Commissioner's Roundtable: Solar Forum

January 26, 2011

Agenda

- **DOB Revisions**

  FY11 Plan Review: February 7, 2011 – April 1, 2011

  FY12 Filing Process: Beginning April 4, 2011

- **DOB Electrical Inspection**

- **DOB Plan Review**

  Case Studies

  DCP: Zoning Requirements

  FDNY: Roof Access

  Construction Documents Checklist

Tax Abatement Participation

- **FY09**

  Applications to DOB: 5

  Applications to DOF: 5

- **FY10**

  Applications to DOB: 36

  Applications to DOF: 25

- **FYTD11**

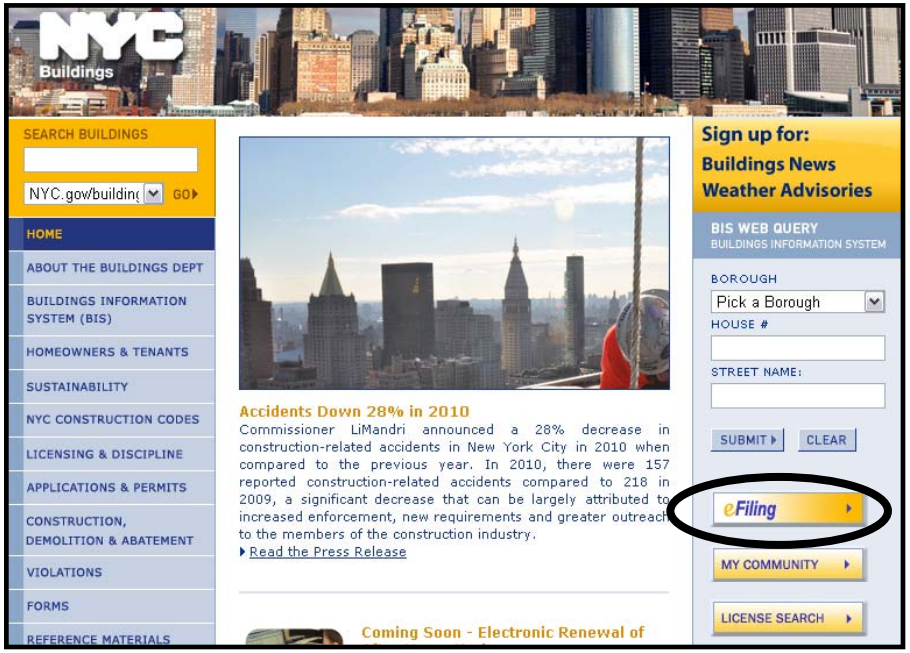
  Applications to DOB: 62

  Applications to DOF: 21

Filing Process Improvements

- **Application Requirements**

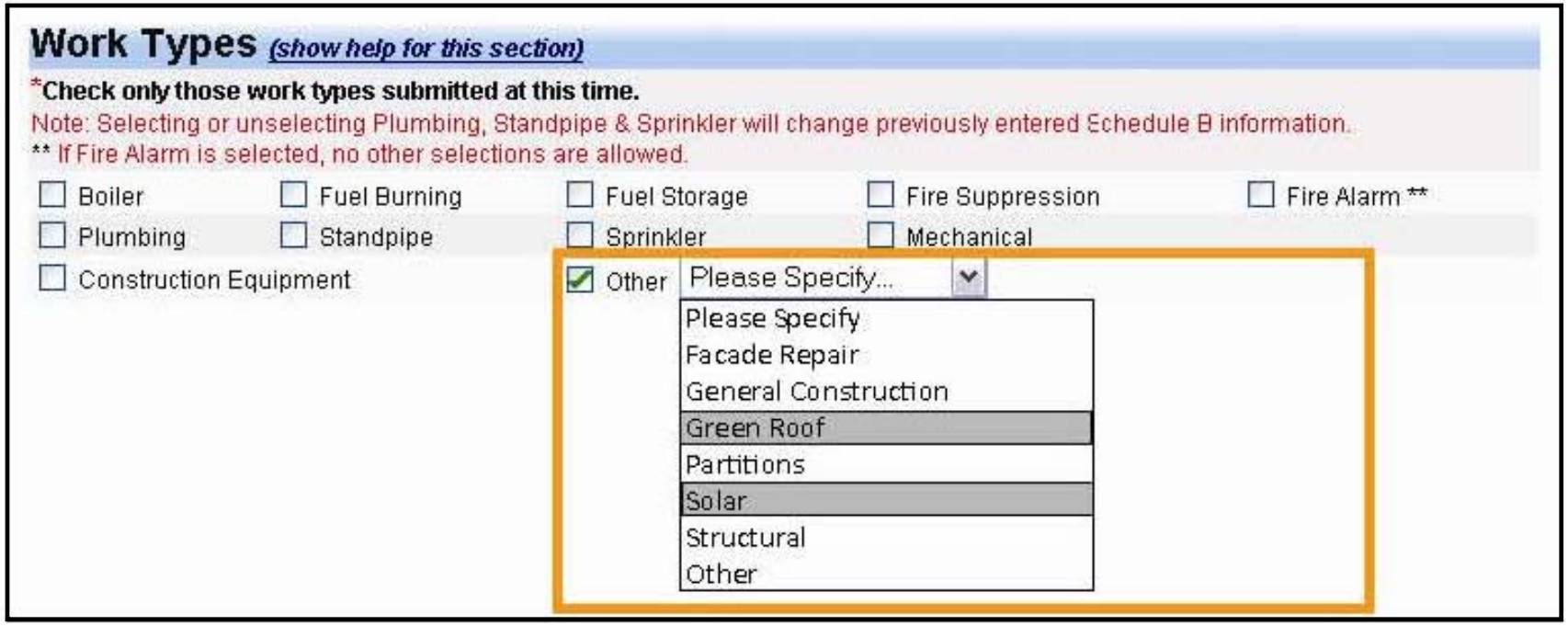
  eFiling; Self-Cert of Objections, D14, Alteration Type 2 or 3



Filing Process Improvements

- **Construction Application Identification**

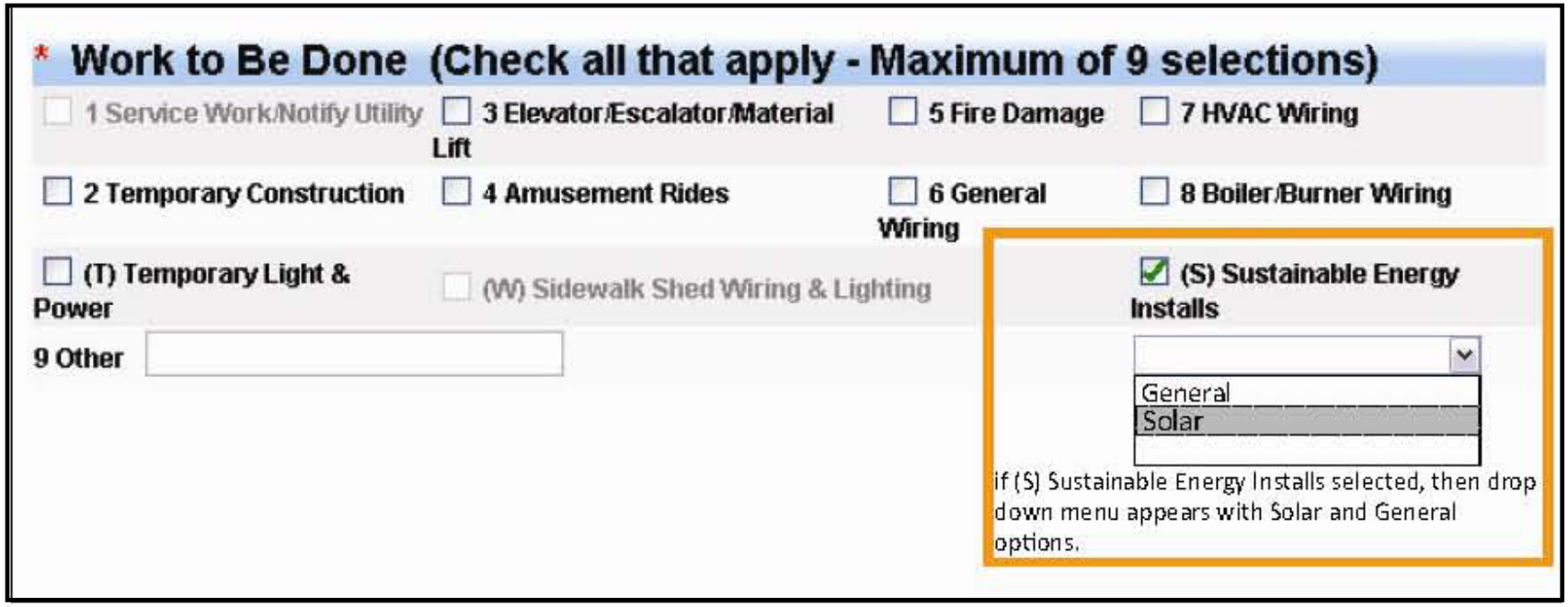
  Specify ‘Other’ work type; ‘Solar’ in pull-down



