</sup> A higher current source may be used; the inverter will limit its input current to the values stated

## PROJECT SUMMARY:

THE PROJECT SCOPE INCLUDES THE DESIGN SPECIFICATION, PROCUREMENT, INSTALLATION AND COMMISSIONING OF A COMPLETE, TURN-KEY, GRID-TIED PHOTOVOLTAIC ELECTRIC SYSTEM.

MODULE TYPE	(42) REC370AA BLK
INVERTER	(2) SE6000H-US
OPTIMIZER	(42) SOLAREEDGE P370
ARRAY PITCH	35°
ARRAY AZIMUTH	270°
RACKING	BLACK IRONRIDGE XR100 ALUMINUM RAIL
ATTACHMENT	S-51 SOLARFOOT WITH ALUMINUM L-FOOT

## DESIGN CRITERIA:

OCCUPANCY	RESIDENTIAL
DESIGN WIND LOAD	115 MPH
RISK CATEGORY	I
GROUND SNOW LOAD	90 PSF
EXPOSURE CATEGORY	C
ROOF HEIGHT	20' ABOVE GRADE TO EAVES
ROOF COMPOSITION	STANDING SEAM
RAFTER	2"x10" TRUE
RAFTER SPACING	16" O.C.

## EQUIPMENT LOCATIONS:

INTERIOR:  
 MAIN LOAD CENTER  
 PV AC COMBINER PANEL  
 (2) SOLAR INVERTERS  
 PV AC DISCONNECT

EXTERIOR:  
 UTILITY NET METER  
 PV RAPID SHUTDOWN DISCONNECT (RSID)



**REVISION  
ENERGY**

78 MAIN STREET  
 ENFIELD, NH 03748  
 (603)-632-1263

CLIENT:

ODILE CLAVIER  
 10 OLD STAGE COACH RD  
 PLAINFIELD NH, 03781

SYSTEM TYPE:

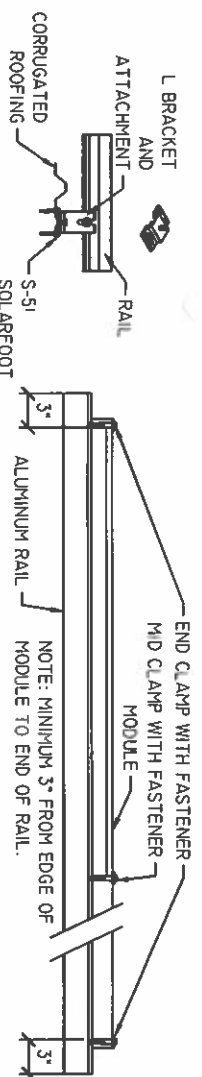
15.54KW DC GRID TIED SOLAR  
 PHOTOVOLTAIC SYSTEM

