DESIGN GUIDELINE 263100
PHOTOVOLTAIC ENERGY EQUIPMENT

Scope

All solar generating systems connecting into the University of Michigan system or building behind the regulated utility meter.

Related Sections

U-M Design Guideline Sections:
1.0 Codes and Regulatory Agencies (for energy code requirements)
4.8 Fall Protection on Roofs
6.0 DG075000 Roofing Systems and Accessories
6.0 DG265600 Exterior Lighting

U-M Master Specification Sections:
261100 Unit Substations

Reference Documents:
ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
IEC 61215 Terrestrial Photovoltaic (PV) Modules–Design Qualification and Type Approval
NFPA 70E Standard for Electrical Safety in the Workplace

Design and Installation Requirements

Design and installation are subject to governing codes as adopted by the University of Michigan. These can be found at: https://umaec.umich.edu/desguide/1.0-Codes/DG1.0.pdf

Identify a clear, unobstructed pathway for firefighting response in compliance with the International Fire Code Section 1205 for all Photovoltaic installations.

Additional relevant code and design requirements may be identified later in this document for each installation type.

General Equipment Requirements:

- Solar modules must meet IEC 61215 for hailstone resistance
- A 25-year panel manufacturer's workmanship warranty is required
- 25-year minimum linear power warranty, with guaranteed 85% minimum production at year 25.
- 12-year string inverter warranty required
- The required installer warranty is 2 years
- UM prefers grid-interactive inverters over islanding type
- Modules and inverter manufacturer should be in business for a minimum of 10 years

General Installation and Construction Requirements:

Carport or ground mount connections to be made at the nearest building substation, where practical, and as follows:

- The preferred installation shall be ahead of the main breaker of the substation. The project team shall discuss options with UM Utilities during the design phase.
- Space permitting, U-M prefers the inverters to be located within the substation room.
- Revenue grade metering, consistent with the university standard, shall be installed at each interconnection point to the university electrical system. Per UM MS261100 (Schneider Electric catalog #S8650C4C0H6E1B0A)

Considerations for Building Rooftop Installations

General equipment requirements are as follows:

- Evaluate remaining life span of roof to ensure it is sufficient to align with anticipated PV replacement
- Rooftop connections to be made at the building substation
- No roof mounting penetrations
- Roof warranty
    - New construction projects to ensure system will not void warranty

Pitched Roof Solar Installations

Design Criteria Governing Codes:

- Latest edition of NFPA 70E
- The latest Building Code minimums for snow load, wind speed, wind class exposure, and appropriate risk category.

Preferred equipment:

- Large scale photovoltaics is a developing industry. New products and companies continue to emerge, exit the market, or merge with competitors. In order to ensure product longevity along service part availability and warranty support, the following should be considered when evaluating photovoltaic equipment and manufacturers:
    - US manufactured equipment is preferred
    - Manufacturing company should be in business for 10 years
    - 10 year in service period of electronic equipment is preferred
- Approved products
    - Boviet 550w Solar Modules

- SolarEdge Inverters
- SolarEdge Optimizers w/ built-in Rapid Shutdown
- IronRidge Racking Components

Flat Roof Solar Installations

Design Criteria Governing Codes:

- Latest edition of NFPA 70E
- The latest Building Code minimums for snow load, wind speed, wind class exposure, and appropriate risk category.

Roof mounting techniques:

- Ballasted system for flat roof
- Option for a mounted system but it is on an elevated grid to minimize roof connection points but is lighter than a ballasted system for roofs with limited structural capacity
- Minimum clearance around roof hatches is 15 feet.

Preferred equipment:

- Large scale photovoltaics is a developing industry. New products and companies continue to emerge, exit the market or merge with competitors. In order to ensure product longevity along service part availability and warranty support, the following should be considered when evaluating photovoltaic equipment and manufactures:
  - US manufactured equipment is preferred
  - Manufacturing company should be in business for 10 years
  - 10 year in service period of electronic equipment is preferred

Approved Products:

- Boviet 550w Solar Modules
- SolarEdge Inverters
- SolarEdge Optimizers w/ built-in Rapid Shutdown
- Unirac Racking Components

Considerations for Parking Lot and Garage Canopy Installations

Design Criteria Governing Codes:

- ASCE 7-10
- Latest edition of NFPA 70E
- The latest Building Code minimums for snow load, wind speed, wind class exposure, and appropriate risk category.

Parking lot structural:

- Tubular Construction with galvanized finish
- Minimum height clearance = 13'- 6". Some lots may have tall vehicle requirements, so the project team shall engage U-M LTP and/or the primary lot user to confirm the minimum height.
- Provide parking lot lighting in accordance with https://umaec.umich.edu/desguide/tech/26/DG265600.pdf Parking Garage lighting shall be in accordance with https://umaec.umich.edu/desguide/5.0-SBA/SBA5.6.pdf.

Preferred equipment:

- Large scale photovoltaics is a developing industry. New products and companies continue to emerge, exit the market or merge with competitors. In order to ensure product longevity along service part availability and warranty support, the following should be considered when evaluating photovoltaic equipment and manufactures:
    - US manufactured equipment is preferred
    - Manufacturing company should be in business for 10 years
    - 10 year in service period of electronic equipment is preferred
- Approved Products:
    - Boviet 550w Solar Modules
    - SMA CORE1 Inverters