Filing Process Improvements

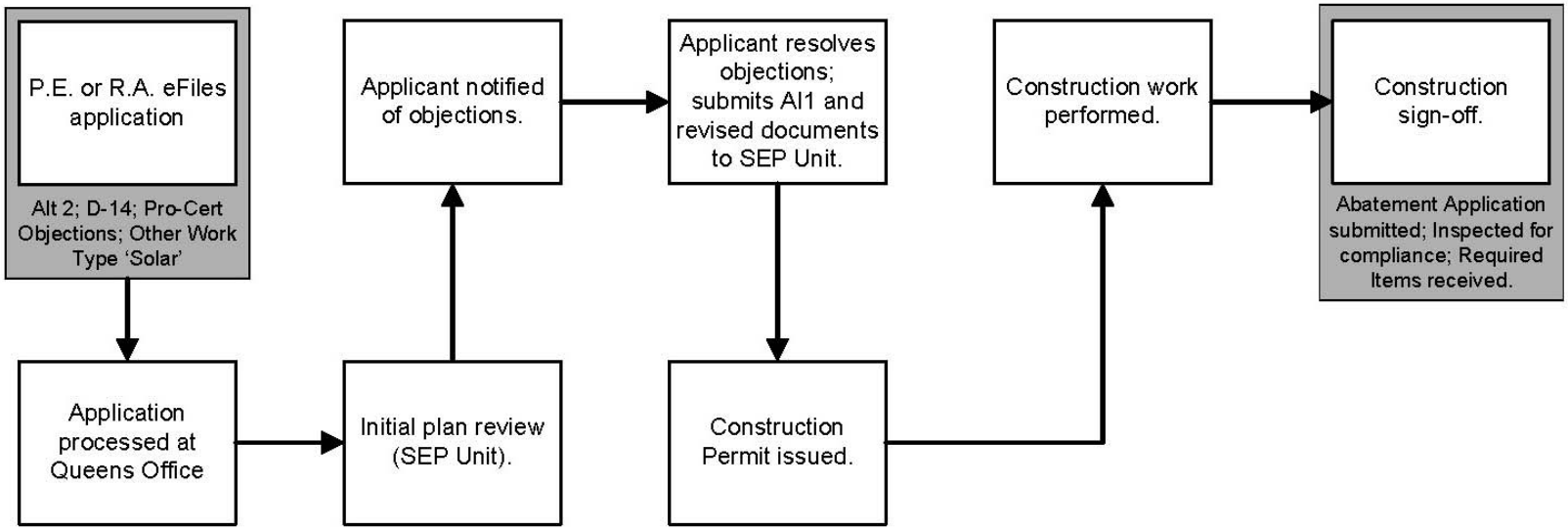
- **Electrical Application Identification**

  Specify ‘(S) Sustainable Energy Installs’; ‘Solar’ in pull-down



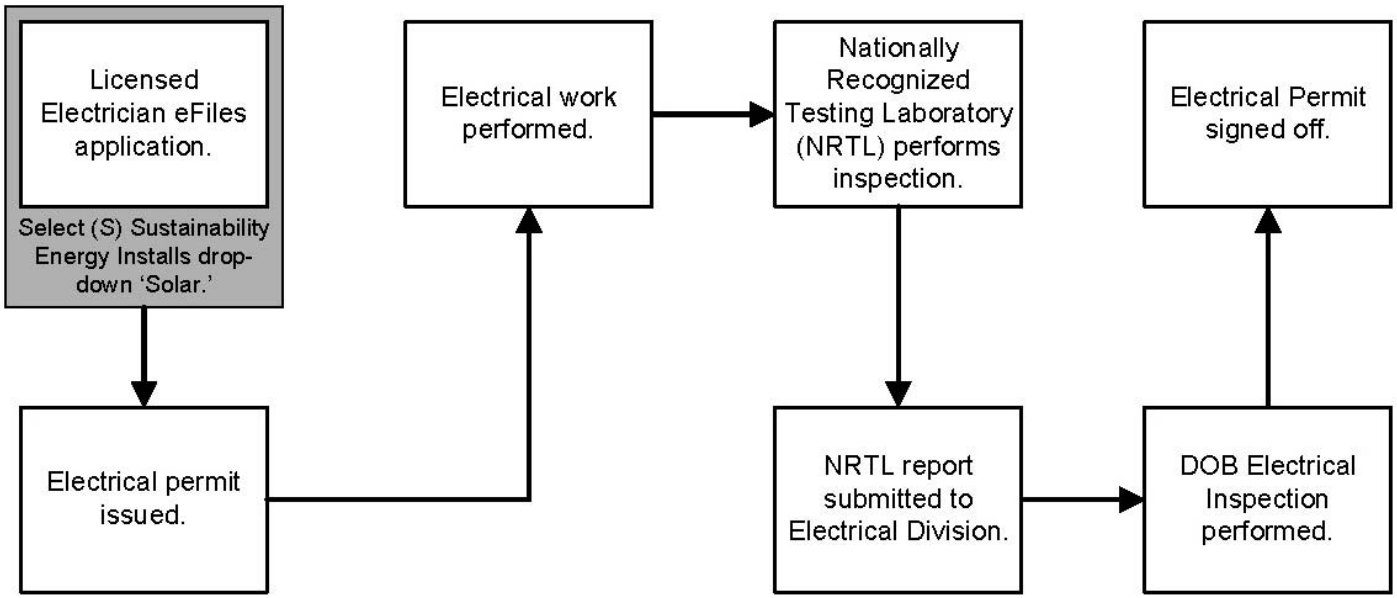
Filing Process Improvements

- **Construction Application Process**



Filing Process Improvements

- **Electrical Application Process**



Electrical Inspections

- **Requirements**
  - Third Party NRTL Inspection and Report
  - DOB Inspection

- **Issues**
  - Limited NYC testing laboratories
  - Inspection date backlog

Electrical Inspections

- **Interim Solution**

  Prioritized Inspections

  To accommodate applicants seeking abatement for FY2011, DOB Electrical Inspections for solar installs to be scheduled within two weeks of department notification.

  End date: March 4, 2011

- **Proposed Solution(s)**

  Minimize electrical inspections

  Centralized inspections

Plan Review

- **Forms**

  PW1: Plan/Work Approval Application

  PW3: Cost Affidavit

  PTA4: Property Tax Abatement Application for Solar

  TR1: Technical Report: Statement of Responsibility

- **Documents**

  Electrical Sign-Off

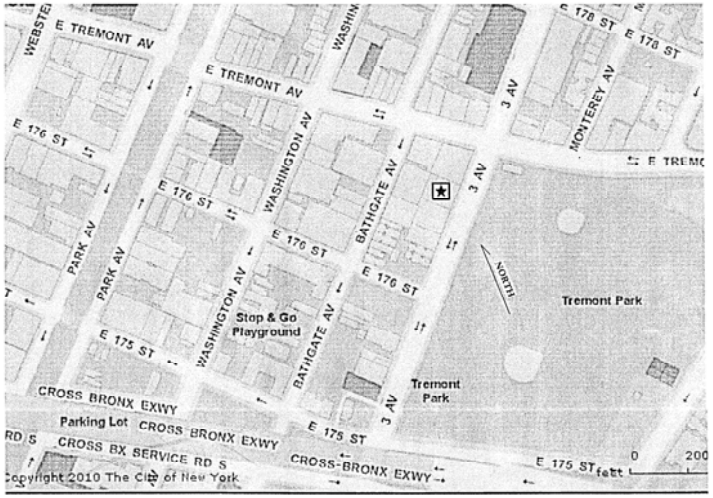
  Utility Company Acknowledgement

  Third Party Signoff Report (NRTL Inspection Verification)