FOR CONSTRUCTION

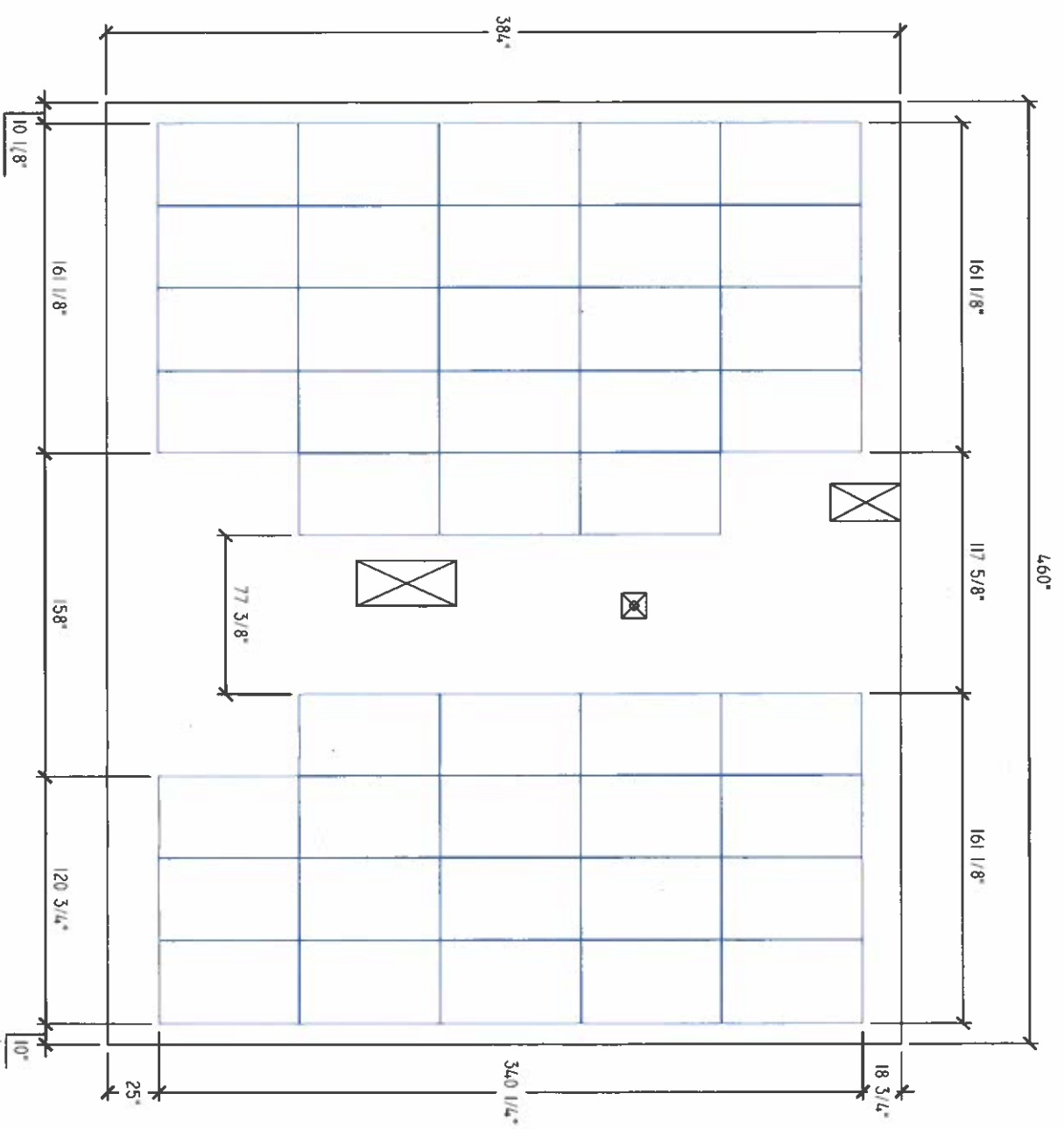
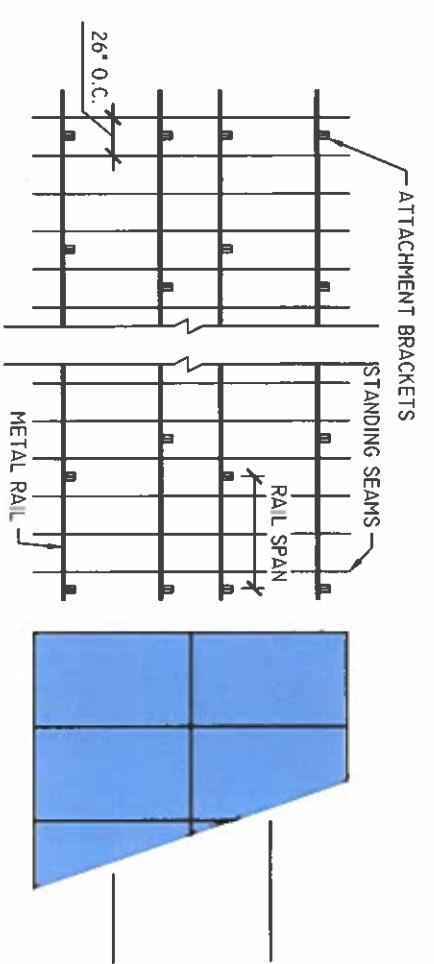
DESIGNED BY: MCF  
 REVISION: 0  
 PRINT SIZE: 11" x 17"  
 DATE: 4/29/2021  
 DWG TITLE: SITE PLAN  
 DWG NUMBER: A001