Plan Review

- **Drawings/Diagrams**
  - Site Plan
  - Lot Diagram
  - Zoning height and setback elevation(s)/section(s)
  - Roof Plan/Access Plan
  - Structural Plan, Detail(s), Analysis
  - Electrical Design Drawing(s)

Case Study: Site Plan/Location Plan



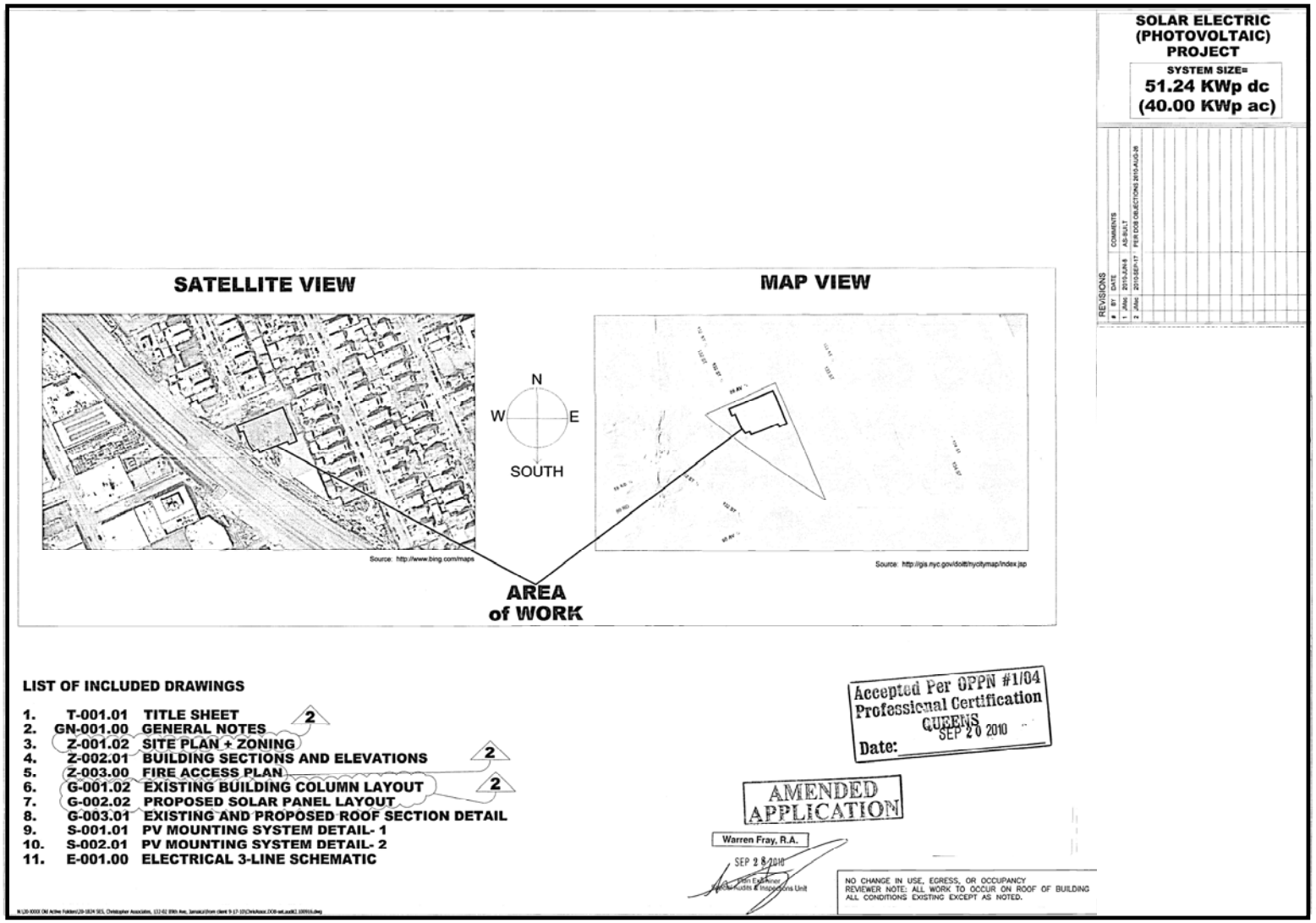
DRAWING INDEX

T-001	TITLE SHEET
Z-001	ZONING
G-001	ROOF PLAN & BUILDING SECTIONS
G-002	FRONTAGE ELEVATION + PARTIAL FLOOR PLAN + NOTES
S-001	STRUCTURAL COMPUTATIONS & EQUIPMENT DETAILS
E001	3 LINE ELECTRICAL SCHEMATIC
E002	ELECTRICAL EQUIPMENT SPECIFICATIONS

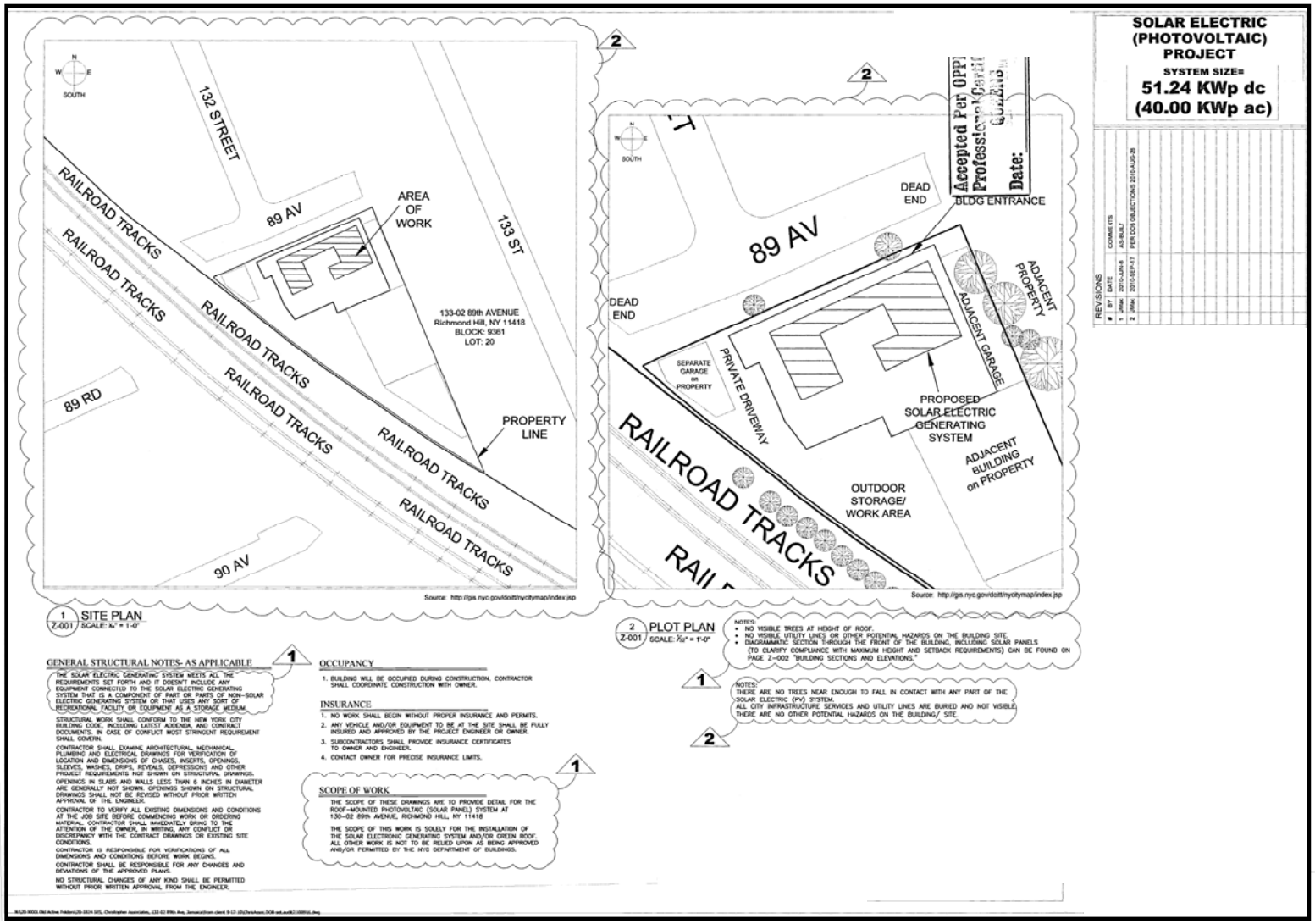
Warren Fray, R.A.
MAY 07 2010
Plan Examiner
Special Audits & Inspections Unit
AMENDED APPLICATION

NOTE: Scope of work is solely for the installation of solar electric generating system. All other work is not to be relied upon as being approved and/or permitted by the New York City Department of Buildings.

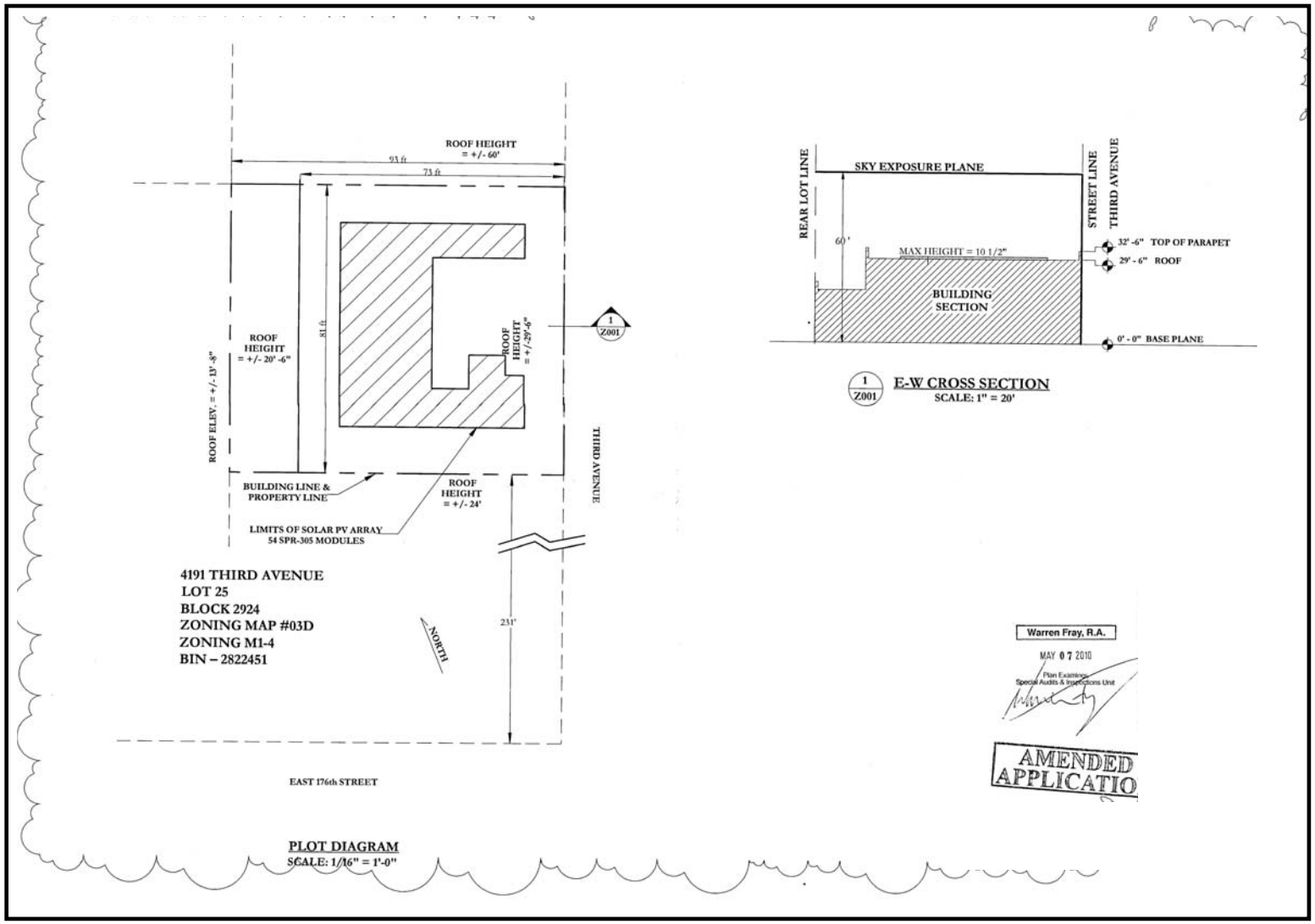
Case Study: Site Plan/Location Plan



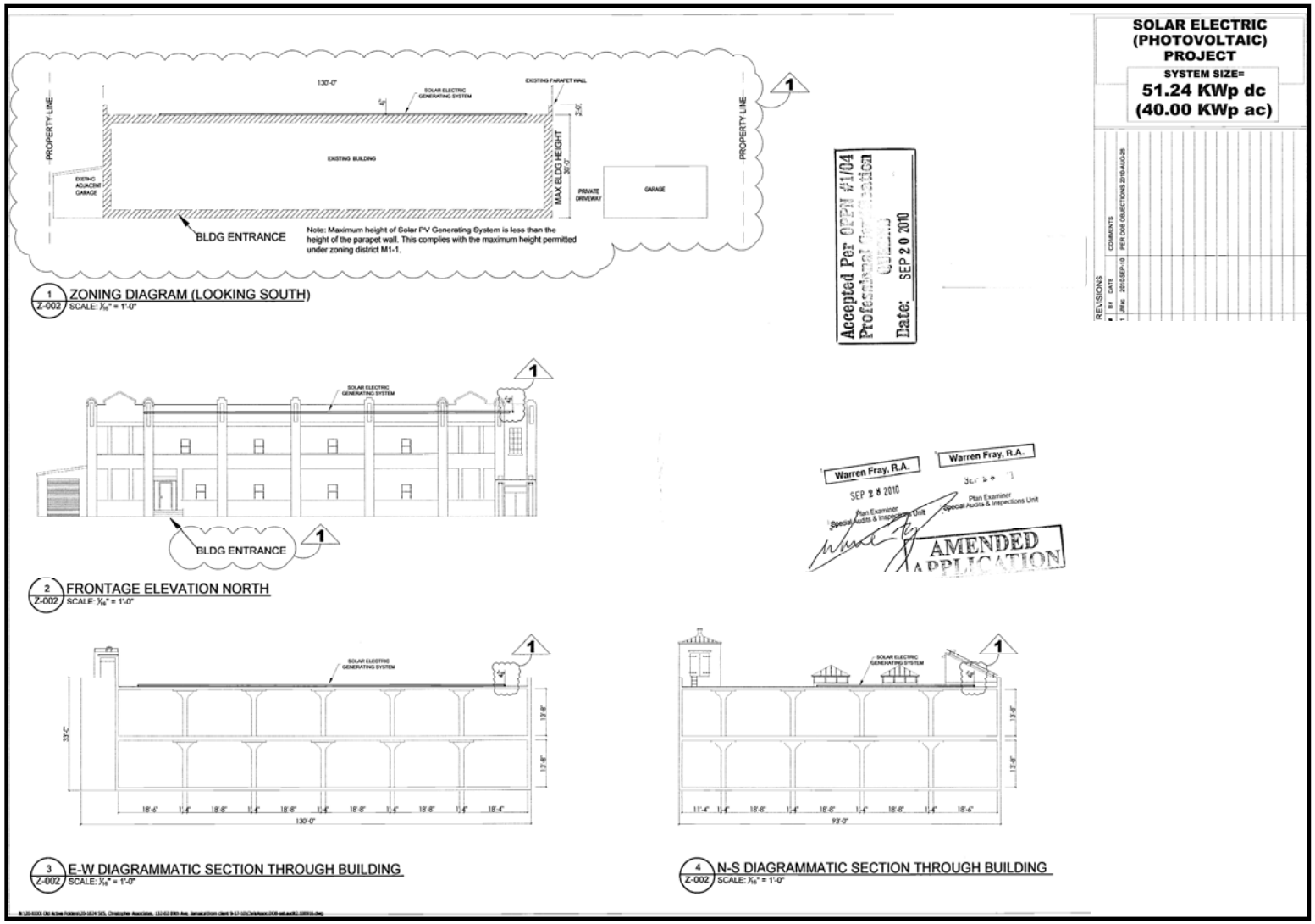
Case Study: Lot Diagram



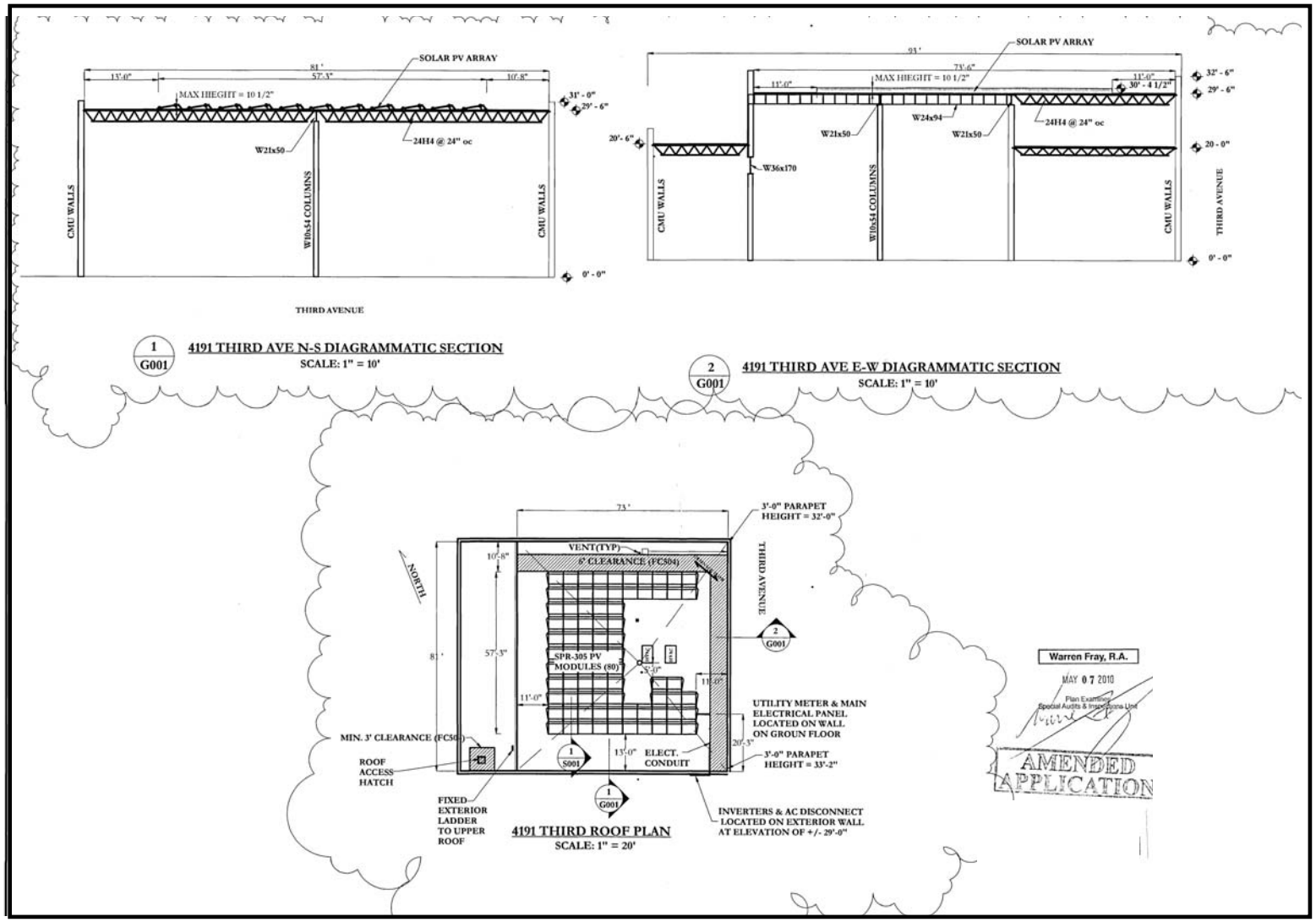
Case Study: Lot Diagram/Zoning Analysis



Case Study: Zoning Analysis



Case Study: Roof Plan



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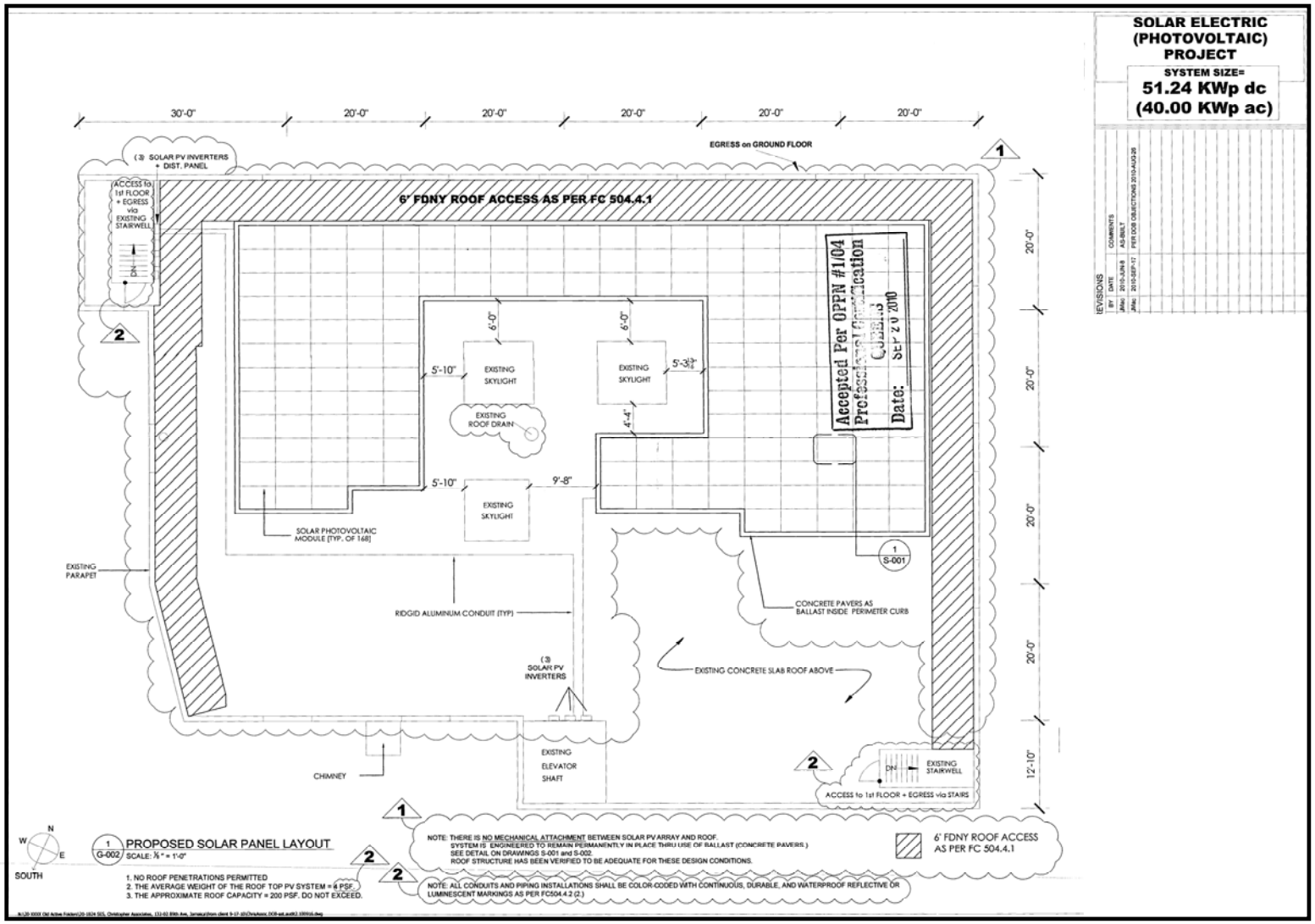


Case Study: Structural Drawing

Version 2.0.0

T10 VAR Wind Load Calculator

Select Module	N-S spacing (in)	E-W spacing (in)	Roof area per module (sq.ft.)	System base weight (psf)
SPR 300 series	61.035	62.31	26.4	2.5

Select Wind Zone: 110 (ASCE 7-Standard, 3-second gust, 50-year return)

Select Exposure: B

Definition: Urban or suburban areas, wooded areas. This terrain prevails in the upwind direction for at least 2,600 ft. (792 m) or 20 times the height of the building, whichever is greater. For buildings whose mean roof height is less than or equal to 30 ft. (9.1 m), the upwind distance may be reduced to 1,500 ft (457.2 m).