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- ATTACHMENT NOTES:
1. MAXIMUM RAIL LENGTH IS 100' BEFORE EXPANSION GAP IS REQUIRED.
  2. MAXIMUM RAIL SPAN IS TYPICALLY 4'. THIS DISTANCE WILL VARY BASED ON ROOF SLOPE, SNOW LOAD, WIND SPEED, AND EXPOSURE CATEGORY.
  3. MAXIMUM RAIL CANTILEVER DISTANCE IS 0.40 X RAIL SPAN.
  4. SEAL ALL ATTACHMENT POINTS WITH GEOCELL. SEALS SHALL BE WATERTIGHT BETWEEN THE ATTACHMENT BRACKETS, ROOF MATERIAL AND STRUCTURAL MEMBERS.
  5. ROOF ATTACHMENTS SHALL BE STAGGERED FOR EVEN DISTRIBUTION OF LOAD ON ROOF RAFTERS.
  6. CLEARANCE BETWEEN THE ROOF AND THE BOTTOM OF THE RAIL SHALL BE A MINIMUM OF 2".



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PLAINFIELD NH, 03781

SYSTEM TYPE:

15.54KW DC GRID TIED SOLAR  
PHOTOVOLTAIC SYSTEM

**FOR CONSTRUCTION**

DESIGNED BY:	MCF
REVISION:	0
PRINT SIZE:	11" X 17"
DATE:	4/29/2021
DWG TITLE:	MODULE LAYOUT
DWG NUMBER:	A002

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MODULE SPECIFICATIONS		
REC310AA BLK QTY 42		
STC RATING	370	W
VMP	37.4	V
IHP	9.5	A
VOC	44	V
ISC	10.19	A
TEMP COEFF. VOC	-0.24	%/°C

MODULE-LEVEL DC OPTIMIZER SPECIFICATIONS		
SOLAREGE P370 QTY 42		
NOMINAL DC RATING (WATTS)	370	W
MAX OUTPUT CURRENT 10C	15	A

GRID TIED INVERTER SPECIFICATIONS		
SE6000H-US QTY 2		
NOMINAL AC RATING	6000	W
NOMINAL VAC	240	V
MAX IAC	25	A
CEC EFFICIENCY	99.00%	%

STICKER CALCULATIONS		
MAXIMUM DC VOLTAGE		480V
MAXIMUM CIRCUIT CURRENT		15A
RATED AC OUTPUT CURRENT		50A
NOMINAL OPERATING AC VOLTAGE		240V

- DESIGN NOTES:**
1. ALL CONDUCTORS SHALL BE COPPER UNLESS NOTED OTHERWISE.
  2. SYSTEM VOLTAGE DROP SHALL NOT EXCEED 5%.
  3. LOWEST EXPECTED AMBIENT TEMPERATURE IS BASED ON ASHRAE EXTREME MIN FOR THE SPECIFIED LOCATION.
  4. ASHRAE 2% AVG. FOR THE SPECIFIED LOCATION.