Select Building Type: II

Definition: All buildings and other structures except those listed in Categories I, III, and IV.

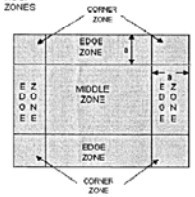
Select roof material: Bitumen

Force securement? No

Building dimensions	
Length	90 ft.
Width	80 ft.
Roof Height	30 ft.
Dimension a:	11 ft.

Project
Name: ABCO STEEL DOOR, LLC
Address: 4191 THIRD AVENUE BRONX, NY 10457

ROOF ZONES



Minimum Required Array Weight:

Middle Location		Edge Location		Corner Location		Securement
Array Weight (psf)	Pavers per Module*	Array Weight (psf)	Pavers per Module*	Array Weight (psf)	Pavers per Module*	
3.4	2.0	Do Not Install	N/A	Do Not Install	N/A	NONE

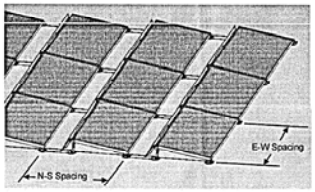
*Paver quantities are rounded up to the nearest 1/2, so actual array weights may be slightly different from the minimum requirement. Actual array weights are shown below.

Actual Array Weight:

Middle Location	Edge Location	Corner Location	Securement
Array Weight (psf)	Array Weight (psf)	Array Weight (psf)	
3.6	N/A	N/A	NONE

Array dimensions
Number of N-S columns
Number of E-W rows
Area of array: 0 sq. ft.

For details of calculation method, refer to SunPower Corporation document 1507-355.



STRUCTURAL CAPCITY:

GENERAL DESIGN DATA:
ROOF HEIGHT = <30'
OCCUPANCY CATEGORY = I
EXPOSURE CATEGORY = B
GROUND SNOW LOAD = p_g =
BASIC WIND SPEED = Vbasic
6-1C)

Vbasic = 110 mph (Fig. 6-1C of ASCE 7-05)

e 6-2)
6-2)
$g^{0.5}$ = 1.83 (Table 6-3)
i.7.2)
le 6-4)
)

q_h = 0.0256 Kz Kzt Kd V^2 I = 21.7 psf (eq 6-15)
Performance of Sunpower racking system determined using wind tunnel test results
(ref: Botkin, Structural Qualification of Wind Resistance for T10 Solar Roof Tile, 2007)
V_{mw} = 1.42(h/z_g)$^{1/16}$ $(K_z I)^{0.5}V_{basic}$ = 92.2 mph (scaled wind tunnel failure velocity)
$U_i = U_t(L_w/L_i)^{0.5}$ $\{(\rho_r/\rho_a)_{mw}/(\rho_r/\rho_a)_{mi}\}^{0.5}$ (Modified foude no. scaling to field conditions)
$U_{i(ref)_{mw}}$ = 69 mph (wind tunnel failure velocity
ρ_a = 1.9 psf (wind tunnel density)
$\rho_r = \rho_a (V_{mw}/(U_{i(ref)})_{mw})^2$ = 3.4 psf (required field density)

Array weight = 2.5 psf
Required Ballast weight = 0.9 psf
Actual weight of ballast = 1.1 psf
Total weight = 3.6 psf

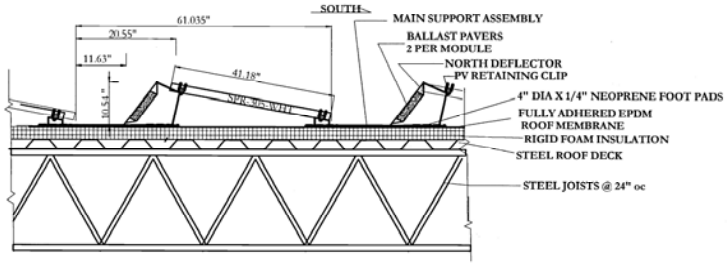
LIVE LOAD - Roof LL = 20 psf
SNOW LOAD
p_g = 20 psf (Fig 7-1)
Terrain Category - B
Exposure - Partially Exposed
Ce = 1.0 (Table 7-2)
Cs = 1.0 (Fig. 7-12)
Ct = 1.0 (Table 7-3)
I = 1.0 (Table 7-4)
SL = 0.7 p_g I Ce Cs Ct = 14 psf

SUPPORTING BEAMS: 24LJ04 STEEL JOISTS (SPACING = 2'-0"; MAX. SPAN = 45')MAX. ALLOWABLE UNIFORMLY DISTRIBUTED LOAD = 197#/LF
ROOF DECKING: TYPE B 20GA GALVANIZED STEEL MAX. ALLOWABLE UNIFORMLY DISTRIBUTED LOAD = 74 PSF

DEAD LOAD:

BUILT UP ROOF	6.5 PSF	13.0 #/LF
DECKING	2.4	4.8
24LJ04		16.0
EXISTING DL ON DECKING	8.9	
EXISTING DL ON 24LJ04		33.8
PV ARRAY	3.6	7.2
LIVE LOADS:		
SNOW	14.0	28.0
ROOF LIVE LOAD	20.0	40.0

DECKING:
DL + SLL = 8.9 + 3.6 + 14 = 26.5 PSF < 74
DL + 0.75 SLL + 0.75 RLL = 8.9 + 3.6 + (0.75)14 + (0.75) 20.0 = 39 PSF < 74
STEEL JOISTS:
DL + SLL = 33.8 + 7.2 + 28.0 = 69.0 #/LF < 197
DL + 0.75 SLL + 0.75 RLL = 33.8 + 7.2 + (0.75)28.0 + (0.75) 40.0= 92 #/LF < 197



1 / S001 SECTIONAL DETAIL
3/4" = 1'-0"