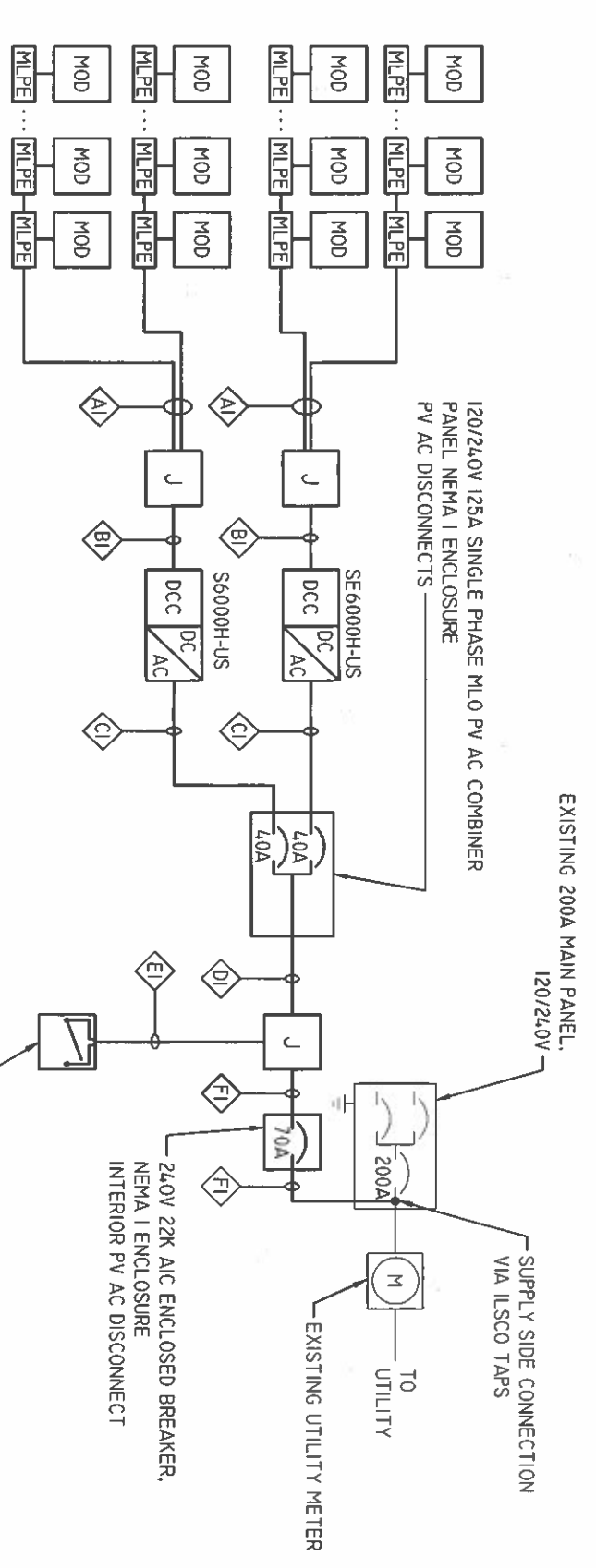
- LINE TYPES:**
- - - DEMOLITION
  - EXISTING
  - NEW

WIRING SCHEDULE						
TAG	FROM / TO	CONDUCTORS	WIRE TYPE	LENGTH (FT)	AS BUILT LENGTH (FT)	VOLTAGE DROP
AI	PV ARRAY / JUNCTION BOX (TYPICAL OF 2)	L-(4) #10 G-(1) #6	PV WIRE 1000V CU	20		0.19%
BI	JUNCTION BOX / INVERTER (TYPICAL OF 2)	L-(4) #10 G-(1) #10	THWN-2 600V CU	50		0.47%
CI	INVERTER / PV AC COMBINER PANEL (TYPICAL OF 2)	L-(2) #8 N-(1) #10 G-(1) #10	THWN-2 600V CU	20		0.33%
DI	PV AC COMBINER PANEL / JUNCTION BOX	L-(2) #4 N-(1) #8 G-(1) #8	THWN-2 600V CU	20		0.26%
EI	JUNCTION BOX / EXTERIOR PV AC DISCONNECT	L-(4) #4 G-(1) #8	THWN-2 600V CU	10		0.13%
FI	JUNCTION BOX / INTERCONNECTION	L-(2) #4 N-(1) #8 G-(1) #8	THWN-2 600V CU	10		0.13%

MONITORING \_\_\_\_\_ HOME ROUTER \_\_\_\_\_

**SYMBOLS:**

- MOD PV MODULE
- M/PE MODULE LEVEL POWER ELECTRONIC / OPTIMIZER
- DCC DC COMBINER AND DC DISCONNECT
- DC/AC PV DC TO AC INVERTER
- FUSED DISCONNECT SWITCH
- NON-FUSED DISCONNECT SWITCH
- ENCLOSED CIRCUIT BREAKER
- POWER METER



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PHOTOVOLTAIC SYSTEM

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DESIGNED BY: MCF  
REVISION: 0  
PRINT SIZE: 11" x 17"  
DATE: 4/29/2021

DWG TITLE: ONE LINE AND EQUIPMENT SPECIFICATIONS  
DWG NUMBER: E001

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