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MAY 07 2010
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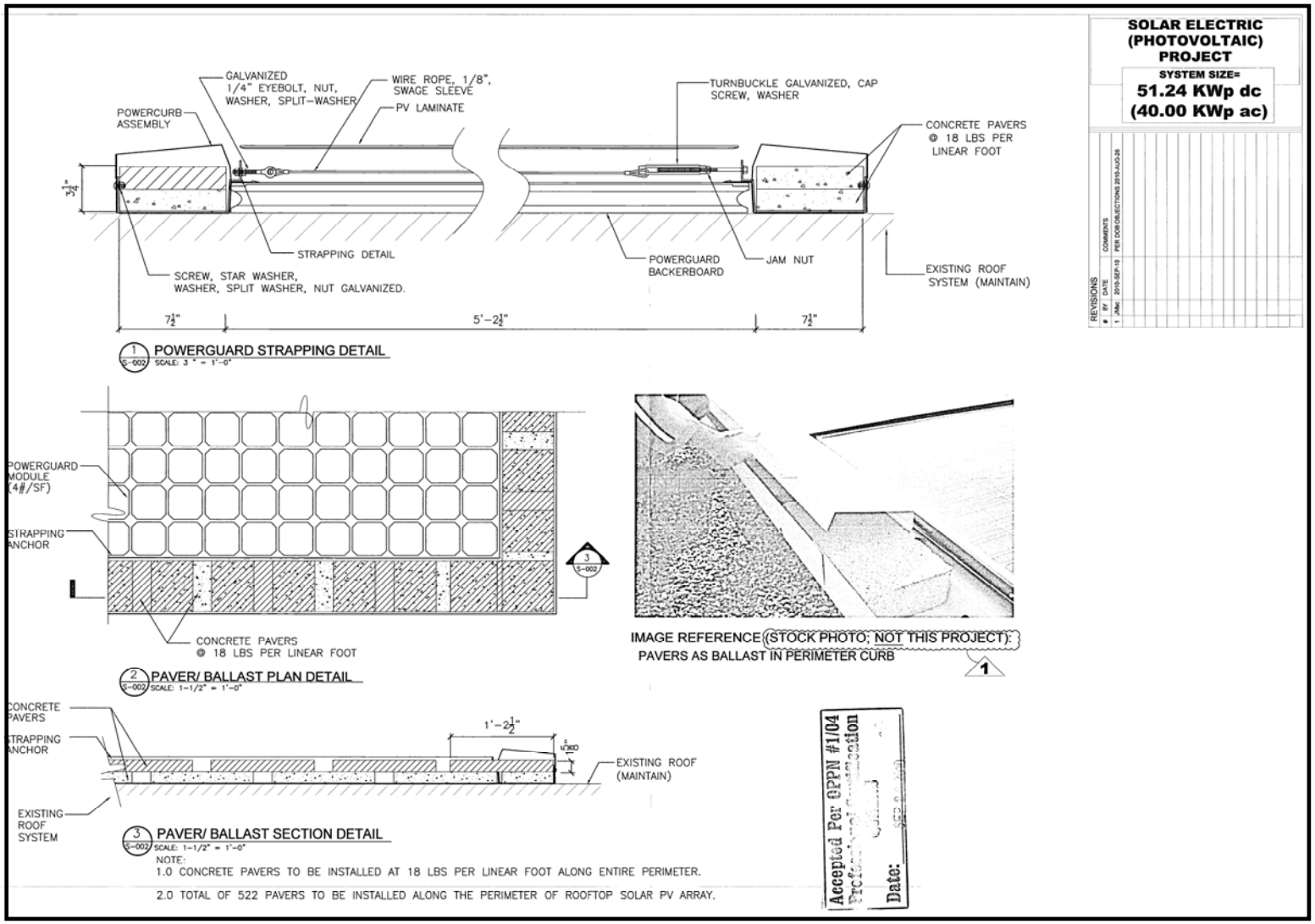
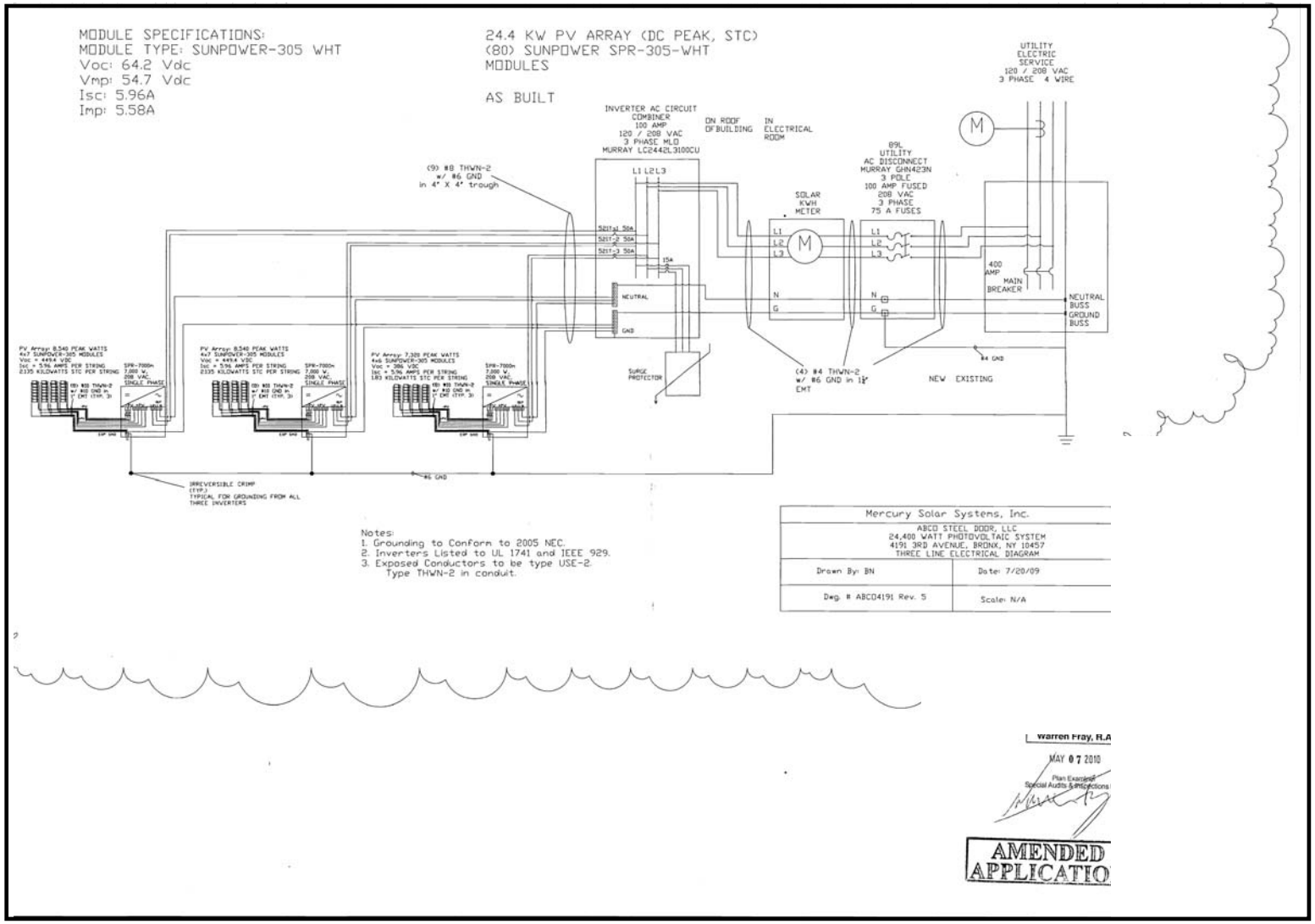
AMENDED APPLICATIO

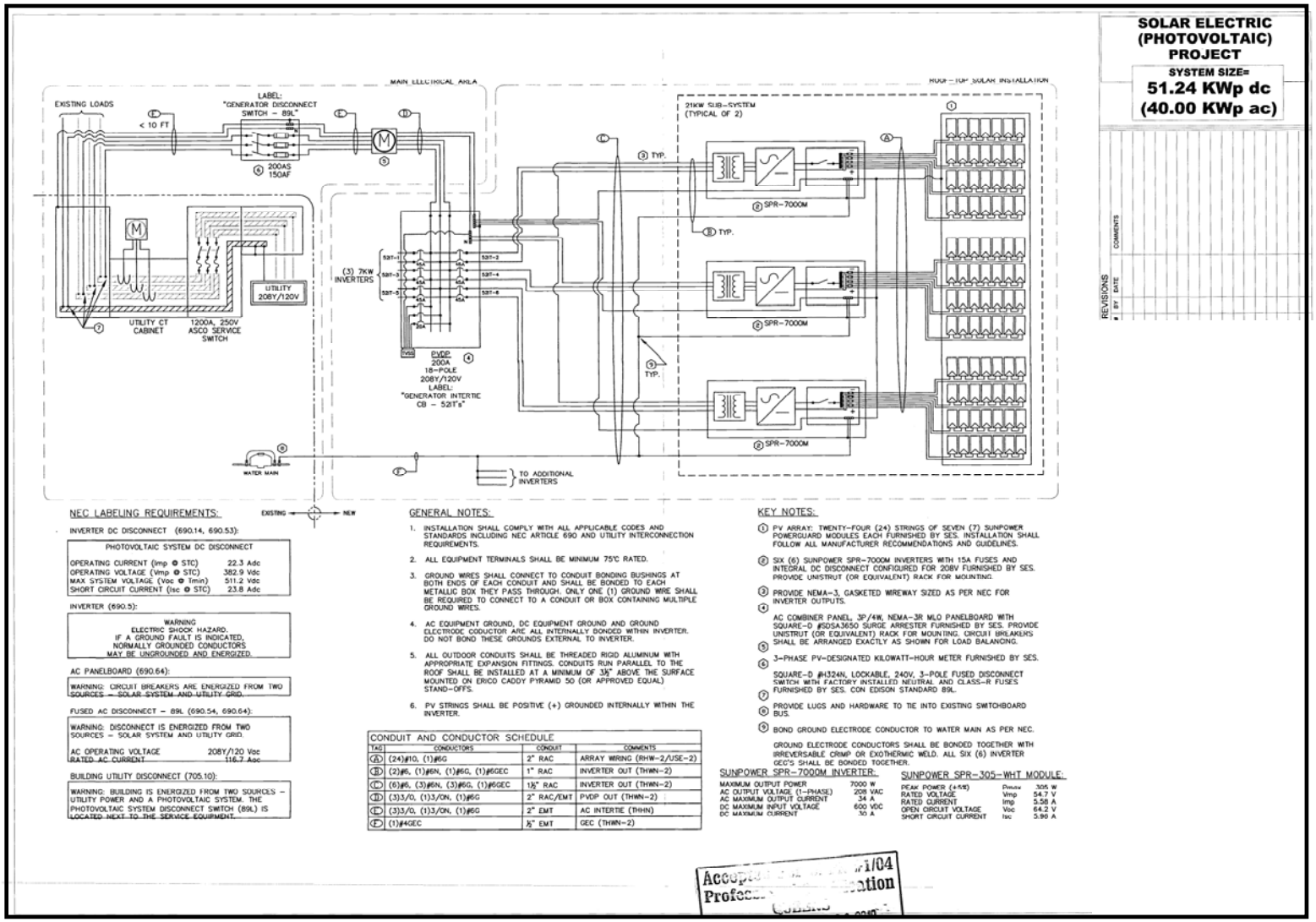
Case Study: Structural Drawing



Case Study: Electrical Drawing



Case Study: Electrical Drawing



NEC LABELING REQUIREMENTS:

INVERTER DC DISCONNECT (690.14, 690.53):

PHOTOVOLTAIC SYSTEM DC DISCONNECT	
OPERATING CURRENT (Imp @ STC)	22.3 Adc
OPERATING VOLTAGE (Vmp @ STC)	382.9 Vdc
MAX SYSTEM VOLTAGE (Voc @ Tmin)	511.2 Vdc
SHORT CIRCUIT CURRENT (Isc @ STC)	23.8 Adc

INVERTER (690.5):

WARNING
ELECTRIC SHOCK HAZARD.
IF A GROUND FAULT IS INDICATED,
NORMALLY GROUNDED CONDUCTORS
MAY BE UNGROUNDED AND ENERGIZED.

AC PANELBOARD (690.64):

WARNING: CIRCUIT BREAKERS ARE ENERGIZED FROM TWO SOURCES – SOLAR SYSTEM AND UTILITY GRID.

FUSED AC DISCONNECT – 89L (690.54, 690.64):

WARNING: DISCONNECT IS ENERGIZED FROM TWO SOURCES – SOLAR SYSTEM AND UTILITY GRID.

AC OPERATING VOLTAGE 208Y/120 Vac
RATED AC CURRENT 116.7 Aac

BUILDING UTILITY DISCONNECT (705.10):

WARNING: BUILDING IS ENERGIZED FROM TWO SOURCES – UTILITY POWER AND A PHOTOVOLTAIC SYSTEM. THE PHOTOVOLTAIC SYSTEM DISCONNECT SWITCH (89L) IS LOCATED NEXT TO THE SERVICE EQUIPMENT.

GENERAL NOTES:

1. INSTALLATION SHALL COMPLY WITH ALL APPLICABLE CODES AND STANDARDS INCLUDING NEC ARTICLE 690 AND UTILITY INTERCONNECTION REQUIREMENTS.
2. ALL EQUIPMENT TERMINALS SHALL BE MINIMUM 75°C RATED.
3. GROUND WIRES SHALL CONNECT TO CONDUIT BONDING BUSHINGS AT BOTH ENDS OF EACH CONDUIT AND SHALL BE BONDED TO EACH METALLIC BOX THEY PASS THROUGH. ONLY ONE (1) GROUND WIRE SHALL BE REQUIRED TO CONNECT TO A CONDUIT OR BOX CONTAINING MULTIPLE GROUND WIRES.
4. AC EQUIPMENT GROUND, DC EQUIPMENT GROUND AND GROUND ELECTRODE CODUCTOR ARE ALL INTERNALLY BONDED WITHIN INVERTER. DO NOT BOND THESE GROUNDS EXTERNAL TO INVERTER.
5. ALL OUTDOOR CONDUITS SHALL BE THREADED RIGID ALUMINUM WITH APPROPRIATE EXPANSION FITTINGS. CONDUITS RUN PARALLEL TO THE ROOF SHALL BE INSTALLED AT A MINIMUM OF 3½" ABOVE THE SURFACE MOUNTED ON ERICO CADDY PYRAMID 50 (OR APPROVED EQUAL) STAND-OFFS.
6. PV STRINGS SHALL BE POSITIVE (+) GROUNDED INTERNALLY WITHIN THE INVERTER.

CONDUIT AND CONDUCTOR SCHEDULE

TAG	CONDUCTORS	CONDUIT	COMMENTS
(A)	(24)#10, (1)#6G	2" RAC	ARRAY WIRING (RHW-2/USE-2)
(B)	(2)#6, (1)#6N, (1)#6G, (1)#6GEC	1" RAC	INVERTER OUT (THWN-2)
(C)	(6)#6, (3)#6N, (3)#6G, (1)#6GEC	1½" RAC	INVERTER OUT (THWN-2)
(D)	(3)3/0, (1)3/0N, (1)#6G	2" RAC/EMT	PVDP OUT (THWN-2)
(E)	(3)3/0, (1)3/0N, (1)#6G	2" EMT	AC INTERTIE (THHN)
(F)	(1)#4GEC	½" EMT	GEC (THWN-2)

KEY NOTES:

1. PV ARRAY: TWENTY-FOUR (24) STRINGS OF SEVEN (7) SUNPOWER POWERGUARD MODULES EACH FURNISHED BY SES. INSTALLATION SHALL FOLLOW ALL MANUFACTURER RECOMMENDATIONS AND GUIDELINES.
2. SIX (6) SUNPOWER SPR-7000M INVERTERS WITH 15A FUSES AND INTEGRAL DC DISCONNECT CONFIGURED FOR 208V FURNISHED BY SES. PROVIDE UNISTRUT (OR EQUIVALENT) RACK FOR MOUNTING.
3. PROVIDE NEMA-3, GASKETED WIREWAY SIZED AS PER NEC FOR INVERTER OUTPUTS.
4. AC COMBINER PANEL, 3P/4W, NEMA-3R MLO PANELBOARD WITH SQUARE-D #SDSA3650 SURGE ARRESTER FURNISHED BY SES. PROVIDE UNISTRUT (OR EQUIVALENT) RACK FOR MOUNTING. CIRCUIT BREAKERS SHALL BE ARRANGED EXACTLY AS SHOWN FOR LOAD BALANCING.
5. 3-PHASE PV-DESIGNATED KILOWATT-HOUR METER FURNISHED BY SES.
6. SQUARE-D #H324N, LOCKABLE, 240V, 3-POLE FUSED DISCONNECT SWITCH WITH FACTORY INSTALLED NEUTRAL AND CLASS-R FUSES FURNISHED BY SES. CON EDISON STANDARD 89L.
7. PROVIDE LUGS AND HARDWARE TO TIE INTO EXISTING SWITCHBOARD BUS.
8. BOND GROUND ELECTRODE CONDUCTOR TO WATER MAIN AS PER NEC.

GROUND ELECTRODE CONDUCTORS SHALL BE BONDED TOGETHER WITH IRREVERSABLE CRIMP OR EXOTHERMIC WELD. ALL SIX (6) INVERTER GEC'S SHALL BE BONDED TOGETHER.

SUNPOWER SPR-7000M INVERTER:

MAXIMUM OUTPUT POWER	7000 W
AC OUTPUT VOLTAGE (1-PHASE)	208 VAC
AC MAXIMUM OUTPUT CURRENT	34 A
DC MAXIMUM INPUT VOLTAGE	600 VDC
DC MAXIMUM CURRENT	30 A

SUNPOWER SPR-305-WHT MODULE:

PEAK POWER (+5%)	Pmax	305 W
RATED VOLTAGE	Vmp	54.7 V
RATED CURRENT	Imp	5.58 A
OPEN CIRCUIT VOLTAGE	Voc	64.2 V
SHORT CIRCUIT CURRENT	Isc	5.96 A

greenroofandsolar@buildings.nyc.gov